CONSUMPTION OF POTTERY AND LITHICS IN THE PERIPHERIES OF TIKAL, GUATEMALA

A Dissertation in
Anthropology
by
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ABSTRACT

My dissertation utilizes field data collected from the Classic lowland Maya center of Tikal by The Pennsylvania State University Tikal Project between 2003 and 2006. It is specifically designed to address household economics at a pre-industrial Maya center relating artifact distributions to household consumption and exchange patterns. Household level recovery of pottery and lithics from two field seasons of settlement excavations are summarized here and used to address several questions and test various hypotheses and models.

My artifact data set was retrieved primarily from 60 test-pits: 49 from 36 discreet residential units (i.e., households) within the northern survey corridor and western survey block, and another 11 at the minor center of Ramonal/Chalpate. Thirty five trench excavations (18 Operations) were also excavated across the ditch and embankment of the earthwork segments, but these produced few ceramics or lithics. All excavations are within peripheral or hinterland Tikal, between 4.6 and 9 km from central Tikal’s large core architecture or “downtown” area.

Lithic artifact distribution patterns are contrasted against more complex ceramic distributions. An Instrumental Neutron Activation Analysis (INAA) facilitated the construction of compositional reference groups for ceramics related by paste recipe. These groups reflect different production traditions, and the distribution patterns for sherds from these groups inform about the likely mechanisms of exchange in the Classic period.
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Chapter 1 – An Introduction to the Archaeological Site of Tikal

1.1 – Introduction

My dissertation utilizes recently collected field data from the Classic lowland Maya center of Tikal that relate to household consumption and exchange patterns. It is specifically designed to address household economics at a pre-industrial Maya center. Household-level recovery of pottery and lithics from two field seasons of settlement excavations conducted by The Pennsylvania State University Tikal Project in 2005 and 2006 are summarized here and used to address several questions and test various hypotheses and models. These hypotheses and models are as follows:

1) Was any production organized above the level of the household?
2) How redundant were production units, i.e., how many units produced the same things?
3) Was any production centrally sponsored or controlled?
4) Did any segment of society maintain more restricted production or distribution networks outside of those operating throughout the entire settlement?
5) Do the distribution data suggest a single integrated economic system?
6) Does a market based model fit the data better than a redistributive one?

The use of the word “consumption” in the title of this dissertation does not indicate that this study primarily addresses the specific issues surrounding this process (see Appadurai 1986:29-33). Consumption has not received the same attention as production and distribution (Costin 1991:1). While I consider the varied compositions of household refuse dumps or “middens” and even the replacement rates for specific ceramic vessel classes, the term consumption here is primarily meant simply to denote the limits of the study. All observations and hypotheses derive from the archaeological

1 The author acted as project ceramic analyst for the Pennsylvania State University Tikal Project.
recovery of hard artifacts (i.e., pottery sherds and lithics), mainly from consumption or discard contexts. No direct evidence of production facilities or distribution institutions was encountered by the project; artifacts were recovered from a test-pitting program and no horizontal excavations of residential groups were attempted.

My dissertation addresses issues of production and distribution through the attributes of the artifacts, combined with their recovery contexts. The chemical or elemental compositions of the ceramic sherds encode information on their manufacture and, taken as a group, the organization of ceramic production. Likewise, the physical characteristics of lithic tools and debitage encode information concerning the manufacture of these implements. The goal of the study is to investigate the interrelated subjects of production, distribution, and consumption, but this has proceeded in the opposite order. Ceramics and lithics recovered from the loci of their discard have been analyzed in order to garner information about their manufacture and distribution. The recovered patterns are used to infer modes of production and also the probable mechanisms or institutional arrangements responsible for their distribution patterns.

The Pennsylvania State University Tikal Project (hereafter referred to as the PST Project) began in 2003 as an investigation of the previously reported “defensive earthworks” (Puleston and Callendar 1967) to the north and ‘south’ of the main architectural complex at the heart of Tikal (Webster et al. 2004, Webster et al. 2007). The PST Project (2003-2006) produced maps of the known northern earthwork, a previously unknown western earthwork, and located new segments of the eastern earthwork (previously identified as the southern earthwork); the project also mapped approximately 7 km² of residential occupation. My artifact data set was retrieved primarily from 60 test-pits: 49 at 36 discrete residential units (i.e., households) within the northern survey corridor and western survey block, and another 11 at the minor center of Ramonal/Chalpate. Thirty five trenches (18 operations) were also excavated across the ditch and embankment of the earthwork segments, but these produced few ceramics or
lithics. All excavations are within peripheral or hinterland Tikal, between 4.6 and 9 km from central Tikal’s large core architecture or “downtown” area (see Figure 9.1.1).

Large trenching excavations through the earthwork profiles typically produced little cultural material unless they were set perpendicular to household groups which straddled the earthworks — a situation we rarely encountered. Test-pits excavated at residential groups were typically 2 x 2 m squares aligned with a raised plaza or structure platform base to capture refuse immediately adjacent to the domestic compound. Most of the PST Project artifacts represent refuse or midden accumulation.

The goals of the PST Project included mapping all previously investigated segments of the earthworks, surveying for additional earthworks, and mapping associated household settlement. Trenching excavations through the earthworks were implemented to both clarify the form of the constructions and provide ceramic samples with which to determine construction dates for these features. In the summer of 2003 we completed the initial season or Phase I of the project (Webster et al. 2004). We mapped the northern earthwork, extending the total mapped length to 13.6 km (including gaps in the construction). We also completed a household settlement survey extending 125 m to either side (north and south) of this basically east-west running linear feature.

During the 2005 and 2006 field seasons, or Phase II of the project, we located and mapped various earthwork segments to the west and east of central Tikal, bringing the total mapped length of the earthwork system to around 24.6 km (including small gaps in the construction, but excluding longer expanses between segments). A 1 km² block of household settlement was surveyed and mapped approximately 5 km to the west of epicentral Tikal and another 1 km² block of settlement was surveyed and mapped approximately 4-5 km north of epicentral Tikal, centered on the already mapped northern transect. The satellite community of Ramonal/Chalpate, approximately 8.8 km to the east and slightly south of central Tikal, was also added to the maps. The 60 test-pit excavations and the 35 trench excavations (18 operations) were all completed during the
two field seasons of Phase II. Many of the household test-pits produced datable ceramics, at least from the last occupation episode at any particular group.

Cultural materials from the 2005 and 2006 excavation seasons were collected, labeled with field provenience designations, and then recorded in electronic spreadsheet form. All artifacts were counted and weighed in the field before transport to Guatemala City for analysis, which followed each of these field seasons. I worked alone in the lab and am responsible for all washing, labeling, drawing, and photography of artifacts. Ceramics were assigned type designations, when possible, following established canons (Gifford 1960; Sabloff and Smith 1969; Smith 1955; Smith et al. 1960; Willey et al. 1965; Willey et al. 1967). The ceramic types and forms from recovered lots were then assigned ceramic complex designations in accord with the established Tikal ceramic sequence (Culbert 1993), providing occupation dates for many of our settlement remains. Some larger concentrations of chert ‘debitage’ were coded for numerous flake attributes combined with counts, weights, and flake size categories in tabulation or mass assemblage fashion (e.g., Prentiss 1998; Sullivan and Rozen 1985). Obsidian artifacts were systematically measured and weighed and formal chert tools or implements were classified based on form after recording of weights and diagnostic characteristics.

In total, 9212 ceramic sherds [268.64kg.], 4262 chert flakes [63.59kg.], 53 formal chert implements [5.201 kg.], 18 additional cores or hammerstones [3.313 kg.], 106 obsidian fragments [120 grams], 13 ground stone artifact fragments [7.04kg.], and 3 shell fragments [30 grams] were recorded. In 2006 I sampled 170 ceramic artifacts by drilling into their fabric and removing a couple of hundred milligrams of powder from each sherd, which was stored in small glass vials. The 170 vials of ceramic powder were returned to the United States and sent to the Smithsonian Center for Materials Research and Education (SCMRE) where they were subjected to Instrumental Neutron Activation Analysis (INAA) at the National Institute of Standards and Technology (NIST) reactor by Dr. Ronald Bishop. The results of this subprogram are discussed in Chapter 9.5. The
analyses of ceramic, chert and obsidian artifacts which form the basis for testing economic organizational models here are reported fully in Chapter 9.

I will discuss the ‘economy’ of Tikal in my dissertation, reviewing previous theories and models as well as the pillars of evidence upon which they have been elevated. I will add another piece to this discussion by relating archaeological evidence of an economic nature from our recent excavations to this growing debate. I will be speaking of exotic imported goods, trade, and the contents of elite tombs. I will also discuss political interactions among Tikal, Teotihuacán, and other contemporaneous centers. More specifically, however, I will emphasize much more mundane archaeological data from recent household test-pitting excavations at Tikal: stone tools and pottery vessel fragments which were discarded or left by the Classic Maya inhabitants in the peripheral areas which surround Tikal’s splendid central precinct.

These artifacts constitute the physical remnants of the ancient activities of Tikal’s Classic inhabitants. While household artifact assemblages reflect common activities performed on a daily basis, taken together, they can also be viewed as one large assemblage of representing broader activities throughout the Tikal region – the cumulative remnants of society-wide institutions. My dissertation relates artifact consumption patterns documented by the PST Project with patterns from other regions, including those outside of Mesoamerica. A cross-cultural comparative framework characterizes the study in general, and specific ethnographic and archaeological findings reported for both Maya and non-Maya communities have been used for comparison and evaluation of competing hypotheses of economic organization.

1.2 – Trade, Exchange, and the Circulation of Goods at Tikal

“Long-distance trade has been cited as an important factor in both the rise of Maya civilization (Rathje 1972) and in its dramatic demise (Culbert 1973; Webb 1964). The large lowland civic-ceremonial centers may have functioned as the commercial loci for this long-distance trade. This is suggested by the
presence of long-distance imports and spacious public plazas within the centers, as well as their locational distribution in a hexagonal lattice-like network (Hammond 1974; Marcus 1973).” (Sidrys 1977:92)

The term “trade” has been used as a gloss word for the existence of foreign or imported goods in archaeological contexts. Tikal has long been described as a trading center (e.g., Moholy-Nagy 1997:296) based on the identification of imported material not available locally (i.e., obsidian, jade, marine shell) and centrally located obsidian “workshop dumps” (Moholy-Nagy 1990, 1992). In general, the term “trade” has been conveniently used to refer to the importation or long-distance acquisition of foreign raw materials and goods (see edited volume by Hårgh, Larsson, Olausson, and Petré [1988] Trade and Exchange in Prehistory). The current emphasis on quantifying trade and explaining the mechanisms or institutions responsible for this trade has seen a proliferation of new techniques (i.e., network analysis and locational analysis, see edited volumes by Sabloff and Rathje [1975] Ancient Civilization and Trade; Earle and Ericson [1977] Exchange Systems in Prehistory and Ericson and Earle [1982] Contexts For Prehistoric Exchange) borrowed from other disciplines and developed for the analysis of archaeological artifact distributions.

“It is the aim of this paper to draw attention to some of the regularities that are now becoming apparent and to ask to what extent we are justified in associating these with specific kinds of trade or exchange. Exchange is here interpreted in the widest sense; indeed in the case of some distributions it is not established that the goods changed hands at all. Trade in this case implies procurement of materials from a distance, by whatever mechanism.” (Renfrew 1977:72)

Trade is often associated with a ‘class’ of participants called traders or merchants, from informal single agents with little or no social restrictions (e.g., the Gurage of Ethiopia [Akalu and Stjernquist 1988]; the Kalinga of the Philippines [Stark 1994]) to professional traders such as the pochteca of the Aztec Empire (see Berdan 1982, 1986, 1987; Bittman and Sullivan 1978; Hicks 1994; Isaac 1986b). Karl Polanyi used the term trade in a broad manner, accepting trading activity well before the development of market
trade and the advent of market systems (see Polanyi 1957a); that is, the movement and exchange of goods along lines other than supply and demand principles.

In Polanyi’s writings, trade almost always means external trade and “trade…is ‘natural’ as long as it is a requirement of self-sufficiency” (Polanyi 1968[1957]:97). Hence, commercial trade (i.e., market trade) is an animal apart from the ‘natural’ trading propensity of a self-sufficient community of householders without a developed manufacturing ‘industry.’ For Polanyi trade in the modern use of the word refers to “the movement of goods on their way through the market;” under the market definition, all trade is market trade and all commodities are produced expressly for sale (Polanyi 1975:133-134).

“From the *institutional* point of view, trade is a method of acquiring goods that are not available on the spot. It is something external to the group, similar to activities which we are used to associating with quite different spheres of life, namely, hunts, expeditions, and pirate raids. The point of all these activities, including trade, is acquisition and carrying of goods from a distance. What distinguishes trade from the rest is a two-sidedness which also ensures its peaceful nature, absent in quests for booty and plunder.” (Polanyi 1975:133)

Hence, ‘natural’ trade implies non-commercial acquisition without seeking profit as opposed to exchange as a profession involving merchants. Trade is also a two-sided agreement and not a forced extraction.

“External trade is natural when it serves the survival of the community by maintaining its self-sufficiency. The need for this [trade] arises as soon as the extended family grows overpopulous, and its members are forced to settle apart.” (Polanyi 1968[1957]:96)

“The origin of market institutions is in itself an intricate and obscure subject. It is hard to trace their historical beginnings with precision and even harder to follow the stages by which early forms of trade developed into market trade.” (Polanyi 1968[1957]:101)
Polanyi made a clear distinction between trade and market exchange, both organizationally and temporally (see Polanyi 1975).

“Trade and markets had not only different locations, status, and personnel, they differed also in purpose, ethos, and organization.” (Polanyi 1968[1957]:105)

I use the term trade here simply to refer to the importation of non-local resources and goods (but not services). This usage of the term stems from the archaeological data on which my dissertation is based. Trade is first identified through the recovery of foreign raw materials and objects then the circulation of these is contemplated. Harriet Crawford (1991) eloquently expressed this perspective when discussing trade in Sumer.

“It should be noted that the word ‘trade’ is being used very loosely in this discussion to cover the acquisition of foreign goods by any means, including foraging, pillaging and tribute. It is often impossible to distinguish archaeologically between these methods of moving goods from one place to another and even the texts are unreliable as rulers tended to use inscriptions to enhance their personal standing rather than to keep factual record. With this end in view, genuine trade might be represented as tribute, and pillaging as trade.” (Crawford 1991:139)

The ultimate goal of this archaeological research is to define the mechanism and institutions through which trade and exchange occurred. In the following discussion, the term trade is used in a loose manner to refer to the importation or acquisition of non-local materials and goods; exchange is used specifically to refer to the willful transfer of these things from individuals or groups to other individuals or groups. These exchanges may have involved direct barter, marketplace exchange through barter or with (primitive) money objects, redistribution without immediate equivalent returns, or any number of mechanisms to be explored through the data. I am most concerned with the exchange of locally produced goods (i.e., pottery and lithic tools) throughout the kingdom of Tikal. Trade, in the broad sense, will not be considered as thoroughly as exchange, although it is acknowledged that obsidian is both a trade material and an exchanged item at Tikal. Trade and exchange are often linked physically, as with the importation of obsidian to
produce blades for local circulation (exchange). The two concepts are also theoretically linked as common phenomenon with the same purpose.

“The term trade usually evokes a picture of the movement of goods over long-distances, while local exchange obviously refers to a purely local phenomenon. They are, however, complementary processes. While long-distance trade provides economic links between more or less independent settlement systems, local exchange provides similar linkage within individual systems.” (G. A. Johnson 1975:285)

The study of intra-site exchange has received considerably less attention than the study of long-distance trade or inter-site exchange. Specifics of trade and distribution have not been adequately addressed for either exotic materials like jade or marine shell or for locally produced goods such as pottery and stone tools. Highly abstract models of socio-political organization have been linked to the organization of production and distribution (e.g., Ball 1993; Webb 1977; see Inomata and Houston 2001:5-6). Less effort has been devoted to the archaeological identification of production units for any class of goods within a center or efforts to establish the circulated range of specific commodities produced within a center. A good place to begin is at the most basic level of society, the household, because most models and overviews of the organization of Classic Maya craft production, especially ceramic production, stress dispersed household production.

A household perspective does not deny the importance of wealth items or status goods imported into or crafted within Tikal or any other Classic Maya center or polity. The “economy” of the Maya can be subdivided in a number of ways and there is no reason to believe that one all-inclusive distribution strategy would dominate at a single center, much less prevail in all places at all times. What research is just starting to unravel is the nature of selective control of resources and status goods which facilitated elite manipulation of a prestige economy. On the other hand, locally produced craft items were circulated within polities through unknown mechanisms or institutions. The Maya economy was much more complicated than a simple market versus no market dichotomy, or a simple independent versus attached specialist one. The Classic Maya are not alone
in this regard, most, if not all, ancient societies had complex economic systems characterized by differentiated, and often overlapping, exchange mechanisms. Classic Maya society also appears sufficiently stratified for reciprocal gift exchange and redistribution strategies to have become well developed and embedded in the social fabric of their civilization on a highly formalized level. The economy of the Classic Maya may also fall into the category referred to as multicentric, where not all exchanges were organized through the same institution, or by the same principle (Houston and Inomata 2009:253).

The population density of Maya centers under even the most conservative of estimates places them in the range of societies that developed marketplaces and market systems. The more crucial issues are the centralized control of markets and the hierarchical organization of the market systems, the frequency and intensity of exchanges of all kinds (reciprocal, redistributive, or market based), sponsorship and control of long-distance trade, and the level and structure of appropriation in the form of taxation, tribute, or booty which accompanied such developments over the course of occupation of any center or region. Furthermore, is marketplace exchange the dominant form of exchange or is it “peripheral,” in the sense that the majority of ancient residents did not depend on marketplace exchange for their livelihood (see Bohannon and Dalton 1962; Dalton 1964, 1978)? Even so, marketing practices are certainly worthy of investigation in their own right, even if marketing proves not to be the dominant form of exchange, mode of economic integration, or practice responsible for wealth accumulation and distribution.

Although I stress the inner workings of self-sufficient polities, I do not mean to imply that interactions among discrete centers were unimportant in molding the political and economic landscape of Mayaland. Warfare, conquest, tribute, and (probably) slavery certainly shaped the Classic Maya way of life. It has also been documented that growth cycles and prosperity were, in fact, complementary among Classic Maya centers or regions. History is rife with tales of the waxing and waning of political and economic

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2 Reviews of complex, multicentric economic systems are provided in Chapter 11.
fortunes on the state or polity level; the conquerors soon become the conquered, only to rise again. These complex historical trajectories are not inconsequential. Nonetheless, speculation about political organization has not helped to define the production and distribution of pottery, the most ubiquitous commodity recovered archaeologically from Classic Maya centers.

Economic record-keeping is unknown for the Classic Maya, although an excellent corpus of Classic inscriptions on stone, stucco, and wood monuments (and a few portable objects such as ceramic vessels, bones, or shells) exists for Tikal which provides an epigraphic record or culture history of the polity. This includes interactions with other Classic Maya polities, a dynastic history of rulers, and various ‘time-keeping’ monuments which fortunately help to temporally anchor construction and growth of any center to specific historical periods. Warfare events, marriage alliances and elite visitations among Tikal and other kingdoms are attested in the epigraphic record of not only Tikal, but also of Calakmul, Caracol, Dos Pilas, and Uaxactun. This epigraphic record is incomplete, partially deciphered and written in an exceptionally one-sided ‘propaganda’ fashion. Both the prosody of the ancient language and the social context within which monuments were used are poorly understood³.

Unfortunate for the present inquiry, Maya epigraphic history does not provide any substantial information on production, consumption, or exchange, either within the polity of Tikal or between Tikal and any other center or region. No systematic iconographic and/or epigraphic analysis of tribute scenes and texts recorded on painted pottery vessels has been published⁴. While information elucidating the structure and scale of tribute payments might eventually emerge from such analyses, only titillating clues have as yet come to light. There is an equally sparse, or non-existent, epigraphic record about trade or economics for any other Maya polity or region. In addition to the epigraphic record, a

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³ The Classic Maya corpus of monuments is viewed in terms of elite propaganda by Marcus (1992), while David Stuart has emphasized the epigraphic focus on things rather than people (1995) and their function within actors’ rites (1996).

⁴ Individual pots have sometimes been interpreted as tribute scenes; however, no systematic evaluation of a large corpus of pottery has documented tribute networks of a number of secondary centers’ tributary status to a single major center. No quantitative analysis of tribute has emerged.
well defined ceramic sequence (Culbert 1993, 2003) is directly tied to the Maya Long Count calendrical system which correlates directly with the Gregorian calendar (GMT 11/16 correlation). The settlement data from the PST Project were dated by chronological comparison with this established Tikal ceramic sequence.

The “urban” infrastructure of Tikal represents a large and consistent output of labor and resources (most heavily concentrated in the epicenter) combined with a fairly densely settled periphery or ‘sustaining area,’ whether you view this in purely political terms (i.e., A. Smith 2003), economic terms (see Haviland 1970; Puleston and Callendar 1967; Puleston 1973), or a combination of the two. Furthermore, substantial centers, potentially or actually autonomous and/or independent, [Jimbal, Uaxactun] are located within a day’s walk from the Tikal center, with ‘minor centers’ [Bobal, Navajuelal, Ramonal/Chalpate] dotting other portions of the landscape. A complex and hierarchical community structure of mostly (extensive) agriculturalists is strongly indicated by this settlement pattern, which combines dispersed households with spaced centers of varying size.

Even with the more recent focus on settlement archaeology, we are still ignorant of how the majority of Maya agriculturalists lived their lives. Were households extremely self-sufficient with elites extracting labor and surplus through complex redistributive institutions, or were the Maya highly market-oriented? Did households produce their own craft items and daily necessities at the nuclear- or extended-family level, or did wider kinship ties dominate exchange and redistribution? Furthermore, are these dichotomous distinctions oversimplifications? Was the Classic Maya economy comprised of a mix of both ends of these spectrums? While previous studies have attempted to solve these questions, they have mostly acted to spur more debate. Investigations by The University of Pennsylvania Tikal Project (1956-1970) resulted in strong assertions concerning the positive identification of high population densities (Haviland 1966, 1969, 1970, 1972, 2003, 2008; Puleston 1973), workshop level production (Becker 1973a, 1973b, 2003b; Culbert 2003; Culbert and Schwalbe 1987, Fry

One more confounding variable to be considered in the discussion of imported materials is the fact that symbols and technologies were shared among Maya and non-Mayan polities. This can be seen in the use of foreign symbols on local monuments or ceramic vessels as well as in widespread shared production technologies. Ceramic vessels and obsidian points produced in different polities may look identical and be indistinguishable, even to the trained eye, and hence be classified as equivalent types and varieties (see Bishop et al. 2004, 2006; Foias and Bishop 2005) for fine grey ceramic production zones; Moholy-Nagy et al 1984; Moholy-Nagy 1999, 2003b; Spence 1996, for central Mexican obsidian at Tikal). On the other hand, ceramic vessels may also be immediately distinguished as ‘mimics;’ local copies of foreign pieces which were clearly produced with local clays. Given this dilemma of identification, I submitted 170 ceramic artifact samples to the Smithsonian Institution for INAA (Instrumental Neutron Activation Analysis) to better understand the sources of and variation among certain ceramic types and varieties; this analysis and its significance for understanding the distribution of recovered ceramics from the PST Project are discussed in chapter 9.5. Only two obsidian artifacts recovered appear to be of central Mexican origin, but the obsidian artifacts have not been subjected to compositional sourcing and some of the blade fragments might have been made from obsidian originating in the Mexican highlands.

Evaluating the frequency and intensity of exchanges and their organizational structure requires information on primary production, population density, settlement structure, and artifact distributions. Fortunately, the PST Project recovered sufficient data to produce a revised picture of Maya life in the Tikal polity. All phases of our project, and previous ones, build upon one another to address the issue of ancient economics, and the question of market integration in particular.
A substantial amount of literature exists (and is currently in press) concerning the organization of production, consumption and exchange – in a word: economics\(^5\). Part of this corpus deals with long-distance trade (e.g., Andrews 1984; Dreiss and Brown 1989; E. Graham 1987; Sabloff and Rathje 1975; Santone 1997; Spence 1996; Tourtellot and Sabloff 1972) and another portion solely with the organization of manufacture (e.g., Balkansky et al. 1997; Becker 2003a; Pool 1992; Santley et al. 1989; Sinopoli 1988; Stark and Garraty 2004), while other factions debate the evidence for and means of analyzing centralized marketing versus other forms of redistribution (e.g., Costin 1991, 1995; Fry and Cox 1974; Fry 1979, 1980, 2003; Renfrew 1975, 1977; P. Rice 1987a; Van der Leeuw 1984). The investigation of ‘specialization’ also has a substantial literature corpus (e.g., D. Arnold 1987; Becker 1973a, 1973b; Brumfiel and Earle 1987; Clark and Perry 1990; Costin 1991, 2007; Kvamme et al. 1996; Roux 2003; Yerkes 1983), particularly in regard to how measures of standardization relate to specialized production for the market (e.g.; Bill 1997; Blackman et al. 1993; Brumfiel 1980; A. Chase and D. Chase 2002; D. Chase and A Chase 2008) or other forms of redistribution (Costin 1995; D’Altroy and Bishop 1990; Janusek 1999).

Without a written historical record (like the Colonial period documentary corpus for the Inka or Aztec empires), Maya economic organization remains obscure. The ecological and spatial limitations imposed by the natural environment surely shaped the Maya system of economic organization and by extension, political organization. The extent of exchange ‘spheres’ or zones, the organization of production, and the major and minor modes of exchange remain uncertain, as do the basic family structure (and by extension, kindred, lineage and clan structure), residence patterns, and land use, including the land tenure system. This does not mean that we lack information concerning these points of interest, just that we don’t have a preponderance of secure data about them.

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\(^5\) I have used the term ‘economics’ here in reference to production, consumption, and exchange. This is only one definition of the term ‘economic,’ and although it captures the major thrust of this dissertation, the term ‘economic’ can be defined in many ways.
Given the current lack of empirical evidence for the existence of market systems (or market economies) or even strong evidence for marketplaces at Classic Maya centers, combined with the growing interest in how these polities were internally and externally organized, critical analysis of market indicators is of crucial importance to stimulate more informed discussion of the issue. Problem-oriented investigations at Maya centers are still gaining momentum. A first step in elucidating exchange patterns is to chart consumption patterns across the settlement within each center or polity.

At Tikal, I had a rare (yet extremely limited) opportunity to begin to define these consumption patterns at the household level in peripheral areas of the center. I collected a representative sample of residential/occupational refuse in order to control for chronology (with ceramics), to determine what needs these households were meeting, and to test the various models of production and exchange which would account for the patterns recorded: household production, short distance “neighborhood exchange,” low-level pooling and redistribution, complex polity-wide top-down redistribution, local ‘ring’ or staggered periodic markets, point of manufacture procurement, itinerant peddling, a solar or dendritic market system, a centralized elite sponsored market, or yet other configurations which have not even been hypothesized. It is my hope that this dissertation will bring the study of Maya economics back from vague references to market systems and the market economy to a more informed anthropological inquiry into economic structures at Classic Maya polities and how this could be investigated in the future. The same concerns are evident in the economy chapter of a recently published book on Classic Maya society.

“Instead of simply wondering whether the Classic Maya had money or marketplaces, we need to examine how certain material media of values and spatial nodes of transactions were tied to a diverse array of actions, experiences, and ideas….Different modes of exchange appear to have coexisted. Some objects may have been exchanged at marketplaces, whereas others circulated through preexisting social ties among political allies or members of kin or local groups. Even transactions at marketplaces may have been quite different from the impersonal nature of the modern market system.” (Houston and Inomata 2009:253)
1.3 – Tikal within the Maya World

Having stated the nature of my inquiry, it is necessary to review some basics for the interested reader who is not familiar with the Maya, their geographic and temporal range, or the literature concerning their cultural, political, and economic development. It should also be noted that what the term “Maya” means varies from source to source. Depending on where one works or what predominant perspective one works from, different sources describe the Maya in very varied terms. I do not have the time, space, or the patience to review all background on the Classic Maya. I have worked at several Classic lowland centers (Caracol, Palenque, and Tikal) and I have read a good deal of the popular, academic, and ‘grey’ literature (i.e., site reports) written about the Maya. What follows amounts to a general introduction to Maya archaeology pertinent to the basic issues of my dissertation.

Geographically, the Maya inhabited a portion of what anthropologists refer to as Mesoamerica, an area extending south from the Valley of Mexico into the modern Central American nations of Honduras, Nicaragua, and western El Salvador. (Figures 1.3.1 and 1.3.2). This area was never politically unified and represents a mosaic of ethnically distinct peoples. No people living in this area during pre-Columbian times would ever have referred to any region as ‘Mesoamerica’ (or by any indigenous term equated with this area). The Maya portion of this culture area is centered on the Yucatan Peninsula of Mexico, and includes all or portions of the modern nation states of Mexico, Guatemala, Belize, and Honduras. The westernmost Maya sites are found in the southernmost Mexican states of Tabasco and Chiapas, the easternmost sites in Honduras. Beyond the limits of Mayaland, to the east and north, the Valleys of central Mexico, Oaxaca, and Tlaxcala were major regions of cultural development and dense populations.
Figure 1.3.1 – General map of Mesoamerica emphasizing ecological zones (after Sanders 1992:Figure 1).
Figure 1.3.2 – General map of Mesoamerica emphasizing socio-political zones (after Sanders 1992:Figure 3).
In particular, the centers of Teotihuacán and Monte Albán are best viewed as regional capitals which were in contact with the Maya area. To the east of Mayaland, presumably Lenca speakers at and around the lowland center of Yarumela had some contact with Maya kingdoms across this eastern frontier including the exchange of ceramic vessels.

Scholars divide Maya civilization into named time blocks for convenience as well. The somewhat arbitrary units of time which are applied to the Maya culture are summarized in Table 1.3.1.

Table 1.3.1 – Temporal divisions by period designation with corresponding Tikal ceramic complexes (after Culbert 1993; Houston and Inomata 2009:18; Laporte and Fialko 1987).

<table>
<thead>
<tr>
<th>PERIOD</th>
<th>DATES</th>
<th>TIKAL CERAMIC COMPLEX</th>
</tr>
</thead>
<tbody>
<tr>
<td>POSTCLASSIC</td>
<td>950 - 1100 A.D.</td>
<td>Caban</td>
</tr>
<tr>
<td>TERMINAL CLASSIC</td>
<td>850 - 950 A.D.</td>
<td>Edznab</td>
</tr>
<tr>
<td>LATE CLASSIC</td>
<td>700 - 850 A.D.</td>
<td>Imix</td>
</tr>
<tr>
<td>LATE CLASSIC</td>
<td>550 - 700 A.D.</td>
<td>Ik</td>
</tr>
<tr>
<td>EARLY CLASSIC</td>
<td>400 - 550 A.D.</td>
<td>Manik 3</td>
</tr>
<tr>
<td>EARLY CLASSIC</td>
<td>300 - 400 A.D.</td>
<td>Manik 2</td>
</tr>
<tr>
<td>EARLY CLASSIC</td>
<td>250 - 300 A.D.</td>
<td>Manik 1</td>
</tr>
<tr>
<td>LATE PRECLASSIC</td>
<td>150 - 250 A.D.</td>
<td>Cimi</td>
</tr>
<tr>
<td>LATE PRECLASSIC</td>
<td>0 B.C. - 150 A.D.</td>
<td>Cauac</td>
</tr>
<tr>
<td>LATE PRECLASSIC</td>
<td>350 - 0 B.C.</td>
<td>Chuen</td>
</tr>
<tr>
<td>MIDDLE PRECLASSIC</td>
<td>600 - 350 B.C.</td>
<td>Tzec</td>
</tr>
<tr>
<td>MIDDLE PRECLASSIC</td>
<td>800 - 600 B.C.</td>
<td>Eb</td>
</tr>
</tbody>
</table>

While I refer to the Maya area or Mayaland throughout this dissertation, I must clarify several divisions of primary importance. The whole of Mayaland can conveniently be separated into highlands and lowlands, divided at the 1000 m elevation mark. In geographic terms, the majority of highland sites occupy a broad strip of volcanic terrain running from Mexico into Central America, just inland of the southern coast of the continent. Lowland sites are further subdivided into northern and southern lowland regions, Tikal and Uaxactún are located in the southern lowlands in the Peten
district of Guatemala, the most densely settled portion of Mayaland in Classic times. These southern lowlands extend outward from the Peten to the Usamacinta and Grijalva River basins to the west, where the Classic Maya sites of Palenque, Yaxchilan, Piedras Negras, Tortuguero, and Camalcalco developed. To the east, Copán provides a convenient southeastern cultural boundary. The northern portion of the Yucatan Peninsula is marked by a dryer climate; here we find the Classic Maya centers of Dzibilchaltun, near the city of Merida on the western side of the top of the peninsula, and Coba towards the east. This is also where the Postclassic centers of Chichen-Itza and Mayapan emerged, along with walled Tulum on the eastern coast.

The generally unexpected or unpredicted emergence and persistence of complex society in a tropical forest environment has been commented upon by several authors (Mathewson 1977; Meggars 1954; Trigger 2003:25), and this has only increased interest in Classic Maya social, political, and economic organization. The fairly uniform ecology and lack of geographic boundaries within the Peten region in particular have been emphasized by some authors (e.g., Webb 1973), while others have stressed micro-regional differences and variability (e.g., Sanders 1973). I find both these perspectives of keen interest when contemplating Classic Maya land tenure, settlement growth and nucleation, and the emergence of specialized craft production and the circulation of goods.

Tikal is located in the northern part of the Department of Peten, in westernmost Guatemala, which covers an estimated 40,000 km of the lower Yucatan Peninsula. Lundell (1937) describes the northern Peten as a low plateau (maximum elevation of 400 m, Tikal itself is about 200-240 m above sea level) of Tertiary limestone and typified by sapodilla forest. According to the El Paso weather station data from Sapper (1931, 1932), the average rainfall of northern Peten is approximately 1762 mm, though Lundell pointedly remarks that rainfall is both highly variable (990 mm – 2369 mm range for the Sapper data) and cyclical; that is, with alternating low and high rainfall years.
Puleston (1973:241) cites several years of rainfall data from Tosi (1964): 1622 mm in 1960, 1514 mm in 1961, and 1304 mm in 1962, for a three year average of 1480 mm annually. Robert Griffin (2012) calculated a 1200-1400 mm per year average for the Peten. The wet-dry season contrast is so pronounced in the Peten today that households along the road from Flores to Tikal habitually place water receptacles at the edge of the road to receive water trucked in during the dry season.

The Maya centers never formed an empire comparable to those of the Aztec or Inka, and are best viewed as city-states, petty kingdoms, or local polities. At the peak of Classic times (A.D. 731), dozens of autonomous or semi-autonomous Maya kingdoms coexisted just in the southern lowlands, probably 60 to 80 in the entirety of Classic period Mayaland (Mathews 1991). While political alliance, warfare, and subjugation are well attested in the Classic inscriptions, territorial states do not appear to have developed in the area. Some researchers stress the hegemonic control of tribute states in a feudal-type model of Maya political hierarchies or polities; others stress the self-sufficiency and symbiotic relationship between core and periphery at a single center. Supra-polity alliances were formed, and some kings dominated (in the Maya idiom “possessed”) others. It has been suggested that Tikal, along with its northern neighbor Calakmul, were two great “superpowers” that contended for political supremacy of the Classic Maya lowlands (see Martin and Grube 1995, 2000; also Marken and Straight 2007:281-283, for a critical review of the superstate or superpower model). That the elite segments of society at Tikal and other kingdoms exacted tribute from secondary centers of the Peten is assumed. While the influx of tribute has been linked to marketplace exchange and even to agricultural intensification in the Aztec empire (Brumfiel 1980, 1986), we do not possess the necessary information on tribute acquisition to follow out a model of this kind for the Peten Maya.

In the absence of data concerning tribute demands, the predominantly self-sufficient inner workings of individual kingdoms are stressed here. In the following chapters political interactions among Maya and non-Maya polities are discussed for
specific time periods in the history of Tikal. These include interactions between Tikal and the central Mexican polity of Teotihuacán as well as more localized alliance and warfare episodes among Tikal and its lowland Maya neighbors, especially Calakmul, Caracol, Dos Pilas, and Uaxactun.

Beyond greatness, fame, pride, or splendor, Tikal was (and remains) the largest Classic Maya center or polity in terms of both population and architectural constructions in the forms of residences, temples, palaces, and public works (i.e., the central reservoirs or *aguadas* and raised ‘causeways’ or *sacbeob*; the peripheral ‘defensive earthworks’). Over the past 25 years or so, several researchers have made claims that some other Classic lowland Maya center is larger than Tikal, using population estimates and/or territorial extent derived from settlement maps (for Caracol see A. Chase and D. Chase 1987:72-73, D. Chase et al. 1990:502; for Calakmul see Delvendahl 2008:79; Folan et al. 2008:307). While systematic investigations at Caracol and Calakmul definitely document the large respective sizes of these centers in terms of population, areal extent, and monumental constructions, this tendency to challenge Tikal’s position as the largest Maya center only reinforces Tikal’s supreme stature as the heavyweight champion whose belt is enviously coveted by all contenders. When speaking of the sheer size of Mesoamerican centers one is hard pressed to find comparisons between any non-Maya center (and most Classic Maya centers) and any other center than Tikal.

The population, territorial extent, and political or economic organization of Tikal are frequently compared to or contrasted against the Classic period central Mexican center of Teotihuacán (see Price 1977; Sanders and Price 1968, especially Figures 7 and 8) or Postclassic period centers, such as Texcoco (see Becker 1973b:404), or Tenochtitlan (Sidrys 1978:11-13). The literature on Mesoamerican urbanism, political and social organization, population size and economy singles out Tikal as the prime example of a Classic Maya center, the one which represents the epitome of Classic Maya urbanism, complexity, and size.
Tikal does not look like a planned city on the ground, with streets forming right angles like one sees in a plan map of Teotihuacán. There is on the other hand, a considerable amount of architecture concentrated in an east-west band at the center of the site which does give the impression of some degree of deliberate planning or, at least, nucleation of monumental construction. Many discussions of Maya architecture and city-planning describe Maya centers as growing through accretion. Maya architecture grew up as well as out. That is, many tall buildings actually represent accumulative growth over centuries, as early buildings are buried within later construction episodes. This is why archaeologists working at Copán or Palenque have dug down to enter tombs within buildings. It is usually glossed over that one has to climb to the top of the building (or tunnel in from the side) in order to then dig down. At Copán and Palenque the royal tombs are not actually underground as much as they are at ground level with massive edifices built over them. The epicenter of Tikal has very deep stratigraphy initiating during the Preclassic period, evidence of centuries of accretional growth.

The unplanned nature of Maya settlement surrounding their monumental cores is more apparent as one continues to move out from their epicentral precincts. Most Maya centers have a dispersed settlement pattern, where presumed agrarian households had formed on the landscape pragmatically utilizing the most advantageous topographic positions in respect to drainage and visibility. A few Maya centers (e.g., Palenque, Piedras Negras, and Copán) represent exceptions to this widespread pattern and their settlement patterns are very different from Tikal. Not only do they reflect lower overall populations, they also evidence greater nucleation in their ‘urban’ cores. At Tikal, larger groups of domestic buildings usually grew through remodeling and building additions, but not to the degree that the central architectural complexes did. Peripheral households dotting the landscape away from the monumental core of the site provide the data for my dissertation. The evolution of settlement pattern archaeology is thoroughly reviewed in Chapter 2 as are the individual households which form the basic analytical unit of this study.
Tikal models well as a ‘flat plane without transportation improvements’ (e.g., Von Thünen, Lösch, Christaller locational models). Given the lack of beasts of burden or navigable waterways in this area in Classic times, the movement of goods (grain, construction materials, fuel wood, or craft items) can be modeled as simple transportation costs \[\text{weight} \times \text{distance} = \text{transportation cost}\]. The application of formal modeling with regard to Central Place Theory has not been fully exploited in the Classic Maya area, although there are some early attempts (Flannery 1972; Hammond 1974a, 1974b; Marcus 1973, 1974; Romanov 1974) and more recent exceptions (see Inomata and Aoyama 1996). Central Place analysis has been employed in modern highland Maya communities by Carol Smith in her investigation of market structure there (C. Smith 1974, 1975, 1976). These studies do not provide very good analogies for the understanding of Classic Maya who did not benefit from modern transportation improvements (i.e., roads and vehicles), all-purpose money (see Bohannan 1959:491-492; Dalton 1965), or involvement in a World System economy (Wallerstein 1974, 1979).

Long-distance ‘trade’ is attested in the archaeological records of many Maya centers, including Tikal. By ‘trade’ I simply mean the presence of imported raw materials or finished items of foreign manufacture. Imports range from marine products such as shells and stingray spines to manufactured craft items such as pottery vessels and ceramic figurines. Also present at Tikal are artifacts made from non-local stone, chert, jade, and obsidian, the latter imported from between 300 and 1000 km away (Moholy-Nagy 1997, 1999, 2003a, 2003b, 2008; Moholy-Nagy et al. 1984; Rice and Rice 1979; Santley 1983; Sidrys 1976, 1977, 1978; Spence 1981, 1996). This does not exhaust the list of imported items at a center the size of Tikal, nor does it account for perishable imports which did not survive in the archaeological record. Whether or not materials and objects were widely moved about is not the question. I am interested in how such transfers were structured and how items from distant places were distributed amongst the population of Tikal. When it comes to the structure of transfers or exchanges, we are hard pressed to make more than vague allusions to (social) institutions and hypothetical control mechanisms. More importantly, I am interested in the circulation of pottery made
from local resources – the circulation of locally produced craft items within the kingdom of Tikal – that is, internal as opposed to long-distance movements of goods, or intra-regional versus inter-regional trade or exchange. Even the scale, intensity, and frequency of exchanges are less than obvious. These parameters are especially confounding when estimating pottery exchanges. Even if the gross number of vessels exchanged annually can be confidently estimated, different circulation mechanisms could have left the same distribution pattern. From the compressed archaeological record, a large exchange conducted infrequently will look the same as numerous smaller exchange events conducted continuously.

1.4 – Tikal as the Focus of Economic Inquiry

The economic organization of the Classic Maya has long resisted simple classification. In general, the Maya hold a certain prestige position in the corpus of anthropological and archaeological literature. Mysterious and contagious, the investigation of large Maya centers draws a considerable amount of attention, traditionally focused on the central architectural complexes or ‘downtown’ areas of their ‘capitals.’ Maya high-culture stimulates much discussion concerning astronomy, mathematics, architectural engineering, religion and world view. Fabulous antiquities from caches and tombs innervate discussion of production and trade. Archaeological investigations at Tikal represent some of the first serious forays into modern Maya studies. Tikal has in many respects long constituted the archaeological archetype of a Classic Maya capital. How the Maya were socially, economically, and politically organized have been points of fascination and controversy, receiving public and academic attention for decades.

Tikal also holds a unique position in popular culture, especially in Guatemala where the center stands in a sense as proxy for the entire modern nation. All Guatemalan license plates proudly display the image of Tikal Temple 1. Guatemala’s finest domestic
beer producer, *Gallo*, often uses Tikal’s Temple 1 as a backdrop for their beer ads, with the company slogan, “*El Orgullo de Guatemala,***” consonantly displayed above. Glyphic altars from Tikal grace quetzal notes, the paper currency of Guatemala.

Situated in the Maya heartland of the Peten region of modern northern Guatemala, Tikal has long held paramount position in all reconstructions of Classic Maya society. Even if one views this principal position as *primus inter pares*, Tikal is still featured as the one Maya center which must be compared to or contrasted against all others. In 1966, Michael Coe included this statement in his oft reprinted and assiduously read book entitled simply, *The Maya*:

> “Tikal…is a giant among Classic Maya centres; it is the largest site in the Maya area, and one of the greatest in the New World.” (M. Coe 1966:99)

In this following quote some 28 years later, Norman Hammond clearly views Tikal as the quintessential representative of Maya civilization on the global playing field of civilization.

> “The apogee of Tikal in the eighth century is coeval with the great Tang capitol of Chang-an, with its population of over one million, and with the empire of Charlemange in Western Europe.” (Hammond 1994:105)

The first paragraph of the first chapter of Peter Harrison’s 1999 book, *The Lords of Tikal: Rulers of an Ancient Maya City*, ruminates upon Tikal in the most romantic of fashions.

> “Great cities, like great works of art, are the product of a great deal of time and expense, reflecting the full range of emotions of the people that made them happen. In the case of Tikal, its splendid setting, partially hidden in the rainforest of Guatemala, and the hedonistic delights offered by the city’s textures, colors, and shapes – and the mystery that lies beneath its surface – invite interpretation.” (Harrison 1999:9)
Harrison continues, six paragraphs later, with this sobering comment on the state of Maya studies on the eve of the turn of the millennium,

“Despite a century and a half of study, which has seen a recent acceleration in the rate of scholarly breakthroughs, improved archaeological techniques, and a more enlightened approach to non-Western cultures, much of the ancient Maya achievement remains poorly understood and hotly disputed.” (Harrison 1999:11)

When referring to the character of Maya ‘cities’ or ‘centers,’ David Webster (2002) found an obvious choice in Tikal as iconic exemplar of the peak of Classic Maya monumentality.

“[T]he central precinct of the most famous Classic Maya center, Tikal,… has some of the largest buildings ever erected by the Maya, and if monumentality of architecture is one criterion of ‘city-ness,’ then Tikal certainly qualifies.” (Webster 2002:151)

Investigating the production and circulation of ceramic vessels is fundamental for understanding exchange within any Maya polity. Ceramic sherds are abundant, easy to find, nearly indestructible, and provide information concerning manufacture, circulation, social identity and social rank, chronology, and activities performed. Nonetheless, discussions of the economic organization of Maya polities usually turn to just two studies of the circulation of pottery (e.g., Ball 1993; Rice 1987a): Robert Fry’s work at Tikal (Fry 1979, 1980, 2003; Fry and Cox 1974) and Robert Rands’ and colleagues work in the Palenque region (Bishop 1975, 1994; Bishop, Rands and Harbottle 1982; Bishop, Rands and Holley 1982; Rands 1967, 1969, 1974a, 1974b, 1977, 1987, 1988, 1994, 2007a, 2007b; Rands and Bargielski Weimer 1992; Rands and Bishop 1980, 2003; Rands and Rands 1959; Rands et al. 1978). These two studies were conducted with very dissimilar pottery collections, from different areas of the Maya lowlands within quite distinct ecological environments; the sampling strategies and analytical techniques employed were quite divergent.
“Like archaeologists elsewhere in Mesoamerica and beyond, Mayanists tend to refer to a few prime sources as models. Among Classic lowland sites, Tikal looms particularly large. That site is notable for the pivotal political and economic roles it played in ancient times. But I think most archaeologists would agree that what is true for Tikal might not be true elsewhere.” (Ashmore 1988:153-154, emphasis in original)

The point made in this statement is generally true, we cannot assume any organizational principle, be it political, economic, or other, evidenced at Tikal was necessarily the same at another center. At the same time, even the political and economic roles played by Tikal in ancient times are far from clear. In regard to craft production, it may also be fair to say that the size, complexity, and location of Tikal do make it an excellent center for testing models of production and distribution. Perhaps if specialized craft production for market exchange hadn’t developed at Tikal, it is unlikely that it had developed elsewhere, especially at smaller or more peripheral centers. Alternately, if centralized control of the economy had effectively suppressed market exchange at Tikal, it should not be assumed that smaller centers were also characterized by a similar development. By the 1960s William T. Sanders had already pointed out that the sheer size and multitude of non-residential structures at Tikal, especially when compared with other Classic Maya centers, made it the number one candidate for intensified investigation of settlement pattern and social and economic systems.

“The greatest of all Classic Maya centers in size, grandeur and number of its religious and civic buildings is undoubtedly Tikal, situated in the northeastern Peten. Because of its size, some writers have even considered it the capital of the entire Lowland Maya area...If any Maya center had an urban settlement pattern and socio-economic system during the Classic period, it should be Tikal.” (Sanders 1963:207)

Ironically, or perhaps logistically because of its size, Tikal has not been consistently investigated, and any prior study conducted there is usually not revisited or re-tested. The defensive earthworks, which have been so often cited in reference to warfare and demographic estimates, had only been seen by a handful of people until after 2000. Even after the recent earthworks project led by David Webster, these features
remain enigmatic; their function and date of construction are basically unknown (Webster et al. 2004, Webster et al. 2007; Webster et al. 2008). Fry’s study of ceramic distributions (Fry 1979, 1980, 2003; Fry and Cox 1974) has basically remained the sole analysis of the circulation of any good at Tikal. No attempt to study the distribution of ceramics (or any other artifact class) has since been attempted over a comparable scale until I began a limited investigation of household artifacts in 2005.

The center of Tikal is here used as an economic test case because of its putative high population, degree of social complexity and geographic position (both with regard to resources and other population centers). If markets were important institutions in the development and florescence of Maya culture, then this, the largest center of them all, should produce evidence of marketing behavior. Alternately, if reciprocal exchange and redistribution along lines other than marketing were more fundamental mechanisms for distributing goods (and services) at Tikal, then this finding would have great repercussions for our understanding of the Classic Lowland Maya. Documenting the circulation of goods through institutions other than, or in addition to, markets would impact our reconstructions of Mesoamerican civilization in general. Furthermore, Tikal is located in a remote area with little access to water sources, aside from rainfall, and is surrounded by other Maya centers of varying sizes. If a well-integrated marketplace system were operating in the Peten in Classic times, then Tikal should be a first-order center and theoretically be at the center of the system.

I have attempted to augment the study of the circulation of ceramics at Tikal using compositional analysis of pottery recovered from peripheral excavations by the PST Project, Phase II (2005-2006). These analyses address some of the fundamental issues raised in the discussion of specialized pottery production and circulation. How many production units were there within a given site or region? What forms, wares, or types of pottery was each of these producing? Did production units concentrate on one or a few specific shapes classes or types? How far were the products of a production unit circulated? How was the circulation of pottery accomplished? Did all inhabitants
participate in the same polity-wide system, or were segments of society isolated from and unaffected by the production of others?
Chapter 2 – Ancient Demographic Reconstructions

2.1 – Households as Analytical Units

“Households are fundamental elements of human society, and their main physical manifestations are the houses their members occupy. Households embody and underlie the organization of a society at its most basic level; they can therefore serve as sensitive indicators of evolutionary change in social organization. The remains of houses are among the most common and obtrusive on archaeological sites.” (Ashmore and Wilk 1988:1)

Common sense tells us that families live in houses, and that the household consists of both a physical structure, the building (or set of buildings), and a social structure, the family members that live within. However, anthropologists are famous for dispelling common-sense myths and arguing that what is obvious at first glance is not always a complete or accurate explanation of a social phenomenon (Harris 1974; Murphy 1990:331). Anthropologists are also quite keen to define terms precisely so as to avoid confusion and to make appropriate analogies and comparisons. Cultural anthropologists have long noticed the varied arrangements which constitute “families” in various societies, and have developed specific theories and jargon to deal with the ‘on the ground’ reality of variable human family structures (see Kottak 2008:Chapter 9). Likewise, the term “family” has a broad semantic range in English parlance.

“The English term ‘family’ is a polysemic word used to describe a conjugal pair and their young (‘starting a family’), the members of a household (‘one of the family’), a range of bilateral kin (‘relatives’) or a patronymic group, usually associated with a title (‘the Churchill family’). And there are wider semantic usages, extending to the human (‘the family of man’) and non-human (‘the family of sweet peas’) species.” (Goody 1972[1958]:103)

Ethnographers, demographers, sociologists and archaeologists have come to similar conclusions concerning the overlap of family structures and the physical buildings which they live in. There is no simple one-to-one correlation between biological families and houses. Furthermore, houses themselves are often related to one another by physical
and social distances. The idea that the family as a basic co-residential group of related individuals can be defined in mathematical fashion using culturally specific kinship norms has faded. The ethnographic ground truth is that family structure is variable within the set of cultural norms of any group, community or nation. This is true of families in North and South America, Europe, Africa, India, and Asia. Family structure is influenced by many factors besides kinship, which itself is influenced by ecological, technological and economic factors.

The concept of a household, as a basic unit of study, has arisen from ethnographers facing the intersection of expectation and observation. It is a construct created to address the ethnographer’s application of definite social norms and ideal kinship arrangements which did not correlate exactly, approximately, or usually with the varied living arrangements actually documented (Ashmore and Wilk 1988:2). The development of the household concept as a more appropriate analytical construct than the family stemmed from the recognition of various deranging factors. From cultural anthropology’s formal residence rules (see Murdock’s [1949] ‘social structures’) through developmental cycles (Goody 1958) into the recognition of variable cultural norms and the common divergence from these ideals (Goodenough 1956; Goody 1976) the household has been a constantly moving target. These models continue to be reevaluated through cross-cultural demographics (e.g., Laslett 1972).

The expression “simple family” denotes a nuclear-family, an elementary-family, or a biological-family. It is comprised of a married couple with or without offspring or a widowed person with offspring. Thus, simple-families have at least two individuals connected by a conjugal link or arising from that conjugal link. Laslett (1972:29) prefers the term “conjugal family unit” to describe all possible groups structured this way. By this definition, brothers and sisters living together do not constitute a simple-family, nor does an aunt and nephew, or a widow and grandson residing together. Any conjugal-family unit co-residing as a domestic unit is called a simple-family household. The most
common simple-family households, cross-culturally, are made up of a man, wife, and child or children (Laslett 1972:29).

An extended-family household consists of a conjugal family unit with the addition of one or more relatives (not including offspring) living together with or without servants. Extended-family households may be extended upwards, downwards, or laterally. The addition of grandchildren (without either parent present), nieces, or nephews creates a downward extension while the addition of a widow or widower parent of either of the conjugal pair creates an upward extension. The addition of a brother, sister, or cousin of one of the conjugal pair implies lateral extension. Extended-family households may be extended vertically and laterally at the same time (Laslett 1972:29-30).

When two or more conjugal family units, connected by kinship or by marriage, live together a multiple-family or joint-family household is formed. Such multiple-family households may be formed with two conjugal pairs from different generations, as when a married mother and father move in with one of their offspring and their offspring’s spouse. Alternately, two or more conjugal units may all be from the same generation, as when two brothers and their spouses and children reside together. Multiple-family households may also have vertical or lateral extensions (Laslett 1972:29-30).

House and household are not the same (Wilk 1988:138). The household, a group of individuals performing certain functions, be they enculturation, production, reproduction etc., does not necessarily correlate with a single house or even a contiguous group of structures separated (or not) from other households. The fundamental distinction between residence and residents only skims the surface of the fundamental difficulty in assessing the basic household unit in terms of function. Even the basic figure of average family size under particular sets of circumstances has proven to be counterintuitive.
“Description of non-nuclear family systems in terms of their characteristic rules of residence often seems to imply very large and complex households. For example, in a classic patriarchal family system, a household containing a father, his wife, two married sons, and their wives and children would number ten or more persons. Such large households are seldom encountered as model or average, however. A recent compilation of census materials reported in the U.N. *Demographic Yearbook* showed no bona fide case of a national average household size larger than six.” (Burch 1972:91)

Cross-cultural comparison of household size (number of individuals) from Europe, India and China documents a five person per household average, even with variable age at marriage (Hajnal 1982). The average household size for urban Cairo (under Ottoman rule) derived from the 1848 census was 3.54 persons, with 70% of households comprised of a single person or a married couple with or without unmarried children; The other 30% were complex-households of both related and non-related people (Fargues 2003:38). Still larger households are documented for some areas at some times; specific population studies evidence quite divergent numbers. Russian serf households in the early nineteenth century averaged over nine persons per household, usually organized around two brothers with wives and mostly other blood relatives. In the Russian serf case, new household formation was likely to occur by succession three times as often as by fissioning; the average new household head was forty-six years of age (Hajnal 1982:467). In nineteenth century Cairo, the profession of the household head greatly influenced the rate of new household formation. Craftsmen typically trained their co-residing sons at home while wholesale traders, merchants, and those engaged in religious training (*aç haris*) rarely had children in their homes (Farques 2003:42). Even with average family or household sizes derived from ethnographic or historic documents, the actual cooperative workings of any particular household remain unknown, internally or externally.

“My point … is that for these groups an extensive comparison of family or household size (meaning the number of occupants of a dwelling) is not very meaningful from the standpoint of the structure of the domestic groups that occupy them; ‘household size’ is relatively unimportant from the domestic standpoint, since the basic reproductive and economic units remain much the same in each case.” (Goody 1972[1958]:109-110)
Goody seems to be pointing out the fact that households may appear very large, when viewed from the perspective of co-residence within a single structure or compound, when we are actually dealing with multiple families co-residing within a larger, more inclusive kinship structure yet maintaining virtual autonomy. For instance, Goody (1972[1958]:Figure 3.2) illustrates a complex-type LoDagaba compound from northern Ghana that housed four distinct families related by blood ties that keep separate kitchens while also maintaining a central pooled granary. This brings us back to the fundamental question of what defines a household. Is it co-residence, cooperation in primary production, sharing of food, biological reproduction and enculturation or other factors? This in turn raises the question of the applicability of any definition of the household. Are households organized in variable fashion in response to different needs, from one society to another or even within the same society among different segments, classes, or social subgroups?

The household does appear to exist everywhere and always no matter what culture one is investigating, and yet researchers are hard pressed to precisely *define* this basic unit of analysis, either specific to one culture group at one time period or in a general all-purpose manner with cross-cultural applicability.

“Households can usually be identified ‘on the ground’ in a particular cultural setting, but a universal definition is an elusive target….While in every society a householdlike group or thing can be found, in each place it performs unique mixes and functions.” (Wilk 1997:34-35)

The concept of the household as a basic social unit that performs the functions of production, consumption and reproduction is straight-forward and valid. This definition, while conforming to a general model of wide applicability, may be too broad to be of utility in some cases, although it does capture important distinctions at the “household level,” and is a perfectly sound model for basic interpretations of household rank and social status, landholdings, or exchange patterns. Variation from household to household should be expected and incorporated into the study parameters in order to control for wealth or rank differences. Furthermore, the average household in any society is just the
norm, a considerable variation in household composition and function should be expected, even in smaller, more homogenous societies.

The weight of tradition and a generally conservative approach to householding may suppress divergence from the norm leading to considerable stability in the dominant culture pattern over time. In northern Thailand, the ideal or ‘normative’ household “becomes a potent symbol of ethnic identity and is maintained with minor variations in many different social and economic contexts – urban and rural, agricultural and industrial” (Wilk 1988:137). Each researcher must acknowledge the flexibility of social variation and its divergence from cultural norms.

“Every case study illustrates a balance between pragmatism and custom in the formation of household groups.” (Wilk 1988:136)

Even if the normative cultural rules and the range of social divergence from these are well known, as are the ‘hard’ facts of age structure, mortality and birth rates, other factors will confound any absolute definition of the household. For instance, in a Classic Maya community, did individuals from distinct households cooperate in agricultural production? Craft production? If so, are they related by blood or by marriage? If so, then are they distinct households or should they be better dealt with conceptually as a single household? What if the distinctions are not clear cut? In some years (say, of poor harvest) do they pool resources and at other times maintain basic self-sufficiency in spite of blood and marriage ties or even co-residence within the same compound? How did these circumstances change for individual households on a case by case basis and generally over longer periods of time?

The following quote demonstrates the kind of all inclusive definition which has developed in response to various schools’ concerns, and attempts to synthesize the major points into a single (perhaps unwieldy) ‘definition’:
“Recent ethnographic research has defined the household as an activity group in which the basic economic functions of production, consumption, inheritance, biological reproduction, and shelter are organized and carried out (Arnould and Netting 1982; Carter 1984; Wilk and Netting 1984). There is general agreement that the household is a flexible, adaptable unit that changes form and function when economic and environmental conditions vary. Ethnographic case studies document this process of economic adaptation in detail (Barth 1967; Loucky 1979; Netting 1969; Sahlins 1957; Udo 1965; Wilk 1981). Variation in household form has been specifically linked to population density and agricultural intensity (Collier 1975; Creighton 1980; Goody 1976; Smith 1959) and to differences in social rank, role in economic production, wealth, and political status within a single society (Medick 1976; Netting 1965, 1982; Wilk and Netting 1984). At the same time, households are shaped by customs that regulate and condition crucial household-forming decisions. Age at marriage, choice of spouse, place of postmarital residence, number of desired children, and mode of inheritance are influenced by customs, although they are not always prescribed by normative rules of behavior (Yanagisako 1979).” (Wilk 1988:136)

While we may commend Wilk for his thorough definition, the opposite side of the coin is this, what do I do with this definition; in my own research, how do I take account of the complexity of households when I attempt to complete a study of a particular cultural group beginning at the household level?^6^  

All-inclusive definitions arise from debate and discourse in an attempt to be precise. Ethnography, ethnology, demography, and social history research have been the fertile grounds of the household definition debate. As I said, the household as a theoretical construct has developed in reaction to the shortcomings of previous ‘idealized’ definitions of the household which arose from a more formulaic cultural anthropology position, one which is widely acknowledged as overly simple and a gross distortion of reality. When mounting research into actual living households showed them to be highly variable, a more sophisticated approach to the study (or definition) of households developed. Some questioned why they are so variable and what factors are most influential in shaping household structure. That is to say, are there cross-cultural norms which dominantly influence household structure?

^6^ Upon review of this document, Kenneth G. Hirth suggested evaluating twentieth century A.D. households. While I do look to ethnographic studies for possible analogies, I have largely avoided applying a strictly formalist analysis.
That household size correlates positively with size of land holdings in agrarian societies is a well-attested statistical correlation (Goody 1972[1958]:122; Tax 1963[1953]; Wilk 1988:144). Likewise, the composition and structure of households change in response to varied or changing systems of primary production (Netting 1993). Age at marriage, childbirth rates, and post-marital residence patterns will combine to influence the size of households as well. Land tenure and inheritance rules also influence the size of households, often explaining the timing of fissioning or fusing. The developmental cycle or stage of the household will also determine, in large part, the size of a household, though not in a strictly predictable fashion. Household composition cannot be determined through standard postmarital residence rules or polygyny (Goodenough 1956; Netting 1993; Wilk and Netting 1984). This last point brings a temporal element to bear on household formation and warns against viewing households in static terms and averages; households are not the product of unchanging variables. Quite the contrary, house-holding is a response to numerous changing variables, a pragmatic reaction to biological, ecological and cultural factors. These factors are not static but ebb and flow over time. During intervals when the general population of a community or region is rapidly expanding, one would expect increased household size compared to intervals of more stable population growth, or when the general population is decreasing.

From the viewpoint of the current archaeological study, this great debate over what constitutes a household may be simplified considerably.

“The research challenge is to reconcile the behavioral definitions of households present in the ethnographic literature with the physical remains recovered in the archaeological record. This requires a diachronic analytical perspective which defines household composition in relation to the temporal scales with which archaeologists examine their data (Binford 1981; Bailey 1981; Smith 1992). From an archaeological perspective, all ethnographic discussions of households work from a synchronic or near-synchronic point of view (Bailey 1981, 1987). On the other hand, when archaeologists uncover the remains of domestic architecture, they usually represent a time series accumulation spanning decades or even centuries of residential occupation.” (Hirth 1993:21, 24)
While the current study employs a household sampling strategy and a household level analysis of cultural artifacts, much of the ethnographic literature concerning the definition of a household cannot be operationalized. With respect to the caveats which I have quickly overviewed, the household, as conceived and utilized as an analytic unit in the current study, is defined based on very concrete grounds. The ‘households’ at Tikal are defined by domestic architecture and artifact assemblages physically separated in space from other such discrete groups which represent the physical remains of householding activities left behind by the past residents. On a more theoretical level the household should be viewed as both the physical locus of production/consumption and the human agents that lived there.

The limitations of the PST Project sampling strategy are recognized, including the difficulty in interpreting the layers of occupation representing centuries of complex social phenomena that have been compressed into archaeological mounds. The artifact collections from household midden excavations probably represent refuse discarded immediately at the residence. Distinctions among the ceramic collections from distinct household groups surely reflect differential consumption patterns, the range of circulation for specific types of ceramics, and the relative material ‘wealth’ reflected in discarded portable objects.

I would certainly enjoy and make use of finer grained chronological control if it were available. However, the reasonable time scale which can be differentiated at Tikal (and at most Classic Maya sites) is on the order of about 100 years. This 100 year temporal control is obtained through ceramic serration, a difficult and time consuming process which requires years if not decades of directed research by itself. In this regard, when I speak of a household in this study I am referring to a location which was inhabited long enough to leave definite physical remains: architecture and household refuse containing a sufficient amount of ceramics to provide a date. Some researchers have suggested using the term “household series” to refer to the accumulated debris from a succession of living families at the same location (Smith 1992:12, cited in Hirth
1993:25). I simply use the term household in this study although it is recognized that the physical remains of living groups termed “households” are comprised of the material remains produced by a number of individuals over time, any point in time representing a distinct “household” from the viewpoint of the occupants.

2.2 – The History of Settlement Pattern Studies in the Maya Area

My dissertation focuses on discrete units of analysis (i.e., households) which can form larger configurations of occupation (i.e., group clusters, minor centers) that can be correlated with social networks on a broader scale (i.e., extended kin groups, communities or neighborhoods). This perspective has developed hand-in-hand with large mapping programs documenting the extent of central and peripheral habitation at major Maya centers. As more Maya centers have been mapped more completely, including their peripheries and inter-site areas, definitions have become more precise to facilitate discussion of broader social organization models extrapolated from these settlement pattern studies.

Ashmore (1981:3, 43) defines settlement patterns as the totality of cultural remains – attributable to humans – on the landscape, from small features (hearth, chultunes) to large features (defensive walls, earthworks). The term has seen increased use in conjunction with a growing interest among archaeologists with small or domestic structures which are numerically dominant within this universe (see Haviland 1985; Webster 1985). The interest in such structures has followed the logical path of defining centers or ‘cities’ in a more inclusive fashion, as well as with the acknowledged need to investigate intersite areas and conduct regional studies (Ashmore 1981:4; Puleston 1973, 1974).

Often cited as the first genuine settlement study of a Maya center, O. G. Ricketson’s (of the Carnegie Institution of Washington) cruciform survey of Uaxactun (Ricketson and Ricketson 1937) identified 78 small mounds or platforms and 50 chultunes within the four 1600 x 365 m cardinal transects radiating out from the epicenter
Robert Wauchope (1938), also a Carnegie investigator, excavated five of these mounds concluding that three were surely residential in function (Wauchope 1938:138, 151). From the Uaxactun maps, O. G. Ricketson settled on a figure of 25% of all mapped structures as houses, calculating a population density of 270 persons per km², which he noted was higher than the overall population density for New York State at that time (Kurjack 1974:24). These two studies together created the initial spark of interest in agricultural production and population size and density within the Peten that would continue to be the focus of investigations in the region by the University Museum of Pennsylvania (1956-1969, especially by Puleston 1973) and others until present day (i.e., Culbert and Fialko 1997; Ford 1981, 1986; Webster et al. 2004, 2007, 2008).

Some reviews of settlement studies in the New World claim that Julian Steward, much interested in ancient cultural practices, had encouraged and persuaded Gordon R. Willey to apply the concept archaeologically as a regional study. The result was the Viro Valley settlement survey conducted by Willey in Peru and published in 1953 to an enthusiastic response. Willey then applied the concept to the Maya area with the Belize Valley (Barton Ramie) settlement survey, published in 1954 (Ashmore 1981:10).

Several other projects took the settlement study concept to heart and a proliferation of projects was initiated with settlement data collection in mind. William Bullard (1960) covered approximately 250 km of the northeastern Peten on mule-back, noting the architectural remains of residential platforms (Ashmore 1981:11). Actually, Alfred Tozzer had previously conducted a similar mule-back trail survey in 1909-1910, recording 80 mounds along approximately 8.4 km² of territory for an average of 9.5 mounds per km² (Rice and Puleston 1981:129). The settlement patterns and population densities of the ancient Peten Maya had become serious research topics, and have continued to illicit debate and comment continuously up to the present (see A. Chase and D. Chase 1987, 1994; D. Chase et al. 1990; Culbert et al. 1990; Fry 1974, 1979, 1980, 1990; Haviland, 1965, 1968, 1969, 1970, 2003, 2008; Puleston 1973; Rice and Culbert
Throughout the last century, settlement investigations were conducted at Maya centers on the Yucatan peninsula of Mexico by the Carnegie Institution of Washington at Mayapan (Pollock et al. 1962) and by Tulane University’s Middle America Research Institute at Dzibilchaltun (E. W. Andrews IV 1960, 1961, 1965; Kurjack 1974). William T. Sanders of the Pennsylvania State University, who had written his dissertation on human agrarian adaptations in the Valley of Mexico (1957), conducted settlement surveys in the Chontalpa region of Tabasco, Mexico (Sanders 1961, 1962, 1963) and the northeastern and coastal regions of Quintana Roo, Mexico on the eastern coast of the Yucatan peninsula (1955, 1960). Dr. Sanders would remain a strong advocate of regional settlement survey throughout his life. In 1956, the University Museum of Pennsylvania began their large-scale thirteen-year investigation program at Tikal, then, now, and always to be, the largest Classic Maya center (see W. R. Coe 1962; W. R. Coe and Haviland 1982). Several of the Pennsylvania Museum investigators took great interest in incorporating settlement studies into this project (Becker 1973a, 1973b; Fry 1979, 1980; Haviland 1963, 1968, 1969, 1970; Puleston 1973, 1974).

As new settlement data were being published, research questions and models were being tested, debated and refined. J. Eric S. Thompson’s vacant ceremonial center model (1931:199, 334, 1942:21-23, 1954; see Becker 1976 for a review of the development of this model), also championed by Brainerd (1954) had been seriously challenged by data from settlement studies and is today usually evoked only in cases where it provides a convenient straw-man for supposedly more sophisticated and realistic models. The concentric ring settlement hierarchy model derived from Landa’s ethnographic account...
(Tozzer 1941) and supported by settlement arrangements at modern Maya villages studied by Thompson (1954) was also proposed as an adequate analogy. This model has had a much longer run on the theoretical model front, especially as a powerful descriptive analogy correlating well with settlement pattern data from Maya lowland centers (including Tikal), although this has stirred a debate (see Arnold and Ford 1980; Folan et al. 1982; Ford and Arnold 1982; Haviland 1982). It is worth noting that this concentric ring pattern arises from periodic markets (and churches) located at the center of these towns or villages and can be related to Central Place models of transportation cost (e.g., Von Thünen’s 1954 model) with an emphasis on a two-tiered social hierarchy. At Dzibilchaltun, Kurjack (1974:94) did combine the concentric ring model with a four-tiered settlement hierarchy, viewing the two proposals as complementary. Arlen F. and Diane Z. Chase (1987:50-58) have expressed their belief that the concentric model does not fit the settlement pattern of Caracol if a strict application of concentric zones of ever decreasing (or increasing) social status radiating outward from the epicenter is applied.

In 1956, Gordon R. Willey proposed three distinct settlement pattern models for the Classic Maya, although he clearly stated the idealized and simplified nature of these.

“It should be emphasized that these are only projected ideal types for prehistoric settlement in the Maya lowlands. There is no reason why combinations of these types might not be nearer actuality, nor need any type have prevailed throughout the entire area and Classic period.” (Willey 1990a[1956]:339)

Willey described his three idealized models relating the relationship between the ceremonial center and households as follows:

“First, there is the one in which (Type A) the ceremonial center is surrounded by dwellings so closely spaced that their inhabitants could not have farmed immediately adjacent to them... In the second type (Type B) the ceremonial center is without dwellings, and houses of the sustaining population are scattered singly over a wide surrounding area... The third idealized type (Type C) is similar to B in that there is no appreciable population concentrated in the ceremonial center, but the sustaining populations are spotted through the surrounding country in hamlets or small villages rather than in individual houses.” (Willey 1990a[1956]:339)
Several terms within this paragraph seem to anticipate later theoretical considerations. The concept of a sustaining population supporting a centralized elite, the ceremonial nature of the large architectural complexes of the central core, and the clustering (or not) of houses became central themes in settlement pattern studies over the following decades. Nonetheless, the actual settlement pattern at Tikal does not completely support any of the three models. It would seem that the “ceremonial center” was inhabited year-round by a fairly dense population with a considerable population living in individual households (some quite large) surrounding this central core. Beyond this densely settled core area, households are continuously spaced over the terrain with enough land in between for some agriculture, although the projected population density suggests that the land between these households would not have been sufficient to support all the people living on the land.

With regard to Willey’s Type C pattern, there is a mix of individual ‘houses,’ or single structures, although these are rare. It appears that the household is usually represented by a group of buildings – the plazuela, patio-quad, or group. Furthermore, a range in size of groups runs from the smallest two or three structure group with no formal plaza through formal groups with many structures, vaulted architecture and multiple raised plazas, to ‘minor centers’ of various sizes represented by an even greater number and variety of structures and plazas. The largest of these minor centers have architectural plans that mimic epicentral forms, complete with temples, ballcourts, and stelae.

All the empirical data, especially the Tikal Sustaining Area Project data published by Puleston (1973, 1983) were leading to a great debate concerning the interrelated nature of Maya centers as ‘true urban cities’ (D. Chase et al. 1990; Folan 1992; Sanders and Price 1968; Sanders and Webster 1988), the distribution and density of population around such centers (and in between them – see Ford 1981; Puleston 1973, 1974), and the nature of the agricultural production system(s) practiced by the Classic Maya (i.e., the Ramón hypothesis, see Lambert and Aronson 1978; Miksicek et al. 1981; Puleston 1971, Reina and Hill 1980). These debates continue to illicit great argument among researchers
at conferences, in press and in classrooms at universities. As general models of the social and political organization of the Classic Maya have evolved, evidence and assumptions concerning one sub-system (i.e., agriculture or marketing) have been evoked in order to support or refute models of other sub-systems.

One’s view of agricultural production is surely bound to one’s assumptions about population density, or vice versa. Likewise, one cannot speak of settlement patterns without mention of population densities which are also dependent upon agricultural production. Perhaps as important as these three strands of investigation is the evaluation of the economic organization of the Classic Maya. The Classic Maya economy was certainly shaped by primary production, and the resulting dispersed settlement pattern surely influenced the development of craft specialization. It has been argued that the even spacing of major and minor centers reflects a political hierarchy as well as an economically integrated market system (e.g., Marcus 1973), although this remains to be rigorously tested with field data.

2.3 – Estimating Populations from Surface Survey

“For reconstructing ancient population size, the assumption in all cases is that there is a direct correlation between population size and observable quantities of particular classes of archaeological data, and that this correlation is expressible in a specific ratio. A particular reconstruction requires selection of some form of archaeological data as a counting unit; in settlement archaeology, the unit is frequently a “house.” Then contemporaneous units are identified and counted, and a conversion rate (e.g., 1 house = 5.6 people) is applied.” (Ashmore 1981:40)

This ‘industry standard’ formula has been widely applied to Maya settlements as follows: the number of houses (sometimes a structure group and sometimes each building) recorded for any given time period is multiplied by 5.6 persons and then divided by the areal measurement of land occupied to arrive at a population density; this population density per unit of land is then multiplied by the total extent of the site to come to a total projected population of the site. In practice, this is usually done for the
projected demographic peak of the site. At the same time, most researchers prefer a personal variant of the formula, modifying a variable or adding a correction factor. All variables in this equation have been challenged at one time or another. The most serious challenges relate to identifying ‘houses,’ the contemporaneous occupation of these houses (i.e., cyclical versus continuous occupation, see D. Rice and Culbert 1990:15-16), the appropriateness of the 5.6 persons per house multiplier, the applicability of any ethnographically derived multiplier, double-counting structures which do not represent year-round residences, the subtraction of non-residential structures or the addition of ‘invisible’ or vacant terrain structures.

At present I view population estimates (density and total population), if calculated with the same or similar formula, meaningful for comparative purposes, less so as absolute numbers. As with all estimations, any inaccuracy in the numbers will be multiplied throughout the equation used and may lead to grossly inaccurate final counts. Alternately, they may cancel one another out (see Williams 1989, for the Basin of Mexico), or it may be possible to double-check the settlement study with an agricultural simulation (e.g., Wingard 1992, 1996) to arrive at a reasonable concurrence (see Webster 2005 for Copán). Cowgill has expressed his concern with constructing population estimates for ancient Mesoamerican centers, stressing the tentative nature of his own population estimates for Teotihuacán which he considered to range from 30,000 to 150,000 inhabitants, from which he extrapolates a probable plateau of 80,000 or so during the A.D. 150 – 550 habitation peak (2008:97). The population estimates for Tikal constructed through this method have long been considered a turning point in lowland Maya studies; they ushered in an acceptance of dense populations around centers in the Peten.

“The Tikal Project, conducted by the University of Pennsylvania between 1956 and 1970, provided an unusual amount of data relevant to the question of prehistoric population. The results from Tikal, in fact, were the precipitating factor in the general acceptance by archaeologists of considerably higher population densities in the southern Maya lowlands than had been suspected earlier.” (Culbert et. al. 1990:103)
The construction of a population estimate from mapped remains is now considered a crucial first step in the analysis of the organization of any Maya center, both internally and in respect to its position in a hierarchically arranged political system or economic network. From the very onset of population studies at Maya centers some scholars have questioned the validity of the procedure. Ironically enough, Robert Wauchope, godfather of the 5.6 persons per family statistic\(^7\), was unconvinced that estimating total population sizes for Classic Maya centers from structure counts was an accurate procedure.

“Population estimates of a ruined city have been based partially on the number of house mounds in the environs of the city, the probable number of occupants per house, and the number of years that a house is occupied before being abandoned. This method is of doubtful validity.” (Wauchope 1938:151)

The average family size is therefore a convenient place to begin dissecting the process of estimating populations for Classic Maya settlements.

**Number of Individuals per Structure**

“[A] common (and much debated) means of population reconstruction in the Maya lowlands takes ‘houses’ as the counting units, counts the number ascribable to the same unit of time (usually a ceramically defined period), and multiplies by a people-per-house figure taken from Maya ethnographic studies — usually the 5.6 figure from Redfield and Villa Roja’s (1934) study of Chan Kom.” (Ashmore 1981:65)

The number of individuals per family and household were highly variable for small Yucatecan Maya villages from the 1900s. Wauchope cites a mode of 4 and average of 3.8 occupants for a series of seven houses in Valladolid, Chichimila and Yalkom. Shattuck estimated a 4.5 average per house for Dzitas and 7.5 for Chan Kom; Redfield and Villa Rojas cite 5.6 as the average number of persons per household for Chan Kom.

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\(^7\) Wauchope (1938) borrowed this figure from Redfield and Villa Rojas' (1934) ethnographic study of the Maya village of Chan Kom.
Using ethnohistoric population data from the early and middle sixteenth century, William T. Sanders calculated an average nuclear family size at 3.3 individuals and an average extended family size at 7 individuals (1973:329). As a guide for population reconstructions for the Classic Maya, these figures are most instructive in warning against the application of any constant without careful consideration of specific local influences.

Average household size is a summary statistic which is more meaningful if used in conjunction with other data on the composition of households in any community. Daniel Shea (1985) has also remarked that a community-wide average is just that – a mathematical mean – perhaps applicable in estimating total population from a complete sample, but certainly masking variation within the population. As I have reviewed in the previous section concerning household structure, household averages usually fall below five persons cross-culturally. This does not imply that five persons per household is the median for these societies or that larger households are uncommon, just that they are counterbalanced by smaller households. These numbers are, of course, influenced by one’s definition of the household, as well.

It should not be forgotten that some societies have had larger average household sizes, so while cross-cultural comparison is instructive in warning against the common sense notion that most societies have not had average household sizes over five individuals, this figure cannot reasonably be directly applied as an absolute figure in estimating populations at any specific archaeological site without positively identifying household structures on the ground. The problem with applying an average person count per household at a Classic Maya center like Tikal is that we are unsure how many households are represented by larger architectural compounds. Certainly some larger complexes of residential architecture represent the living quarters of more than one simple family, in the sense of a household forming the primary cooperative production/consumption/reproduction unit. However, drawing lines or circles onto maps
of domestic architecture may be no more precise than counting individual domestic structures.

There is a certain homogenizing effect to structurecounting that masks differences in wealth. Palaces should not be expected to have as many occupants per m² as the huts of the poorest segment of society. Classic Maya society may also have differed in important ways from Maya communities of the last century, most importantly in the size and frequency of extended-family residences and the extent that lineages co-reside in geographic proximity. It is also possible that Classic Maya society was characterized by a greater proportion of wealthy individuals and that prosperity was generally more widespread among the Classic Maya than it is among their descendants. Obviously there are no longer kings present in modern ethnographic communities, yet archaeologists constantly look to these communities for appropriate models of Classic period social and economic structure.

The household data for the Yucatecan Maya community of Chan Kom shows us that ‘extended domestic families,’ of three generations or more, were rare (just 2 out of 45 households, or 4.4%); multiple-family households were not uncommon (10 of 45, or 22.3%), and single-family or nuclear-family households were dominant (33 of 45, or 73.3%). If almost three quarters of the Chan Kom households were nuclear families then why was there an average household size of 5.6 persons? Two reasons jump out – this is a very young, ‘pioneering’ population with 49% of individuals under the age of 15 (73% under the age of 25) (see Table 2.3.1) and the complex-households (multiple-family and extended-domestic-family) have multiple nuclear-families living together (Redfield and Villa Rojas 1962[1934]:91). This demographic situation indicates that Chan Kom was characterized by a young, fertile, and rapidly growing population (see Webster et al. 2000 for discussion). One should not logically extend statistics from this specific case study to a general population or community characterized by a more stable or a declining population. The demographics described for the community of Chan Kom do not make it the most appropriate analogy for the Classic Maya. Although small (1.8 m square), the
storehouses described by Wauchope had stone walls more often than not and were filled with a ‘domestic’ inventory of artifacts, often broken but only provisionally discarded (1938:136). Some structures were no longer used as sleeping quarters and others were constructed for that purpose and then never used. There is quite a bit of room to question the identification of ancient Maya houses from settlements maps, or even after complete excavation.

In his evaluation of Mesoamerican ethnohistoric and ethnographic data, Charles Kolb (1985) reported a predominance of nuclear-family dwellings over extended-family dwellings for Guatemalan peasants (Kolb and Loucky 1974), the Meseta Central (Madsen 1969; Nutini 1967), Vera Cruz (Kilbride 1968) and the Yucatan (Goldschmidt and Kunkel 1971; Nutini 1968). Blanton’s cross-cultural data compiled on agrarian household structure also indicates that nuclear-families are always the most frequent type found in core or periphery areas (Blanton 1994:173).

Table 2.3.1 – Age structure for Chan Kom (after Redfield and Villa Rojas 1962 [1934]:Table 2).

<table>
<thead>
<tr>
<th>AGE</th>
<th>MALES</th>
<th>FEMALES</th>
<th>BOTH</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Number</td>
<td>Number</td>
<td>Number</td>
</tr>
<tr>
<td>under 5</td>
<td>27</td>
<td>10.7</td>
<td>24</td>
</tr>
<tr>
<td>5 to 9</td>
<td>25</td>
<td>9.9</td>
<td>14</td>
</tr>
<tr>
<td>10 to 14</td>
<td>17</td>
<td>6.8</td>
<td>16</td>
</tr>
<tr>
<td>15 to 19</td>
<td>14</td>
<td>5.6</td>
<td>14</td>
</tr>
<tr>
<td>20 to 24</td>
<td>13</td>
<td>5.2</td>
<td>20</td>
</tr>
<tr>
<td>25 to 29</td>
<td>14</td>
<td>5.6</td>
<td>10</td>
</tr>
<tr>
<td>30 to 34</td>
<td>1</td>
<td>0.4</td>
<td>5</td>
</tr>
<tr>
<td>35 to 39</td>
<td>4</td>
<td>1.6</td>
<td>6</td>
</tr>
<tr>
<td>40 to 44</td>
<td>6</td>
<td>2.4</td>
<td>3</td>
</tr>
<tr>
<td>45 to 49</td>
<td>4</td>
<td>1.6</td>
<td>2</td>
</tr>
<tr>
<td>50 to 54</td>
<td>2</td>
<td>0.8</td>
<td>3</td>
</tr>
<tr>
<td>55 to 59</td>
<td>2</td>
<td>0.8</td>
<td>0</td>
</tr>
<tr>
<td>60 to 64</td>
<td>0</td>
<td>0.0</td>
<td>1</td>
</tr>
<tr>
<td>65 to 69</td>
<td>2</td>
<td>0.8</td>
<td>1</td>
</tr>
<tr>
<td>70 to 74</td>
<td>0</td>
<td>0.0</td>
<td>1</td>
</tr>
<tr>
<td>totals</td>
<td>131</td>
<td>52.2</td>
<td>120</td>
</tr>
</tbody>
</table>
An average household size per nuclear-family was cross-culturally averaged by Kolb (1985) as 5.5 for Mesoamerican peasants, which corresponds with the findings of similar studies citing averages of 5.5-6.5 (Nutini 1967, 1968), 5.4 and 5.6 (Carrasco 1964, 1971a, 1971b), or 5.6 (Redfield and Villa Rojas 1962[1934]; Wachope 1938:145). Kolb’s cross-cultural data on Mesoamerican peasant households indicates an average roofed space of 6.12 m² per person for nuclear-families. His calculated average is well below that of Naroll’s (1962) estimate of 10 m², but only slightly lower than LeBlanc’s (1971) 7.3 m² estimate for the community of peasant cultivators at Hasanbad, Iran (Watson 1966).

The 5.6 persons per household average derived from the Chan Kom population data has routinely been applied incorrectly in population estimates of Classic Maya communities as 5.6 persons per structure. The residential compound of one of the two extended domestic families from Chan Kom (Redfield and Villa Rojas 1962[1934]:Figure 10) has seven structures, including a cook-house with a separate grinding room addition, although the cook house was also used for sleeping quarters by a younger member of the household. With regard to the Chan Kom demographic data, Redfield and Villa Rojas (1962[1934]:91) state,

“It is probable that the extended domestic family was once more common and is now yielding to the small parental family in response to technical and economic changes. It is noteworthy that the two men who maintain these large families are the two most prominent of the older men in the village, pioneers in the founding of the community and distinguished by wealth, property and moral character.” (Redfield and Villa Rojas 1962[1934]:91)

Sol Tax’s (1963[1953]) multi-year study of the Highland Guatemala community of Panajachel, from 1936 to 1941, focused on the economic organization of this mostly ‘Indian’ community. Tax also carefully recorded information concerning the socio-religious system, agricultural production, land tenure, and household composition. Systematic analysis of the quantitative data reported by Tax provides a convenient analogy with the Classic Maya. Of course, the Panajacheleños do live in a different
world than their Classic Maya predecessors. Nonetheless, Panajachel in the 1930s was a mostly rural agricultural community living in largely non-modern conditions. While not exactly a traditional community such as those of the Classic Maya, Panajachel was still organized around the household as the basic economic and social unit, from marketing to landholding to office holding within the rotational or “cargo” socio-religious system.

The Panajachel community was inhabited mostly by ‘simple,’ or nuclear, families living in individual farmsteads or households, although considerable variation existed. A tendency toward a patrilocal residence pattern prevailed with most couples setting up their own residence soon after marriage. Land was the single greatest asset in the accumulation of wealth and was inherited, often divided among the children of a given household when they reached the age of marriage. Tax noted that wealth standings tended to be dynamic over just a few generations, with children either accumulating more wealth than their father or falling to a lower economic status after the fissioning of landholdings. While these wealth distinctions were marked within the community, all households were living near subsistence level; there was no class development among the relatively equally poor households. Tax speculated that even the socio-religious office holding system was not large enough (as it was in Chichicastenango at that time) to solidify status differences either. No family held sway to a much greater extent than any other; there were no Panajachel “Kennedys” or “Medici.”

Market-oriented primary production is likely the most crucial difference between Panajachel households and those of the Classic Maya. The self-sufficiency of Panajachel households is in sharp contrast to their practice of growing agricultural product for sale. Maize and beans were grown for household use and almost never sold (Tax 1963[1953]:121-122). However, these staples were bought by many households with money earned from the cash cropping of vegetables, fruits, and coffee destined for the market.
As a community of mostly agricultural specialists, landholdings in Panajachel correlated positively with wealth (Tax 1963[1953]:189-199). Families lived in compounds made up of multiple structures situated on a single house lot; a discrete functional housing pattern which mirrors both contemporaneous and Classic Maya settlements. The physical measurements of individual structures and information regarding their functions thus provide a baseline for evaluating population estimates derived from structure counts in the Classic Maya lowlands. Tables 2.3.2 – 2.3.5 list the dimensions of all roofed structures present for the ten households for which Tax reported complete information (1963[1953]:154-158). These ten samples represent low, middle, and high wealth-status households, as ranked by Tax (1963[1953]:Appendix 3).

Tax reported the physical dimensions of 42 structures from ten house lots, noting the function of each and, of paramount concern to this study, where each individual from each family slept. Charting the sizes of individual structures, several patterns are immediately apparent. Large domestic structures [kitchens, dormitories, and saint’s houses] and smaller ancillary structures [chicken houses, sweatbaths, or granaries] fall into a discrete, non-overlapping bimodal distribution; the smallest house is still larger than the largest sweatbath or granary. This suggests that major domestic structures can be discriminated from ancillary buildings based on physical dimensions recorded on settlement pattern maps of defunct Maya communities, perhaps even Classic sites.

Thirteen out of twenty-three large structures (56.5%) were used as dormitories; that is 31% of all structure had a dormitory function. Folan et al. (2008:307) reported that 55% of all structures at the modern village of Coba in Mexico were inhabited; the remaining 45% had been abandoned or functioned as kitchens, storage spaces, or as civic/religious activity spaces. In the Panajachel sample, eight of ten households had a sweatbath (8 of 42 structures, 19%) and six of ten households had a chicken house (6 of 42 structures, 14%). Sweatbaths and chicken houses together account for almost one quarter of all buildings within the ten households surveyed or nearly three quarters of the ancillary structures. Ten of the twenty-three large structures (43%) from the sample of
Figure 2.3.2 – Dimensions of Panajachel structures from ten households (After Tax 1963[1953]).

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<tr>
<th>RANK</th>
<th>LAND - O</th>
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<th>TOTAL IND.</th>
<th>M</th>
<th>F</th>
<th>B</th>
<th>G</th>
<th>I</th>
<th>Yard L. (ft.)</th>
<th>Yard W. (ft.)</th>
<th>Yard Area (ft.²)</th>
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| means = | 6 | 2 | 2.1 | 1.29 | 1.33 | 2 | 694.7 |

*The lowest number represents the highest ranking in Tax’ analysis.

RANK = Wealth as determined by landholdings
LAND – O = Land owned (this is a relative ranking of all households, not an absolute dimension)
LAND – C = Land under cultivation (this is a relative ranking of all households, not an absolute dimension)
TOTAL IND. = Total number of individuals in residence within the household
M = Adult males residents
F = Adult female residents
B = Boys
G = Girls
I = infants
Figure 2.3.2 continued – Dimensions of Panajachel structures from ten households (After Tax 1963[1953]).

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<th>Area (ft²)</th>
<th>Dm. (Ind.)</th>
<th>Str. B</th>
<th>L. (ft.)</th>
<th>W. (ft.)</th>
<th>Area (ft²)</th>
<th>Dm. (Ind.)</th>
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Dm (Ind.) = Number of residents that slept in the structure nightly.
Figure 2.3.2 continued – Dimensions of Panajachel structures from ten households (After Tax 1963[1953]).

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<th>RANK</th>
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<th>Str. D</th>
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Figure 2.3.2 continued – Dimensions of Panajachel structures from ten households (After Tax 1963[1953]).

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<th>Str. F</th>
<th>L. (ft.)</th>
<th>W. (ft.)</th>
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Figure 2.3.3 – Summary dimensions of Panajachel structures from ten households (After Tax 1963[1953]).

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<th>Ind./Area (ft²)</th>
<th>Main Area (ft²)</th>
<th>Ind./Area (ft²)</th>
<th>Minor Area (ft²)</th>
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Means = 621.8  113.076  548.4  99.48  73.4

Total Area = Total roofed space from all structures
Ind./Area = Roofed space per individual resident
Main Area = Total roofed space from main structure (i.e., dormitories, kitchens, saint’s houses)
Minor area = total roofed space from ancillary structures (i.e., sweatbaths, chicken houses)
Figure 2.3.4 – Dimensions of Panajachel main structures from ten households (After Tax 1963[1953]).

<table>
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<th>Main Structures</th>
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<th>A. (ft²)</th>
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</table>

means = 17  13.52  241.96  4.62*

L. = Length  
W. = Width  
A. = Area  
Ind. = Individuals that slept in the structure on a nightly basis.

*this number falls to 2.61 when calculated with only structures used as domiciles.
Figure 2.3.5 – Dimensions of Panajachel ancillary structures from ten households (After Tax 1963[1953]).

<table>
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<th>Ancillary Structures</th>
<th>L. (ft²)</th>
<th>W. (ft²)</th>
<th>A. (ft²)</th>
<th>Ind.</th>
</tr>
</thead>
<tbody>
<tr>
<td>#3</td>
<td>9</td>
<td>6</td>
<td>54</td>
<td></td>
</tr>
<tr>
<td>#3</td>
<td>9</td>
<td>6</td>
<td>54</td>
<td></td>
</tr>
<tr>
<td>#3</td>
<td>7</td>
<td>6</td>
<td>42</td>
<td></td>
</tr>
<tr>
<td>#5</td>
<td>7</td>
<td>6</td>
<td>42</td>
<td></td>
</tr>
<tr>
<td>#5</td>
<td>9</td>
<td>4</td>
<td>36</td>
<td></td>
</tr>
<tr>
<td>#15</td>
<td>9</td>
<td>7</td>
<td>63</td>
<td></td>
</tr>
<tr>
<td>#15</td>
<td>9</td>
<td>6</td>
<td>54</td>
<td>1</td>
</tr>
<tr>
<td>#15</td>
<td>6</td>
<td>4</td>
<td>24</td>
<td></td>
</tr>
<tr>
<td>#19</td>
<td>7</td>
<td>6</td>
<td>42</td>
<td></td>
</tr>
<tr>
<td>#19</td>
<td>7</td>
<td>6</td>
<td>42</td>
<td></td>
</tr>
<tr>
<td>#37</td>
<td>6</td>
<td>6</td>
<td>36</td>
<td></td>
</tr>
<tr>
<td>#94</td>
<td>7</td>
<td>6</td>
<td>42</td>
<td></td>
</tr>
<tr>
<td>#95</td>
<td>9</td>
<td>6</td>
<td>54</td>
<td></td>
</tr>
<tr>
<td>#108</td>
<td>6</td>
<td>6</td>
<td>36</td>
<td></td>
</tr>
<tr>
<td>#108</td>
<td>4</td>
<td>4</td>
<td>16</td>
<td></td>
</tr>
<tr>
<td>#109</td>
<td>4</td>
<td>3</td>
<td>12</td>
<td></td>
</tr>
<tr>
<td>means =</td>
<td>7.2</td>
<td>5.5</td>
<td>40.56</td>
<td>1</td>
</tr>
</tbody>
</table>

L. = Length
W. = Width
A. = Area
Ind. = Individuals that slept in the structure on a nightly basis.
ten Panajachel households were also not used as dormitories, but rather as saint’s houses or storage buildings.

From the perspective of an archaeologist constructing population estimates based entirely on structure counts, several dominant trends are apparent from this Panajachel data. Many large and all ancillary structures are not domiciles and no more than two structures within a household have dormitory functions (the average is 1.3 persons per structure). This suggests that the household is the logical unit of counting when working from settlements maps to population estimates. Furthermore, it may be possible to distinguish large or main buildings (possibly dormitories, but certainly not all) from ancillary structures (never dormitories) based on absolute or proportional size distributions.

To continue this quantitative exercise, in the Panajachel household sample the average number of buildings is 4.2 with a range of from two to six. Is this comparable to the settlement pattern of Tikal? Rice and Puleston (1981:149) report that 70% of the households from the Tikal map are groups of from 2 to 6 structures; 15% are solitary structures and 10-15% are clusters of more than six structures (Table 2.3.6). Almost identical figures come from the Yaxha-Sacnab transects around Lake Peten Itza. Analysis of Uaxactun’s map produces comparable figures, with 40% of all groups falling into the 2 to 6 structure range, 50% into the solitary structure category, and only about 5% of structure groups identified as clusters having more than 6 structures.

Table 2.3.6 – Relative frequency of solitary, grouped, and clustered structures at Classic centers in the Peten (After Rice and Puleston 1981:Table 6.2).

<table>
<thead>
<tr>
<th></th>
<th>Solitary Structures</th>
<th>Groups (2 to 6 Strs.)</th>
<th>Clusters (6 + strs.)</th>
<th>Centers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tikal</td>
<td>15%</td>
<td>70% +</td>
<td>10% - 15%</td>
<td>1%</td>
</tr>
<tr>
<td>Uaxactun</td>
<td>50%</td>
<td>40% +</td>
<td>5% +</td>
<td></td>
</tr>
<tr>
<td>Yaxha-Sacnab</td>
<td>16%</td>
<td>69%</td>
<td>13%</td>
<td>2%</td>
</tr>
</tbody>
</table>
The PST Project’s settlement map of the northern earthwork corridor recorded 40 household groups; 3 are solitary structures (7.5%), 33 are groups of 2 to 6 structures (82.5%), and 4 are clusters of over 6 structures (10%). The average number of structures for these 40 peripheral Tikal households is 4 with a range from 1 to 21. Actually, Group 45 at the western end of the northern corridor is an extreme outlier, having 21 structures arranged around 4 or 5 plazas. Omitting this ‘minor center’ from calculation, the average number of structures per household comes to 3.65, with a range of 2 to 12 (Tables 2.3.7 and 2.3.8).

Table 2.3.7 – Relative frequency of solitary, grouped, and clustered structures within the PST Project northern earthwork corridor.

<table>
<thead>
<tr>
<th></th>
<th>Solitary Structures</th>
<th>Groups (2 to 6 strs.)</th>
<th>Clusters (6 + strs.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Northern Corridor</td>
<td>7.5%</td>
<td>82.5%</td>
<td>10%</td>
</tr>
</tbody>
</table>
Table 2.3.8 – Number of structures and plazas for groups from the PST Project northern earthwork corridor.

<table>
<thead>
<tr>
<th>Group</th>
<th>Structures</th>
<th>Plazas</th>
</tr>
</thead>
<tbody>
<tr>
<td>G1</td>
<td>12</td>
<td>2</td>
</tr>
<tr>
<td>G3</td>
<td>4</td>
<td>1</td>
</tr>
<tr>
<td>G4</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>G5</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>G6</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>G8</td>
<td>4</td>
<td>1</td>
</tr>
<tr>
<td>G9</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>G10</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>G11A</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>G11B</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>G13</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>G14</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>G15</td>
<td>6</td>
<td>1</td>
</tr>
<tr>
<td>G16</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>G18</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>G19</td>
<td>4</td>
<td>1</td>
</tr>
<tr>
<td>G20</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>G21</td>
<td>6</td>
<td>2</td>
</tr>
<tr>
<td>G21A</td>
<td>4</td>
<td>1</td>
</tr>
<tr>
<td>G22</td>
<td>4</td>
<td>1</td>
</tr>
<tr>
<td>G23</td>
<td>4</td>
<td>1</td>
</tr>
<tr>
<td>G24</td>
<td>4</td>
<td>1</td>
</tr>
<tr>
<td>G27</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>G29</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>G30</td>
<td>4</td>
<td>1</td>
</tr>
<tr>
<td>G31</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>G32</td>
<td>9</td>
<td>2</td>
</tr>
<tr>
<td>G33</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>G34</td>
<td>9</td>
<td>2</td>
</tr>
<tr>
<td>G40</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>G41</td>
<td>5</td>
<td>1</td>
</tr>
<tr>
<td>G42</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>G43</td>
<td>4</td>
<td>1</td>
</tr>
<tr>
<td>G44</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>G45</td>
<td>21</td>
<td>4</td>
</tr>
<tr>
<td>G46</td>
<td>5</td>
<td>1</td>
</tr>
<tr>
<td>G47</td>
<td>4</td>
<td>1</td>
</tr>
<tr>
<td>G48</td>
<td>4</td>
<td>1</td>
</tr>
<tr>
<td>G49</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>G50</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>G51</td>
<td>4</td>
<td>0</td>
</tr>
</tbody>
</table>

totals = 167
mean = 4.1
Returning to the Panajachel data, the mean number of individuals per household was 5, with a range of from 1 to 11. Note that other Maya communities from Yucatan, Mexico reported by Weeks (1988) had larger households on average, and greater variation in range of sizes (1-30 individuals per household – see Table 2.3.6).

Table 2.3.9 – Average household size for five twentieth century Yucatecan Maya communities (After Weeks 1988:Table 4.4).

<table>
<thead>
<tr>
<th></th>
<th>Ichbalche</th>
<th>Tzuctok</th>
<th>Chunhaz</th>
<th>Chacuitzil</th>
<th>Ichmachich</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Population</td>
<td>850</td>
<td>112</td>
<td>135</td>
<td>178</td>
<td>63</td>
<td>1338</td>
</tr>
<tr>
<td>Residential Groups</td>
<td>118</td>
<td>14</td>
<td>30</td>
<td>21</td>
<td>7</td>
<td>190</td>
</tr>
<tr>
<td>Mean Size</td>
<td>7.3</td>
<td>7.9</td>
<td>4.5</td>
<td>8.4</td>
<td>9</td>
<td>7.1</td>
</tr>
<tr>
<td>Standard Deviation</td>
<td>4.8</td>
<td>5.4</td>
<td>2.6</td>
<td>7.9</td>
<td>7.5</td>
<td>5.2</td>
</tr>
<tr>
<td>Range</td>
<td>1 to 30</td>
<td>1 to 17</td>
<td>2 to 10</td>
<td>2 to 30</td>
<td>2 to 24</td>
<td>1 to 29</td>
</tr>
<tr>
<td>Median</td>
<td>6</td>
<td>6</td>
<td>4</td>
<td>6</td>
<td>9</td>
<td>6</td>
</tr>
</tbody>
</table>

The assumption that larger households represent more established, wealthier and more prominent individuals is widely attested in archaeological, ethnographic and historic examples from a multitude of ancient agrarian cultures. This idea has been adopted by archaeologists working in the Maya lowlands and physical evidence from excavations of larger household complexes apparently confirms this theory (see Becker 1999; Haviland 1981, 1992; Hendon 1991; Webster 1989). Larger households have more abundant and higher quality artifact assemblages (i.e., pottery, lithics, and imported ‘exotica’) as well as larger, better constructed buildings with greater architectural elaboration ‘signaling’ higher status. At Caracol, Murtha has demonstrated that larger household complexes had access to larger plots of agricultural land (2002:297-302). I hold strongly to the idea that land ownership, or at least tenure-ship, probably formed the basis of wealth and wealth distinctions for the Classic Maya more so than any other single variable.
Correction Factors

Subtraction of Non-residential Structures

A standard factor for the number of inhabitants per structure (domicile) in the Maya area will probably always coincide fairly consistently with the 5.6 number currently dominating the literature. Some prefer a rounded down figure of 5.0 (see Barnhart 2001:73-75), and the 3.3 figure cited by Sanders could also be used. More important than the number of persons residing within a structure is the number of structures within a household group which represent living space. The Tikal peripheral households conform to a discrete functional arrangement. That is to say, each household or residential unit is comprised of multiple structures (2-21 according to the PST Project data) arranged around a patio or plaza, often artificially raised. The burning question here is, “what is/are the function(s) of each structure within a household group?”

Without complete horizontal excavation of all groups, we may never know the precise function of each individual structure. Even with full areal stripping, function is notoriously difficult to ascertain, especially when most associated artifacts have been carried away by the pre-Columbian residents. The rare ‘pompeii effect’ preservation at the archaeological site of Ceren (Sheets 2002), or at the burned and rapidly abandoned domestic structures at Aguateca (Inomata 2001; Inomata and Stiver 1998) serve as a reminder that ancient residents usually carried away the majority of still useful possessions under less dramatic conditions. It is also probably safe to assume that not all structures represent sleeping spaces, but rather kitchens, storehouses and workspaces, and that some buildings and/or whole sets of household facilities were either abandoned, in temporary disuse, or unfinished at any given time. At Tikal, Haviland has removed a consistent 16.5% of all structures from consideration as living quarters based on Marshall Becker’s (2003a) identification of household shrines – non-residential buildings which are situated to the east side of mapped groups at Tikal. This figure is fairly consistent with the 14.3% shrine occurrence at Seibal (Fry 1990:126), yet grossly out of proportion...
with the approximately 60-80% eastern-shrine-focused group figure from the site of Caracol, just 77 km from Tikal (A. Chase, personal communication 1998; D. Chase and A. Chase 2004:139).

Sanders reported that 15 to 20% of the houses in the Teotihuacán Valley of the 1950s were uninhabited at any given time (1973:329). Similarly, at the modern pueblo of Coba on the Yucatan Peninsula, Folan and colleagues (Folan et al. 2008:307; Folan, Kintz, and Fletcher 1983) report that only 55% of structures were inhabited, the remaining 45% represented abandoned structures and non-habitation structures (i.e., kitchens, storage spaces, civic or ritual spaces). Perhaps this figure should be questioned first and foremost, because any correction factor for inhabited structures will multiply through the population reconstruction equation.

Population estimates derived from structure counts should be compared with other means of population density evaluation. While artifact counts are probably too inaccurate to use in population reconstruction, estimated agricultural production or carrying capacity of the land seems a reasonable second line of inquiry (e.g., Webster 2005; Wingard 1992, 1996 for Copán). Researchers working in the central Mexican highlands have often used agricultural production potential as a convenient means of estimating total population (i.e., Pollard and Gorenstein 1980, 1983). Watershed analysis is another means of estimating the carrying capacity of the land (Kirk French, personal communication 2011). Comparing the calculated total area of roofed space against cross-cultural data from Narroll (1962), LeBlanc (1971), and Kolb (1985) would also help to estimate the number of inhabitants at the group, palace, or site-wide levels. Puleston arrived at a figure of 5.4 persons per house for Tikal based on measurements of structures identified as houses by Haviland. My own opinion is that if structure-based population estimates are grossly out of line with other avenues of inquiry, then the structure counting method should be critically re-evaluated. On the other hand, if conservative population estimates exceed projected carrying capacity under the presumed agricultural system,
then primary agricultural production should come under scrutiny (Sanders 1973:331; Tourtellot 1993:224).

**Contemporaneous Habitation**

Both Haviland (1990) and Fry (1990) produced their respective population estimates for Tikal under the assumption of continuous occupation of residential groups (i.e., that all residential structures were inhabited year-round for the entire duration of the associated ceramic phase). The extensive excavation of groups within the 16 km² map of Tikal convinced Haviland that the cyclical occupation of houses was unlikely (1971:191, 1985, 2003:121-122). Haviland’s four major arguments against the abandonment and reuse of domestic structures are as follows:

1. Structures were frequently altered. Structure 6E-26 was built and then modified five times within a 200 years period.
2. When small structures were modified, older walls and floors were still in use; they did not show evidence of being subjected to the elements like abandoned structures should have.
3. Several structures [4F-3, 6C-45, 6E-26 and 5F Sub 1] had continuous midden deposits which attested uninterrupted refuse disposal. No intermittent soil accumulations indicative of temporary abandonment were present in these stratigraphic middens. Of course, this may be an unreasonable assumption and I wonder if abandonment on the order of two or three generations would leave easily detected stratigraphic layers. At Group 1 in our northern earthwork corridor settlement survey a stratified midden accumulation was halted for a considerable time (on the order of 150 years) without any noticeable soil accumulation. In fact, it was capped with a stucco floor at some point during this hiatus before residents again began using this location for refuse disposal.
4. Burials were not disturbed by subsequent architectural alterations. To Haviland, this indicated knowledge of previous interments by the subsequent inhabitants who made the architectural modifications.

Upon consideration of Haviland’s four arguments, Dennis Puleston added two additional ones that he believed strengthened the continuous occupation model for Tikal. First, following his general model of ramón tree cultivation adjacent to residences, Puleston argued that smallholders would not give up economically important tree stands (1973:160-161). Second, many groups with large building and platform constructions represent substantial labor investments which would not be quickly abandoned by their inhabitants.

Both of these premises amount to the same thing: there is a trade-off between labor investment and mobility. The greater the investment in improvements, either of architecture or agricultural plots, the less likely those smallholders would be to move away; labor investments are positively correlated with loss of mobility. In regard to the cyclical occupation model, I would like to point out that this model posits the abandonment of houses when nearby agricultural lands are temporarily depleted and need fallow time in order to regenerate. Even so, the same family group may still have claimed ownership or tenure-ship of the abandoned homestead. This would be especially important in the case of tree orchards around households. The trees would still belong to the family which moved their residence in order to farm maize fields elsewhere; they would farm milpa nearby their new homestead and then collect tree products at a distance at their previous residence.

Attempting to reconcile the high number of houses identified at Tikal with the agricultural potential of the Peten soils under a swidden agriculture system, William Sanders suggested that the cyclical occupation model better fit the Tikal settlement data

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8 Haviland found up to 11 undisturbed burials in a single structure [2G-59], and also notes a single case of the disturbance of a burial consequent with planned, large-scale architectural alteration, “…disturbed by design rather than by accident” (2003:122).
While surveying the modern Teotihuacán Valley, Sanders found that 5 to 20% of houses were unoccupied or abandoned at any given time. Following the depletion of soils surrounding a house, the household would move to a new location where agricultural soils had not been farmed or had regenerated sufficiently after long fallow. Sanders cites the average cycle of house abandonment to re-habitation at 36 years, arguing that Haviland’s estimate of architectural modification every 40 years fit the cyclical habitation model well (Sanders 1973:329-331).

While the continuous occupation model does not seem farfetched given the dispersed settlement pattern at Tikal and the probable land tenure system, the cyclical occupation model (see Culbert et al. 1990) deserves consideration. Unfortunately, the current state of ceramic dating does not permit fine enough grained chronological control to detect short-term abandonment of residential units. The possibility remains that investigators are double or triple counting groups which belonged to the same residents; this may also apply to structures within the epicenter that were not occupied full-time by the same residents. We are still ignorant of the organization of central and epicentral palaces or other residential structures, and servants or rotational occupants may have maintained permanent residences elsewhere. This is not an easy factor to control for.

**Addition of ‘Vacant Terrain’ or ‘Invisible’ Structures**

The investigation of invisible structures or vacant terrains has received more attention in press than in the field. Settlement surveys attempting to probe areas devoid of house platforms visible from surface survey are rare. Less rare are speculations concerning the number of invisible structures which have not been accounted for on survey maps. The complete excavation of household groups at Tikal often located very low structure platforms not initially recorded through mapping (Becker 1999; Haviland 2003).
Bronson (1968) excavated in vacant terrain as part of the University of Pennsylvania Tikal project and did locate low structure platforms which would not have made it onto the map without excavation, although several researchers (Haviland, Puleston, Jones, and Chowning) found that vacant terrain structures inevitably pre-dated the Late Classic period (see Culbert et al. 1990:114). The PST Project located one vacant terrain platform (just south of Group 1) which may be Late Preclassic in date. While vacant terrain structures may exist for the Classic period, they have not been readily encountered. Nor have they been actively or systematically sought. On the basis of current information (admittedly sparse) no correction factor for vacant terrain structures should be used in population reconstructions without further investigation of the subject archaeologically at each specific center. The sparse information we do have from Tikal suggests that low structure platforms have been missed during initial mapping either as isolated features or as ancillary structures at residential groups with numerous clearly visible structures; whole plaza groups of low buildings do not appear to have resisted detection (see Culbert et al. 1990:114 for a rare exception). This situation is also true at Copán (Webster, personal communication 2011).

2.4 – Classic Maya Household Configurations

Research in the Maya lowlands has proceeded on assumptions concerning Classic Maya social organization, including household structure. In accord with the theory of abundance, the stone and earthen constructed platforms and buildings which numerically dominate Maya centers have rightly been identified as “houses,” or at least remains of structures somehow associated with household functions. These houses do not usually occur in isolation; they are commonly grouped together, often-times around a plaza or patio space. This basic residential unit, with several structures grouped together, should represent both nuclear-family households as well as extended-family households. There are insufficient single buildings at Classic Maya centers to account for the predicted number of nuclear-family residences, unless these were housed in “invisible” or “vacant terrain” structures which are no longer visible from surface reconnaissance.
“An informal group consists of several structures at a single sitting, with no central ambient space: it is empirically defined by constituent structures’ being closer to each other than to other structures or groups. A patio residence comprises several structures sharing a single central ambient space (a patio).” (Ashmore 1981:48-49, emphasis in original)

Ashmore notes that various labels have been applied to the presumed residential buildings or building platforms commonly identified at Maya centers. These include plazuela, group and unit as well as group-unit and court-plaza-patio (Ashmore 1981:49). This does not exhaust the hyphenated possibilities; patio-quad, habitation-unit and residential-compound also work. Given the variety of terms used to designate what most Maya archaeologists believe are the physical living spaces of households, further confusion may arise when higher order conglomerations of such groups, units or residences are given a further descriptive designation. Participants at the Lowland Maya Settlement Patterns conference, held in Santa Fe, New Mexico in November of 1977, produced four cluster designations, they are as follows (after Ashmore 1981:51):

1.) informal cluster, an aggregate of individual structures, with no apparent patio organization and with more than six structures usually involved.
2.) homogenous patio cluster, an aggregate of patio groups with no apparent differentiation among groups.
3.) structure-focused patio cluster, an aggregate of patio groups with at least one “special purpose structure.”
4.) group-focused patio cluster, one or more patio groups with a surrounding cluster of other structures and/or groups.

Some scholars have noted that clusters don’t really have space between them in particular areas of the Maya lowlands. This led Willey and Leventhal to suggest the term agglutinated cluster for Copán (Ashmore 1981:54); the same could be said of Palenque.

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9 The term plazuela was coined by J. E. S. Thompson of the Carnegie Institute of Washington (Thompson 1931:336, cited in Ashmore 1981:8).
“Special purpose structures” may or may not be detected from examination of surface remains; differentiated building quality may also not be apparent prior to excavation. What is apparent from all this discussion and evaluation of terms is that Maya settlement is variable and not easily defined with simple terms. Nonetheless, most researchers see consistent arrangements which they are hard-pressed to apply well-defined terms to.

“Functional labels…abound, and whether dealing with temples, palaces, raised fields, causeways, or ‘minor ceremonial centers,’ once a functional or formal label has been applied to a feature, it tends to stick.” (Ashmore 1981:41)

One trend has been to substitute functional labels (i.e., palace) with function neutral labels (i.e., range structure), although this trend may be seeing a reversal as researchers attempt to assign function to structures and return to functional labels – just more accurately and securely defined ones. It should also be noted that sometimes a palace is a palace (see Andrews 1980; Harrison 1986; Sanders 1973:345).

“It was not until the twentieth century that the term “palace” and how it was applied to Maya architecture came under academic scrutiny. Early researchers classified architectural entities that they assumed to be residential as palaces. There was no agreed-upon definition as to what exactly constituted a palace with regard to form or function. The palace category was primarily a convenient tool to distinguish temple buildings from other types of architecture; temples usually have single rooms and sit on high pyramidal substructures, while palaces are multichambered and rest on low platforms – a description which applies to most Maya buildings that are not temples.” (Christie 2003:3)

Jessica Joyce Christie defines a palace as the highest-status residence at a site, and has advocated the systematic investigation of palaces and elite residences in order to more stringently record the distinctions between the two categories10 (2003:10, Footnote #1). While all Classic Maya households may have conformed to broad social norms, it is certain that important differences existed among them. A continuum of size, from the most humble single nuclear-family household hut at one end to the most opulent royal

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10 Christie’s use of the term “palace” to refer only to the dynastic ruler’s habitation has not been readily adopted by other researchers. This suggestion encounters several problems, as when the ruler has multiple palaces or deceased rulers have compounds that continue in perpetuity as landed estates posthumously.
palace at the other, implies a considerable degree of variation in internal organization among these residences. Acknowledgment of this phenomenon led to the structure group typologies devised by Kurjack (1974) for Dzibilchaltun and Willey and Levelthal (1979) for Copán. This organization certainly entailed the management of labor and the control of land. Wealthier, more extensive, and larger complexes of buildings are assumed to reflect differential access to kin and possibly non-kin labor as well as control of enough agricultural land to put this labor to use. Craft production may also have developed within this system, at larger groups able to support non-food producing craft specialists.

The term “house” is also an important functional label when estimating population; it is imperative to distinguish a domicile from other household buildings such as saint’s houses, shrines, or storehouses. The term house is difficult to apply to the Classic Maya settlement pattern when household members may not all sleep together. The cultural remains recovered from structures of differing function may also look quite similar to the archaeologist that labels these as ‘domestic’ inventories, implying that multiple buildings within a single residential group were all separate living spaces for different nuclear-families of an extended- or joint-family household. Craft production at the household level likely occurred outside of any walled structure, in central patios or under the overhanging eaves to the sides of, or behind, a structure. The absence of separate workshop structures does not automatically imply that craft production was absent at a particular residential group.

Craft production may also have developed in response to a lack of access to productive agricultural lands (Arnold 1980:147; Foster 1965:46, 1967:37-38; Howard 1981:7; Papousek 1974:1013), although poverty and insufficient agricultural land have not always correlated with the adoption of ceramic specialization (Harry 2005:300). Archaeological data from Monte Alban does not support the marginalized peasant model of craft production either (Feinman 1986:358-363). The marginalized peasant model of craft production as an alternative to agriculture is generally supported by data from the Classic Maya.
“Data from both Palenque and Tikal suggest situations associated with agriculturally marginal or less productive lands may have played a role in the adoption of pottery production as a supplemental economic activity (Rands and Bishop 1980:42; Fry 1980:2; Arnold 1978 330-331, 1985:196-201).” (Ball 1993:244-245)

Temple, ball court, and sweatbath are well defined terms which cause little confusion, but houses and residential structures remain poorly defined. Ethnohistoric or ethnographic material has often been used to argue for family or household size and organization among the Classic Maya, and there are still Maya living in analogous households comprised of individual structures arranged around a plaza or distributed over a housetop in the highlands (e.g., Tax 1963[1953]) and lowlands (e.g., Wilk 1997). When reviewing a 1615 mission census for Yucatecan Maya, John Weeks noted the similarity with Classic period settlement patterns.

“These Rancherias probably consisted of a single thatched house or cluster of such dwellings in a forest clearing together with livestock, fruit trees, and small kitchen gardens.” (Weeks 1988:80)

Many ethnographic accounts (censuses) from sixteenth century Maya communities document a high frequency of multiple-family households (Wilk 1988:138). Speaking of the Kekchi Maya of southern Belize (Toledo district), Richard Wilk explains,

“Often the significant economic and social units live in a single building, but in other cases the cooperative unit lives in two or more dwellings. Others who have found similar flexible multihousehold economic units have called them ‘domestic groups’ (Ashcraft 1966), ‘mutual aid clusters’ (Brown 1977), and ‘nonresidential extended families’ (Nutini 1968; Taggart 1975). I refer to these multiple dwelling units as household clusters, distinct from independent households living in a single dwelling.” (Wilk 1997:204-205)

Here Wilk is describing a modern Maya situation which appears to confirm the plazuela or patio group architectural configurations encountered in the Maya lowlands, exactly what I refer to as households or groups at Tikal. Richard Wilk does make the important point that nuclear-family households living within a single building are not the
same as extended-family or complex households living in multiple buildings in close proximity to one another. There may be pooling of resources among several families (i.e., Wilk’s household clusters) within the cluster at the same time that each simple- or nuclear-family cooks and eats within their own building. Households and household clusters are expected to be variable, flexible and changing; no single arrangement should be ubiquitous. There will always be a mix of multiple-family households and single nuclear-family households interspersed and even if a society has a stable normative ideal household structure, considerable variation from the norm is expected (Wilk 1988:137, 141).

“If the Classic Maya of the Peten were indeed Chol speakers, and thus were closely related to the Chorti and Chontal, it is likely that Wisdom’s (1940) description of the Chorti is the best modern analog. Multiple-family household groups would include married daughters as well as sons and would show no pronounced lineal bias. The poor would live in nuclear-family households and the rich would have larger households….This nonunilineal multiple-family household seems the best candidate for the normative household of the ancient Maya.” (Wilk 1988:142)

Recent linguistic analysis supports this supposition, that the Classic lowland Maya did in fact speak a form of Chol which is most closely related to modern Chorti (Houston, Robertson, and Stuart 2000, 2002). Cross-cultural comparison also suggests that this is a robust model applicable to more agrarian societies than just the Maya. The congruence between the ethnographically derived social-structure model and the settlement patterns of the Classic Maya suggest cultural continuity and a parsimonious relationship between the two.

At Tikal and other Classic Maya sites there is, of course, a large center with monumental architecture (temples and palaces), carved monuments (stelae and altars), raised causeways and large reservoirs. At many Classic lowland Maya settlements, as one continues away from the center, a dispersed settlement pattern does emerge. This pattern does seem to hold for the Classic lowland centers of the Peten, although outside this most densely populated ‘core’ area Palenque, Pomona, Piedras Negras, and, to a
degree, Copán are notable exceptions to this pattern. At Tikal, households, in the physical architecture sense (i.e., residences), of variable size and configuration, dot the landscape. These are not evenly or randomly spaced; households will be found clustered along ridge tops and other advantageous topographic areas (for Tikal, see Puleston 1983:Tables 17-19). Low ground (bajo) will not produce much evidence of occupation and upslope areas will have been inhabited based on pragmatic usage of patches of relatively flat ground surrounded by upslope terrain useful for agriculture.

“All over the Maya lowlands…the household was the fundamental unit of settlement, and because of the dispersed nature of Classic settlement, it is a convenient building block with which to reconstruct higher levels of territorial aggregation. Virtually all of the archaeological evidence suggests that the Maya lived in relatively large extended-family households. Frequently these form a group of separate structures arranged around a patio and built on stone and earth substructures, each structure having a different function, so that the household often included buildings for sleeping, a cookhouse, and ceremonial structures. The courtyard apparently functioned as a major work space. Such households probably had a population averaging at least 6 or 7 persons, and possibly as many as 10 (based on sixteenth-century Spanish tax documents), but the range was considerable, to judge by the variety and number of structures per house complex recorded in the local surveys.” (Sanders 1981:358)

Each household plazuela or plaza group will have a slightly different compass orientation and variable number of structure platforms often arranged around one or more plazas. Some groups will be quite ‘informal’ with a few low structure platforms grouped together without a central plaza. Others will be laid out on cardinal directions with parallel buildings delimiting rectangular plazas. Some groups will be comprised entirely of low platforms build from unmodified rocks, others will have vaulted masonry structures (most are now collapsed) and low platforms build from hewn limestone construction block; these more ‘formal’ groups may have multiple interior plazas, often raised with construction fill. Single, isolated structure platforms or mounds will also be encountered unassociated with other architectural features, although these are rare.

It is understandable to interpret this range in group size (residence), number of buildings and construction quality as an indication of variable household size (residents).
Wealth and rank distinctions are also apparent along the range of variation. Although in one respect this range appears to form a continuum, an almost bimodal distribution can be detected at a different scale. Larger groups have more structures, larger structures, more formally defined and usually raised plazas, multiple plazas, higher quality architecture and a higher percentage of vaulted structures; smaller groups usually lack all of these features. Somewhat richer artifact assemblages are also characteristic of larger groups.

Sanders (1981) noted that structures grouped together have different functions; as cookhouses, dormitories and ceremonial uses. I will also add storage houses, sweatbaths, and defunct or unused buildings to this list (see Tax 1963[1953]), calling this arrangement “discrete functional housing.” The arrangement of free standing and annex structures within a houselot reflects the organization of space within Classic Maya households. The evolution of the ‘family’ or group of occupants will likely be reflected in the architectural changes to the group over time. Ethnographic and ethnohistoric accounts support this model of different buildings being used for different functions. This does not imply that each individual building is dedicated to one and only one function, a degree of overlap in the use of buildings is expected, as are changing functions for the same building over time as the structure of the ‘family’ living there changes. This is an important distinction to remember; not all domestic buildings are houses and the plazuela or plaza group is the unit of analysis (the ‘household’) in the current study, not the individual buildings which taken together form this unit.

This study employs a household level approach, with the household remains defined as those groups of structures which are grouped together and separated by a greater distance from other structures or structure groups. I have referred to these discrete groups of associated buildings simply as “groups” or “households” in this study and assume that these physical groupings of structures were inhabited by dynamic biological households pragmatically structuring the organization of production and reproduction. Looking to the artifact assemblages from these distinct groups, I compare
and contrast ceramic and lithic inventories in order to assess production, consumption, exchange and discard patterns among groups and between sectors of the peripheral settlement of Tikal. Ashmore and Wilk (1988) see two major themes in household archaeology: relating houses to households and relating households to larger social structures (i.e., communities, barrios, districts).

In one area of our survey at Tikal, around the secondary or ‘minor’ center of Ramonal/Chalpate, discrete groups are less obvious and the settlement is more clustered or agglutinated than it is along the northern earthwork corridor. This distinction will be addressed when comparing artifact assemblages between these two zones. As an extension of the household unit focus, several large groups from the northern periphery are viewed as larger more established and successful household. The clustered architectural configurations which form the residential component of the satellite center of Ramonal/Chalpate probably represent lineages, wards, or neighborhoods. Sanders (1981) suggested that the household model was applicable not only for the humblest groups of domestic architecture at Maya centers, but to all levels of Maya settlement hierarchies; from probable nuclear-family dwellings through larger groups right up to the dynastic court complexes at the heart of large centers and often referred to as royal palaces (Andrews 1980; Christie 2003; Harrison 1986). Specifically at Tikal, William Haviland has always noted the difference between houses and households.

“During the past 20 years [1968 – 1988], archaeologists working in the Maya lowlands have come to realize that the terms house and household are not synonymous for the Maya of the Classic period….The typical Classic Maya household was made up of not one but from two to five houses – single, small isolated buildings assumed to have been residences of single nuclear or biological families (Willey 1981:388-389) – arranged around the edges of a small plaza.” (Haviland 1988:121, emphasis in original)

This recognition has been central to Haviland’s demographic reconstructions, from single households to larger clusters of households to site wide population estimates. His assumptions are that the Classic Maya lived in “relatively large extended family households” and that plazuela groups begin as single houses and grow through the
addition of other structures as stages in a household’s development (Haviland 1988:121). Working within a cultural anthropological framework, Haviland has interpreted his extensive household excavations at Tikal in terms of household life-cycles, with households growing through the accretion of buildings and remodeling efforts to accommodate an ever evolving extended- or joint-family. In Haviland’s household development model, there are always five individuals (a married couple with three children) living in each structure (house) around the plaza (1988:129-133, Figures 6.1-6.6). This is, of course, an ideal model and represents a simplification of the complete demographic cycle. Nonetheless, physical configurations of buildings likely reflect cooperative multiple-family households.

“Among the modern Kekchi there is a remarkably close relationship between the social and economic relationships that link people together and the distance that separates their houses (Wilk 1984). Multiple-family households that operate as a single economic entity – sharing meals, graneries, and agricultural tasks – live in houses that almost touch, forming a dense cluster around a small cleared space. Some multiple-family households are less cohesive; the children still expect to inherit land and to continue to work together frequently, but each house has individual fields and granaries and makes independent decisions. In these households, houses tend to be much farther apart – up to 30 m – and there is no formal planning to the cluster.” (Wilk 1988:142-143)

Wilk uses this ethnographic analog to equate Classic Maya ‘informal groups’ with loosely organized multiple-family households, and ‘patio clusters’ or plazuelas with more cohesive multiple-family households (Wilk 1988:142). At Tikal, both Haviland (1985, 2003, 2008) and Becker (1973b, 1999, 2003a, 2003a) have interpreted one clustering of nine plazuelas grouped along a single ridge, or ‘peninsula’ in their words, as indicative of a larger kinship organization: a lineage. Becker has used the term “barrio” to describe this cluster of residences which he believes housed a corporate work group engaged in the production of ceramics in the Late Classic period (2003a).

“Craft specialists were organized in corporate groups, probably lineages, and lived in household compounds clustered together into mutilhousehold units (figure 7) with populations on the order of 50 to 65 people (e.g.; Haviland 2003: 133; Haviland et al. 1985: 184-185).” (Haviland 2008:269)
The Figure 7 which Haviland refers to in this passage is a map of the nine plazuela cluster at the intersection of Tikal map quads 4G, 4H, 5G and 5H (Becker’s [2003a] peninsular group cluster or barrio containing Group 4H-1, the alleged potter’s residence) (Figure 2.4.1). These nine groups contain a total of 43 structures, all nine with an east shrine building. Let us apply some mathematical manipulations to this cluster of groups. If we exclude the nine shrines from the structure count (43 minus 9 structures) we get 34 structures. To apply a consistent 5.6 persons per structure to these 34 structures, we come to 190 total occupants; applying a rounded down number of 5.0 persons per structure, the result is 170 occupants. Excluding the nine shrines as well as one addition structure as a non-domicile, we get a total of 25 habitation structures. Applying the 5.6 and 5.0 persons per structure multipliers to these 25 habitation structures gives us 139 and 125 occupants, respectively. If we divide the number of groups by Haviland’s range of 50 to 65 people, we find a range of 5.55 to 7.22 occupants per group. Multiplying the nine groups by the 5.6 Wahchope (Chan Kom) figure, we come to 54 occupants for the entire peninsular cluster, in line with Haviland’s 50 to 65 person estimate.

If we take the (highly reasonable) estimated population range of 50 to 65 people for the entire peninsular cluster and divide this by 34 structures (the 45 total structures minus nine shrines) we find a range of 1.47 to 1.91 people per structure. Substituting the 25 habitation structure figure (45 total structures minus nine shrines and minus another nine non-habitation structures) we find a range of 2.0 to 2.6 people per structure. If we went one step further and removed one shrine, and two non-habitation structures from each group (say a bodega and a kitchen), we find a range of 3.57 to 4.64 people per ‘house,’ a figure which accords well with cross-cultural average household sizes (Hajnal 1982; Farques 2003; Laslett 1972; Okawara 2003).
Figure 2.4.1 - Nine peninsular groups at the convergence of Tikal map quads 4G, 4H, 5G, and 5H (after Becker 1999:Figure 1).
This is all an exercise in guesswork, but does illustrate the effect of multiplying constants over a small area (just nine groups within a roughly 500 x 500 m quadrant) and the ephemeral value and easily manipulated nature of population counts based on equations.

2.5 – Analogies for Classic Maya Settlement Patterns

At a macro-scale of analysis, more complete maps of Maya centers have permitted researchers to hypothesize about settlement patterns across centers and their peripheries, entire kingdoms, or entire regions. Ethnographic analogies could be borrowed from all over the globe from all time periods in search of a good fit with Maya settlement patterns as revealed through extensive mapping. For example, using ethnographic material from Southeast Asian polities (Geertz 1980; Tambiah 1976, 1977), Aurther Demarest (1992) equated the political control of Maya “hegemonies” with these ethnographically studied “galactic polities” or “theatre states.” This hypothesized political organization is based largely on epigraphic and archaeological research in the southern lowlands which indicated that some Maya centers were highly ‘dynamic’ in regard to the political vicissitudes of certain rulers who were personally involved in expansive warfare for (ephemeral) hegemonic control and that constantly changing alliances among the ruling courts of these “peer polities” indicated rather weak control of agriculture or utilitarian trade. A theoretical model of Classic Maya political control is proposed through this analogy, and the resulting settlement patterns of the two regions are compared in terms of the low density of settlement and the spacing of subordinate centers in a “galaxy” around dominant centers. This perspective is roughly analogous to the segmentary lineage model(s) (M. G. Smith 1956; Fortes 1945, 1953; Fortes and Evans-Pritchard 1940; see also Salzman 1978) and segmentary state model(s) (Barnes 1954; G. C. Bentley 1986; Fallers 1956; Fortes and Evans-Pritchard 1940; Kaberry 1957; Sanders and Webster 1988; Southall 1956, 1988) proposed as general frameworks with cross-cultural applicability. The “galactic polity” model was proffered as an explanation
for the development of Classic Maya centers, a development rooted in ideological manipulation and ritual theatrics that created power, not simply reinforced it (Demarest 1992).

It must be remembered that the settlement pattern at any given Maya center will reflect the specific environment, ecological and cultural, of that center. Also, demographic growth and concomitant socio-political organizational complexity certainly varied with time – Late Preclassic Tikal did not look like Late Classic Tikal. No single general template can subsume all variation across all time and space; analogies should be specific, not all-inclusive and general.

“Regardless of the source of the analogy, the most critical aspect in deriving archaeological inferences lies in the evaluation of models so as to arrive at the most likely reconstruction of the past. The basic procedures for doing this were described by Binford (1967): generating models from secure analogies, followed by defining a series of tests for such models based on how the archaeological record should appear under conditions described by the model. It is hardly surprising that there have been so few archaeological studies involving the organization of Classic Maya society that are based on this procedure – given the general difficulty in correlating archaeological evidence with social factors, and the specific problems of preservation and transformations of the archaeological record faced by Maya lowland archaeologists.” (Sharer 1993:100-101)

Stark (1992) assumes some basic social and economic homologies between the Classic lowland Maya and the Classic period inhabitants of Vera Cruz reflected in the similar settlement patterns of the two regions. Although the two regions are characterized by different ecological settings, the common settlement pattern suggests that some fundamental organizational similarities. Extensive survey of the La Mixtequilla region supports a model of a social hierarchy reflected in differential sized residential units combined with dispersed household production of ceramics similar to the model proposed for the lowland Maya (Stark 1992:203).

Citing studies by Stadelman (1940) and Palerm (1961), Sanders conceived of Classic Maya primary agricultural production as following an infield-outfield system.
In such a system, farmers would have maintained the most labor intensive and valuable crops and trees around their house clusters while farming larger plots at some distance on a rotational basis (i.e., swidden farming). The open spaces between house compounds at Tikal and other Classic centers, which likely did not provide enough land for growing all the necessary nutritional requirements for their projected populations, have increasingly been thought of as house garden plots. Regional studies of intensive forms of agriculture in the Maya lowlands suggest that higher population densities may have been supported directly from these resources and/or exchange involving staple crops could have supported denser populations living within feasible importation range of ‘breadbasket’ areas. The Classic Maya lowlands are characterized by varied ecological conditions, even just within the Peten itself (Griffin 2012; Sanders 1973:338; Webb 1973:387). The greater dilemma in modeling primary production at Tikal rests in the circumscribed settlement pattern. With such high projected populations for the center and periphery of the site, there is simply no outfield land to be cultivated. The peripheries of Tikal blend into the peripheries of other centers without a considerable hinterland area for extensive agricultural production sufficient to support the suspected high populations. No evidence of terracing or irrigation has been documented for the peripheries of Tikal (Puleston 1973:288-290; Webster et al., 2007:52), although a considerable portion of the landscape is covered in bajo lands. Agriculture in these seasonally inundated bottom lands may have formed part of the primary production system, but this remains speculation.

Sanders cited the agricultural production system described by English (1966) for the Kirman Basin of Iran as a possible analogy for pre-Columbian centers of the New World. In the Kirman system, “all of the agricultural land lies outside the physical community.” A similar settlement pattern can be seen in Highland Guatemalan communities around Lake Atitlan (e.g., Santa Cruz) where residents live mostly in nucleated towns and farm lands outside the nucleated communities on the slopes surrounding them. Sanders sees a parallel between this Kirman system and the settlement
patterns of Middle Classic phase Teotihuacán and the Valley of Mexico in Aztec times (1981:364-365).

Perhaps a better ethnographic analogy for the Classic Maya is the patron-client state model derived from sub-Saharan African chiefdoms and kingdoms. In this so called Baganda system, a dispersed settlement surrounds a large administrative court complex (Sanders 1981:365-367). A courtly organizational model has become increasingly popular when describing Maya polities (e.g., Houston and Inomata 2001; see Stuart 2005 for Palenque; Webster 2008 for Copán, Webster et al. 2004:32, 2008:369 for Tikal; Webster and Houston 2003 for Piedras Negras). The structural similarities between the Baganda system and the Classic Maya discussed by Sanders (1981: 366) include patrilocal extended families, ancestral cults, lack of true urban centers, and a hierarchically organized social system. The other correlates of this system which may parallel the Classic Maya system are summed up as follows:

“The major functions of the chiefly position in all of these [sub-Saharan African] societies are military and adjudicative; redistribution of goods, other than festal foods is relatively insignificant. Periodic markets may occur but meet infrequently and the significance of trade in socioeconomic interaction is relatively low. Central places are primarily the residential sites of political leaders, and lack the many-faceted functions of centers of the Kirman type with their highly developed occupational specialization.” (Sanders 1981:368)

Control of Land and Labor

While Classic Maya land tenure is usually interpreted as household-based, larger corporate groups or cult institutions may have controlled a disproportionate percentage of prime agricultural lands, as well as the labor of individuals attached to these institutions or high-status individuals. Larger structure groupings in the peripheries of Tikal may represent more than just large numbers of occupants co-residing, they may have formed nodes of political, judiciary, or/and economic authority.
The so-called feudal model has also received attention as a possible organizational model with analogous features to lowland Maya settlement patterns (R. E. W. Adams and W. D. Smith 1981; Willey 1986; see also Houston and Inomata 2009:182-189; Martin and Grube 2000:20-21). What are referred to as feudal models come in two main varieties: the top-down model and the bottom-up model. On a very large scale of political interaction, models of conquest and control, overlordship and vassalage, have mostly proceeded from epigraphic studies of the Classic Maya monumental inscription corpus; this is the top-down model which Martin and Grube (1995, 2000; A. Smith 2003) and Marcus (1973, 1983, 1993) have proposed as an ‘explanation’ for the organization of Classic Maya lowland polities. I prefer a bottom-up approach that investigates the distribution of land and labor through analysis of settlement maps. By investigating the consumption patterns of households, their internal organization, and access/proximity to agricultural lands, an evaluation of feudal relations is possible. However, this is not simple or unambiguous. Nonetheless, feudalism is an abstract term referring to a number of organizational systems that developed historically out of institutionalized social behaviors. A top-down model neither explores the development of a feudal system, nor does it delve into the specific relationships that, combined, define it.

What is Feudalism?

“The idea of feudalism is an abstraction derived from some of the facts of early European history, but it is not itself one of those facts. No contemporary of William the Conqueror or Godfrey of Bouillon ever used the term; it was invented by scholars, chiefly scholars of the eighteenth century. These scholars, looking at certain peculiar institutions which had survived to their own day, looking back to a period when these institutions had originated and flourished, coined the word feudalism to sum up a long series of loosely related facts. From its very beginning the idea of feudalism was a high-level abstraction; it described a general category of institutions rather than one specific government.” (Strayer and Coulborn 1956:3)

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11 In their discussion of the shortcomings of the so-called ‘superstate’ or ‘superpower’ model, Marken and Straight (2007:281-283) point out that this model does not ‘explain’ how these superstates developed; it is a somewhat static model in this regard.
Of course, feudal relationships changed by region and over time. From an anthropological perspective, the commonalities (and exceptions) permit an evaluation of the general system or institutional arrangements that developed in feudal and feudal-type societies. Although the term “feudal,” or its equivalent in different languages, was used with the increasingly liturgically-structured formal written documents of Europe, the term “feudal” as applied by historians was never employed as a descriptor of any system or society at the time that it was in operation. In many respects, the term feudal is a retrospective one applied to past institutions, political systems, or whole societies. Marx and Engels used the term as a general category for a system of production (Herlihy 1970).

“Now for a provisional description: Feudalism is primarily a method of government, not an economic or a social system, though it obviously modifies and is modified by the social and economic environment. It is a method of government in which the essential relation is not that between ruler and subject, nor state and citizen, but between lord and vassal. This means that the performance of political functions depends on personal agreements between a limited number of individuals, and that political authority is treated as a private possession.” (Strayer and Coulborn 1956:4-5)

Strayer (1956) notes that different scholars emphasize different characteristics which they associate with the term feudal: the lord/vassal relationship, the vassal with fief condition, and the decentralized power of the lord/vassal relationship outside of centralized control or regulation. The overlordship of subordinates has often been more asymmetrical and exploitative throughout history, the term ‘feudal’ to describe such situations is deemed unwarranted by Critchley (1978). This asymmetrical relation was also characteristic of Roman era patron-client relations, more so than in properly feudal societies. In fact, historic documentation of patron-client agreements or arrangements run the gamut from clients being near slaves to near equals (Critchley 1978:101-126).

“True” Feudalism was based in oaths of allegiance or ‘fealty’ that were legally binding in courts of law; fealty also expressed the love and loyalty of a vassal to his lord (Herlihy 1970:71). In Europe over time, there was a gradual shift from a peasant vassal system to an elite system of aristocrats serving as vassals for other aristocrats around the
eighteenth century A.D., and eventually to “bastard feudalism” (see M. Hicks 1995) around the thirteenth century A.D. where money payments largely replaced land grants (Ganshof 1964[1952]). Feudalism was a less centralized and weaker form of government than previously existed in many of the geographic locations that it developed, but the strength of feudalism was in the flexible nature and negotiated rights and obligations that became more formalized over time. Vassalage did not extend power of the king; it accentuated decentralized power in the hands of lords (Ganshof 1964[1952]:56; Herlihy 1970:207). Feudalism is an expression of decentralized power, disorder, and political fragmentation – “centrifugal tendencies” – most often associated with military power (Critchley 1978; Ganshof 1964[1952]). With increasing population growth, feudal relationships became complex accounting mechanism for supporting warriors armed for battle or to defend castles and bastions (Herlihy 1970:71-72).

“[I]n Carolingian Europe, military vassals were royal officials, royal officials military vassals. Government and war not only required the same skills, for most of the time they were the same thing. Somehow, just as benefices became hereditary, so too vassals with office kept the power attached to it as an hereditary possession.” (Critchley 1978:58)

In Europe, fiefs were distributed for military service, establishing “warrior aristocracies” (Critchley 1978:51; Reischauer 1956; Strayer and Coulborn 1956). In its later development in Japan, a system of “bastard feudalism” saw warrior vassals divorced from landholdings in exchange for receiving payments in kind (rice) in the sixteenth century (Reischauer 1956:35).

“Feudal refers to a status group, estate, or Stand, whose members are distinguished from other people, and recognised by each other, by such things as special clothes, a special diet, a code of honour and, not least, special military skills.” (Critchley 1978:51)

James Tod (1829) applied the term “feudal system” to the Rajput states of Northern India (see Thorner 1956). In Rajputana, blood-ties connected lords and their vassals more so than legal oaths; a situation more similar to a segmentary state model (Thorner 1956:138). In this particular case, blood-ties were more important in the tribal
society that was taken over from the top down by the Rajputs – basically an overlordship of a previous segmentary state (A. C. Lyall 1875; see Thorner 1956:140-143). The legal enforcement of fealty is one solution to maintaining solidarity within a society based in segmentary principles that can easily lead to uncontrolled rebellion or generations of blood-feuding and vendetta.

“All royal families face the problem of what to do with their collaterals, and a ‘feudal’ solution is a common alternative to killing them off, mutilating them or locking them up.” (Critchley 1978:72)

A good working definition of feudalism, modeled on the writing of M. Bloch, is provided by Herlihy (1970:xix).

“A subject peasantry; widespread use of the service tenement (i.e. the fief) instead of salary; supremacy of a class of specialized warriors; ties of obedience and protection which bind man to man; fragmentation of authority; and, in the midst of all this, survival of other forms of association, family and State.” (Bloch 1961: no page, cited in Herlihy 1970:xix)

From the bottom-up perspective, a feudal model emphasizing land tenure seems a preferable analog with greater explanatory power in the investigation of the development of Classic Maya polities and their fundamental economic organization. Even better would be a combination of these two models, a synthesis of this dialectic. The so-called “conjunctive” approach, combining epigraphy and archaeology, has been voiced as the be-all-end-all of investigation programs for decades, more often in word than in deed. Researchers tend to fall into two discrete groups: 1) epigraphers bolstering their theoretical models with archaeological data, or 2) archaeologists correlating their archaeological findings with epigraphic (‘historic’) events. The result in either case is usually a chronologic culture history for a polity or region which focuses on particulars to the exclusion of processes (other than warfare).

In my dissertation I discuss Classic Maya lowland settlement patterns from the perspective of the continuum or hierarchy of habitation groups, highlighting the largest
‘estates’ which are documented within Maya kingdoms or polities. Often called ‘minor centers’ or ‘minor ceremonial centers,’ these larger architectural compounds form a distinct segment within Maya settlement patterns, and therefore, Classic Maya society. I believe that these large habitation compounds can be understood within a cross-cultural comparative framework which highlights the development and functioning of larger estates within the cultural fabric of complex agrarian societies. Larger estates were an important institution in terms of economic organization in many past societies; perhaps their investigation at Classic lowland Maya centers will shed light on the structure of the Classic Maya economy.

Estates

Lowland Maya settlement pattern analyses have placed minor centers at one level within the hierarchical organization of Maya society. It is important to point out that we are mostly ignorant of how a large Classic center like Tikal was politically organized in terms of land tenure, lineages, landed estates, and taxation. Cross-culturally, complex societies often produce landed corporate groups (large households or lineages) that control a disproportionate amount of land and labor. In agrarian states, land is typically the basis of wealth, and the control of land is often credited with maintaining inequitable wealth distributions. Given the emphasis placed on political models which view Maya dynastic elites as forming a royal ruling court apparatus at the top of the hierarchy of settlements, I would like to discuss minor centers around Tikal, and what they signify in terms of an overarching theory of political and economic organization.

Minor centers are characterized as being larger than most households and smaller than the central architectural complex at the heart of the center; they may have special function architecture which mirrors central architecture on an intermediate scale. In other words, minor centers are smaller and in too close a proximity to a major center to be called major centers in their own right, they may also lack some of the more elaborate or high-end architecture which characterizes major centers, such as stelae and altars with
glyphic inscriptions. So what are the implications of naming an architectural complex a minor center? In political terms, minor centers are typically viewed as an intermediate level of political authority, subservient to a major center, but with their own authority to tax immediate populations in their surrounding areas, following a feudal-type model. They are also commonly invoked as nodes in a hierarchically organized exchange system (D. Chase and A. Chase 1996; Folan et al. 2008; Marcus 1973, 1983; Moholy-Nagy 2003a).

This organizational aspect of Maya settlement hierarchies has not been discussed to its fullest conclusions. The Classic Maya were sufficiently unique in the history of great civilizations to merit investigation of their own particulars. Some reference to similar structures within broadly similar societies will help to direct the discussion of Classic Maya economics to come. I evaluate a feudal analogy for the Classic Maya, not in terms of top-down political alliance as attested in monumental inscriptions, but rather as a mid-range investigation of land held by a lord or sub-elite or possibly a corporate group or cult institution. Following Coulborn (1956), Adams and Smith (1981:336-337) cite the three defining characteristics of feudal societies, cross-culturally, as follows:

1.) Diffuse political power and authority (chiefs) under a suzerain (king, ajaw).
2.) Wealth, power, and status tied to landed estates worked by slaves, peasants and/or serfs.
3.) Hereditary chiefs acting within a highly structured kinship obligation system with horizontal ‘family’ as well as vertical ‘personal’ responsibilities and rights.

William T. Sanders directly equated major and minor ceremonial centers with households, noting the similarities between smaller house compounds and larger architectural configurations with buildings arranged around plazas. Sanders saw minor ceremonial centers as complex-family compounds for community leaders of lower status than the more powerful central elites of the major ceremonial centers (1981:359), a hypothesis which was confirmed by Haviland (1981, 1992) for the minor center 7F-1 at
Tikal. This social model has great explanatory power when we equate architectural compounds with the individuals who lived within them as well as the social rights and obligations which produced and structured this status hierarchy.

Taschek and Ball’s (2003) analyses of the artifact distributions and architectural configuration of the minor center of Nohoch Ek in the upper Belize River Valley suggest that this compound was a “manor” oriented toward house-holding activities and organizing agricultural production in the immediate vicinity.

“Nohoch Ek was simply an exceptionally large and architecturally formalized ‘patio group’ – that is, a residential compound. Larger and more substantial than most others, its remains nonetheless offer little to suggest any special or significantly elevated status, exceptional wealth, or other out-of-the-ordinary role for the complex or its Late Classic inhabitants. What we see are the ruins of a reasonably successful, rural, agricultural corporate group, presumably consisting of the multiple nuclear units of a single extended family, lineage, or ‘house.’” (Taschek and Ball 2003:384)

They see no evidence that Nohoch Ek was a ceremonial or a civic center as W. R. Coe and M. D. Coe (1956) initially proposed, nor do they interpret it as a node in a hierarchically ordered settlement pattern. In this interpretation, size does not indicate a functional difference. Within a feudal model, the compound is interpreted as a manor, situated in respect to agricultural lands held by the inhabitants and organized as a private estate with the surrounding lands probably ‘owned’ or ‘controlled’ by a ‘lord.’

“Loosely, such a ‘lord’ was an owner of land through grant, acquisition, or inheritance to whom service and obedience were owed by the tenant-users of that land and its resources.” (Taschek and Ball 2003:385)

Minor centers can be considered within market system models as physical loci for marketplace exchange or within redistributive models as tax collection nodes. They may also be interpreted as large households without direct political influence or distribution functions beyond their immediate redistributive function for the group of people attached to the estate. It is difficult to ascertain whether land tenure-ship at such complexes was
derived from a central authority (as in the European or Japanese forms of feudalism) or if this were entirely a function of the lineage’s continued residence in the area and self-proclaimed usufruct rights to the land.

In feudal Japan, household group size positively correlated with the size of landholdings, as did the household’s construction quality and elaboration. In every village there were a few wealthy households with large landholdings and these were consistently occupied by multiple-family households (Wilk 1988:144). With the growth of the feudal Japanese household eventually came fissioning. This system, like that of the Chorti described by Wisdom (1940) produced a settlement pattern like that of the Classic Maya, with rich and poor, large and small households interspersed (Wilk 1988:144).

“Thus the tendency to larger households and larger, more complex houses, on average, in peripheries is likely to be attributable to the presence of a comparatively few very large, wealthy households like the ‘great houses’ of the Japanese periphery village mentioned by Beardsley, Hall and Ward (1959:477).” (Blanton 1994:177)

Blanton (1994) continues to quote from Beardsley, Hall and Ward:

“The residents of this [hierarchical] village, living on land originally controlled by one single household…were never in a position to operate on a principle of mutuality…Similarly, whenever landlords have been able to rise from within a community or to wedge into it from the outside…or whenever special crops or alternative occupations such as mining or handicrafts provided unique, non-agricultural income to the entrepreneur…. The growth of the egalitarian, corporate community was almost certain to be warped or thwarted.” (Beardsley, Hall, and Ward 1959:477-478).

As a consequence of population pressure on limited land in feudal Japan, children of the poor (fudai) often entered the households of wealthier families as servants. Richard Wilk cites a 36 – 60% rate of fudai families living in larger compounds as part of

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12 On the basis of cross-cultural demographic data, John Hajnal (1982) has argued that average household size will not differ greatly between households formed through succession or through fissioning; it will remain below 6 persons in either case. However, larger estates may also represent residences for multiple households, in the demographic sense.
extended-family households. These _fudai_ could be indentured servants with no prospect of inheritance or hereditary servants maintaining their own families. Some were sold into the wealthy household as property; others were integrated into the host family (Wilk 1988:145).

Haviland interprets the lower status houses within Tikal Group 7F-1 as the residences of either lower ranking members of the kin group living there (following a developmental model of household growth), or as the houses of lower status servants attached to the higher status kin group (Haviland 1981:101-102).

“Since houses were, from first to last, prominent features of group 7F-1, the logical question to ask is, what sort of people called the group home? Evidence suggests that is was home to people of elite upper-class status in Tikal society, but that some people of lower-class status may have lived here, too.” (Haviland: 1981:100)

Cabrera Castro and Gómez Chávez (2008) postulate lower-status craft producers living with higher-status occupants at the La Ventilla compound at Teotihuacán. Even at the lower-status apartment compound of Tlijinga 33 (Widmer and Storey 1993) a local resident population lived in proximity to immigrants whose role was to produce crafts (White et al. 2004:193). Although these may have married into the lineage, they may also have been servants or lower-status residents unrelated by kinship. Elite residential compounds at Copán have been interpreted as the residences of maximal lineages within a segmentary state model (Sanders and Webster 1988; Webster and Sanders 2001; Webster 2008; Sanders 1989). Lower-status residences within the Copán lineage compounds are interpreted as lesser ranked members of the same kin group (Hendon 1991).

Larger ‘farm families’ (i.e., landed estates) among the richer or higher castes in stratified societies is the norm in Africa, India, and Tibet (Goody 1972[1958]:122). Large estates developed in Sumer under an extensive agricultural system (R. M. Adams 1966:57) and Igor Diakonoff (1954) has shown that a number of Early Dynastic land
transfer documents register the sellers of land as corporate groups (R. M. Adams 1966:83).

“Diakonoff notes that the actual ritual of transfer is carried out in the name of the corporate group as a whole, the ‘house of …,’ rather than that of the ‘owners,’ while in one particularly revealing case the ‘owners’ are further characterized as ‘men elected by the house of….’ Incidentally, the numbers of individuals involved in these transactions can be relatively large; in one example that dates from the Akkadian period 600 men of Marad were feasted by Manishtusu for two days in connection with the purchase of land.” (R. M. Adams 1966:84)

Robert McC. Adams is careful to note that Diakonoff found transfer of land documents for small, privately held subsistence plots as well as large estates, concluding that not all landholdings were organized within kin-oriented corporate groups and that the system of land tenure was surely varied and quickly evolving (1966:84). The earliest Sumerian records suggest that land was held by extended family groups and that all males of the group had to consent to a land transfer (Diakonoff 1982). Private ownership of land, in the hands of individuals and not corporate groups, gradually replaced the previous landholding system. The large temple estates of previous periods were replaced by private estates, either gifted to individuals by the king as rewards for service or administered by the wives of city rulers (Crawford 1991:25).

Richard Blanton feels that extended-family or complex households should be more common in peripheral areas in response to the economic advantage gained through commercial production and exotic long-distance trading (in addition to subsistence production) facilitated by the larger, redundant family composition. These great estates will be few in number; nuclear families will always be numerically dominant in peripheral or cores areas (Blanton 1994:173). He also suggests that the insular and self-sufficient nature of large rural estates in feudal Japan was a response to their peripheral locations and lack of marketplace access.
“I would argue that there are additional elements leading to the development of differences in periphery communities that might be related to the marked differences I have noted between basic and costly houses. In core communities, all households, even poor ones, have equal access to multiple market places within comparatively short distances. In peripheries, commercial transactions are more spatially diffuse and more likely to be based on various kinds of external contacts working at a distance, including trade partnerships, connections to government officials, family members residing in distant urban centers, and so on (network ties)...I suggest that network ties are much more subject to monopoly control by wealthy and influential periphery households, a situation that could produce and reproduce wealth inequality within communities.” (Blanton 1994:178)

A bottom-up feudal model may have explanatory power when applied to the Classic Maya case. Surely the development of minor centers or large estates within the overall settlement pattern of Classic Maya centers reflects organizational principles as they developed over time. If larger extended-family households inhabited these larger estates, then they likely acted as corporate groups controlling land, labor, and production. If this was the case, then to what degree were these Classic Maya estates focused primarily on internal redistribution versus production for exchange? Comparisons with the Indian jajmani estate system or with the organization of Classic Greek or Helenistic oikos households are instructive. These analogies are employed more for the sake of discussion than as direct correlates to Classic Maya estates or minor centers.

“The authoritarian household, the oikos, was the center around which life was organized, from which flowed not only the satisfaction of material needs, including security, but ethical norms and values, duties, obligations, and responsibilities, social relationships, and relations with the gods. The oikos was not merely the family, it was all the people of the household and its goods; hence “economics” (from the Latinized form, oecus), the art of managing an oikos, meant running a farm, not managing to keep peace in the family.” (Finley 1967[1954]:403)

The oikos was an idealized concept which translated into organizational similarities among estates of different sizes. Of course, the organization of larger estates could be much more complex in reality (see Rostovtzeff 1979[1922]), even if the general oikos model was applicable to estates ranging in size, wealth, and power. My main concern with estate development within Classic Maya society is the control and
organization of labor and resources. Marketplace exchange is commonly cited as the primary institution through which goods and services flowed in Classic Maya society, but state redistribution, religious cults, and private landholding institutions may have superseded marketplace exchange as the fundamental organizational mechanisms for the production and distribution of goods and services. The oikos and jajmani estates were not only economic institutions they were also social institutions that structured the way society was organized, enforcing the rights and obligations of all participants.

“Briefly, the jajmani system is a system of distribution in Indian villages whereby high-caste landowning families called jajmans are provided services and products by various lower castes such as carpenters, potters, blacksmiths, watercarriers, sweepers, and laundrymen. Purely ritual services may be provided by Brahman priests and various sectarian castes, and almost all serving castes have ceremonial and ritual duties at their jajman’s births, marriages, funerals, and at some of the religious festivals. Important in the latter duties is the lower castes’ capacity to absorb pollution by handling clothing and other things defiled by birth or death pollution, gathering up banquet dishes after the feasts, and administering various attentions to new mother, bride or groom.” (Kolenda 1967[1963]:287)

Unequal and power-laden, the system’s success is dependent upon the self-sufficiency and insularity of the jajman estates. However, these estates are reliant upon their lower caste servants for mixed economic and religious reasons. Lower caste craft producers and service providers input labor into the system and are paid in kind (rice and other products) from the surplus of the estates’ agricultural and animal production. This is roughly analogous to the oikos (estate) system found in ancient Greece. In both of these system, wealth and power are in the hands of the land owning class or caste (Kolenda 1967[1963]; Finley 1973) and control of labor by the wealthy landlords is exacerbated by the lack of outside markets for labor or product, as M. Weber, K. Marx and T. Biedelman have pointed out (Kolenda 1967 [1963]:304).

Within the Indian jajmani system, land ownership is almost exclusively within the Jajman caste and the wealthy land owning segment of society is also politically dominant (Beidelman 1959:6). This control is exacerbated by the social and political aspects of the patron-client relationship; clients must side with their patrons in feuds, litigation, and
disputes, often against their equally powerless kamin caste brethren. Landholders maintain patron-client relationships with service personnel by rewarding (i.e., “paying”) their clients in kind from their landholding production. Key to the operation of the system and continued acceptance by all participants is the agricultural cycle. Within a closed agricultural village setting, grain has a consistent ‘purchasing power’ and acts as a universal exchange medium, perpetuating the system (Harper 1957; Neale 1957; Srinivas 1955). As Epstein has posited, the security of larger landholdings permits ‘wealthier’ patrons to make use of less wealthy clients’ services because of the security in basic foodstuffs that they provide. The rewards are calculated based on minimal needs, and during years of poor harvest-yields all participants receive about the same amount of agricultural product. In years of good harvest, clients still receive the same minimal allotment of foodstuffs while the patrons benefit from the greater yield. It is the guarantee of sufficient foodstuffs in all years that encourage clients’ continued participation in the system. In years of greater harvest, due largely to stochastic climatic conditions, patrons have need of their clients to a greater extent in order to harvest the bumper crop. This crop is then used to hold feasts and garner greater prestige, while redistributing a portion of the bumper crop back to the clients whose labor made it possible. Security for the kamin is the major incentive for participation in the inequitable system.

“Thus, it was the expectation of good harvests which induced the Peasant master to accept in bad years a share equal to the annual rewards his labourers received, whereas the continued threat of bad harvests induced Untouchable labourers to accept a reward which did not vary according to labour performed or according to harvest.” (Epstein 1967:246)

“If my analysis of traditional Indian peasant economies is valid…it may also be relevant to other pre-industrial societies. For instance, we may find that many societies with a low level of technological knowledge and consequent inability to control their environment tend to distribute produce in a standard pattern equally in bad as in good seasons.” (Epstein 1967:250)

In addition to the ‘formal’ payments of agricultural produce following harvest, clients also dole out ‘considerations’ or ‘concessions’ as inducements to maintain clients’
continued enthusiastic participation in the system. These may consist of additional grain distributions following good harvests, but also support that only the wealthy can provide: loans, employment, control of irrigation water, political support (and funds) for litigation, advances in education, rights to collect fuel wood or use pasturage etc. (see Beidelman 1959:41; Gould 1958; Kolenda 1967[1963]:297, 305). This also gives the patron a greater social power, as they have the capacity to provide gifts to their clients, pushing them into further subservience. Patrons may also solidify their overlordship by combining dominant roles, becoming both patron and landlord or patron and lender (Kolenda 1967[1963:317].

The jajmani system has a very real economic rationality to it. Clients practicing a craft or service that is needed by a large number of patron households might serve dozens of households, or even an entire village if the service is one needed infrequently, such as a florist. More common service persons, such as watercarriers, might serve only three of four households. In this way, the threshold range of a good or service translates into the number of patron-client relations that service persons maintain within the village, rather than being based on the number of persons in need of the good or service traveling to the producer. This is just an inversion of the economic rationality of service area proposed by spatial economic theory.

“One manifestation of this interdependence [between patron and client] is the balanced if inequitable specialisation of function within the local community. In its more extreme and methodical form this is known in the north of India as the jajmani system, and elsewhere by other names. Caste and occupation tend to go together, but a man is born not only to his job but to his employer as well. He will work only for particular higher-caste families, and they in turn will use only his services for that particular task. The employer is known as the jajman, the employee as the kamin. By custom neither has much choice in the matter.” (Critchley 1978:111)

Fundamental to its perpetuation, the jajmani system runs on participation at the household level, patrons and clients alike are individual households (families) belonging to different castes. It is the interdependence among households of different castes (and
occupational specializations) that creates and enforces solidarity. An underreported heterarchical dimension may also be important to the maintenance of the jajmani system; equal exchanges between client castes have been reported for many Indian villages (see Kolenda 1967[1963]:312).

So why take a complex (and often elusive) analytical unit, the household, as the basic unit of inquiry? In the specific case of the Classic Maya, the answer is simple: archaeologists can locate household remains fairly easily and definitely on the ground. Furthermore, the collections of artifacts from these Maya households can be plotted in space as distribution patterns which can then be related to different exchange modes, although this is not an easy or straight-forward task (Bey 1992). Analogies with other culture groups permit the construction of theoretical models from which testable hypotheses can be evaluated, especially against patterns predicted under specific institutional arrangements. For example, if Classic Maya estates were organized around strict patron-client relations, like Indian Jajman estates, then they should have received services and goods from a limited number of clients. Although ascertaining the number of service providers is difficult, the artifact assemblages of the Tikal estates indicate the relative isolation of the household from more widespread economic exchange networks (i.e., centralized redistribution, market systems).

2.6 – Concluding Remarks to Chapter 2

This chapter began with a discussion of the household as a theoretical unit and the degree to which co-residential patterns may or may not conform to expected cultural norms. The overlap in meaning of the terms family, house, and household have important significance when interpreting the distribution of residential architecture throughout a Classic Maya center or settlement system. Single house mounds are a fairly rare feature of the settlement pattern at Tikal and elsewhere in the Peten. Given the expectation for a mix of nuclear-family households and extended-family households, it is logical to assume that some of the smallest plaza groups must represent upstart nuclear-
families while larger more formal plaza groups were home to more established and more complex households. Some large estates may have been private ‘manors’ dedicated primarily to the regulation of agricultural production and craft production while other architectural complexes may have formed a political hierarchy or even exchange nodes within an economic network.

The development of settlement pattern studies was reviewed historically and long-held assumptions were critically evaluated. The process of formulating population estimates based on mapping surface remains of residential structures is now considered a fundamental first step in the investigation of pre-Columbian centers. The standard procedure for estimating populations involves determining contemporaneous habitation of ‘residential’ structures and then multiplying this number of inhabited structures by a constant. This constant family or household size has been deduced from the ethnographic study of contemporary Maya settlement patterns and cross-cultural ethnology and demographics. Following a phase of critical evaluation in the 1970s and 1980s, formulating population estimates for entire centers extrapolated from completely mapped sectors is now a fairly routine procedure. Questions persist concerning the accuracy of this method, and all variables in the population equation have been scrutinized at one time or another. For good or bad, Mayanists seem to have settled on this procedure.

At a fundamental level, the most important factor influencing whether or not an individual will continue potting is co-residence within a household of potters (Chávez 1992:74, 83). Co-residence within a potting household facilitates the transmission of knowledge and skill as well as diffusing the burden of resource procurement and facilitating the firing of vessels in quantity (either open-air or in kilns). A non-potting spouse who moves into a potting household will likely begin learning the trade from scratch, while a potter that moves from a potting household into a non-potting household will likely give up the trade. The archaeological record may indicate that the inhabitants of a certain barrio or even an entire center were engaged in ceramic production. Given the dispersed residential settlement of Tikal, the movement of potters for reasons of
marriage, kinship, or economic opportunity is beyond the scale of investigation. It is assumed that most potters worked at the household level and that the household was a fairly stable residence. The scale of labor input at some residential groups, while not excessive if spread over a long period of time, does suggest a level of permanence. The construction of storage and firing facilities for a ceramic workshop would also add to the value of the household’s production potential and be an incentive to remain in the current location.

The household data from the current study are viewed as materials associated with locations as much as with families or series of related individuals residing in the same place at the same time. It is absurd to argue that the Classic Maya inhabitants of Tikal, families or households, were haphazardly leap-frogging from one location to another, precluding a meaningful analysis at the household level. While greater control of individual household development is certainly possible with more extensive excavations (see Haviland 1985, 2003), my study was predicated upon a simple test-pitting strategy which did not cut any architecture and was meant simply to provide dates for evaluating temporal settlement shifts associated with the large linear earthwork constructions long presumed to have been defensive in nature. The limitations of the sampling strategy are recognized, but do not preclude a meaningful study. All caveats heeded, the household is the basic unit of analysis in my dissertation.

The next chapter will review previous archaeological investigations at Tikal and especially the theories derived from the thirteen year-long University of Pennsylvania Tikal project. The household, as represented on the ground as a plaza group, will be a consistent focus. Initial fascination with the epicentral precinct gave way to a greater appreciation of the importance of peripheral habitation as a ‘sustaining population.’ Extensive excavations of groups outside the epicenter confirmed their residential function and documented their occupation spans.
Chapter 3 – The Recovery of Tikal

Chapter 3 reviews how Tikal came to the attention of both public and academic scholars, and how early archaeological investigations at Tikal led to the development of a basic theoretical framework, or culture history, of the polity. The early work at the center not only provided a chronological framework through the formulation of the ceramic sequence (Culbert 1993, 2003) and associated construction episodes but also insights into the institutions related to trade or other kinds of acquisitions of exotic materials. The University of Pennsylvania Tikal project (1955-1969) laid the groundwork for reconstructing the evolution of the polity and the development of models of social, political, and economic organization not just at Tikal, but for the Classic Maya in general. This review begins with the re-discovery of Tikal.

3.1 – The Discovery of Tikal

Traveling from Mexico to Honduras in 1524-25, Hernan Cortes passed through the Peten, stopping at the Postclassic Maya center of Tayasal located at the western end of Lake Peten Itza. This route brought the Spanish conquistador within 60 km of the ruins of Tikal. Centuries later, after the fall of Tayasal, the shores of Lake Peten Itza would see renewed settlement. In 1848 Modesto Mendez, the commissioner of the department of El Peten, Guatemala, along with then Governor Ambrosio Tut and an artist named Eusebio Lara, also visited the ruins. An account of this first official visit was published by the Berlin Academy of Science the next year (Harrison 1999:31). Subsequent visits over the next 50 years by prominent European travelers would bring the existence of Tikal to the world’s attention.

The Swiss gentleman and then Guatemalan resident Dr. Gustav Bernoulli traveled to Tikal from Palenque with Teobert Maler in 1877, removing three carved wooden lintels from Temples I and IV to the Museum für Volkrunde in Basel, where they remain in excellent condition. Subsequent forays by the Englishman Alfred Percival Maudslay
in 1881-1882, and the German (Austrian) Teobert Maler, then employed by the Peabody Museum of Harvard University, in 1895 and again in 1904, provided photographs and maps of portions of the site. Maler’s report would not be published until 1911; a year after the Peabody Museum sent Alfred Tozzer, the first Bowditch Chair holder at Harvard University, to complete the work begun by Maler. Although Maler’s record of the extent of the center of Tikal was incomplete, it conveyed the site’s size and importance.

With the growing interest in recording Maya inscriptions from eroded stone monuments, Sylvanus P. Morley made recording expeditions to Tikal in 1914, 1921, 1922, and 1928, supported by the Carnegie Institution of Washington. In 1926 Morley had begun archaeological investigations at Uaxactun, just 19 km north of Tikal, which continued until 1937. Following the Carnegie Institution Uaxactun Archaeological Project, the University of Pennsylvania began a large scale investigation program at Tikal in 1955. Under the first project director, Edwin Shook (from 1955-1961), large scale trenching excavations in the North Acropolis began revealing the stratigraphic depth of the site’s core architectural complex (Harrison 1999:31-35).

The University of Pennsylvania Tikal Project would continue large epicentral excavations and a number of sub-projects for another decade. Under the new project director, Robert S. Dyson (in 1962), the number of workmen employed in excavation grew to over 100 and excavations were opened in the Central Acropolis under the direction of Peter Harrison. In 1963, William R. Coe II took over as project director and retained that position until 1969 when the project came to an official end (Harrison 1999:36). The Tikal Small Structure Programme (Haviland 1963, 1965) and the Tikal Sustaining Area Project (Fry 1969; Haviland 1965; Puleston 1973, 1983) moved investigations from the epicenter out into the central, peripheral, and hinterland or intrasite residential areas of Tikal (Puleston 1974). One hundred and thirteen professional participants received Tikal project numbers over the life of the project. Some such as Jeffery Parsons and Payson Sheets went on to work in other areas of Mesoamerica. Others, including William Haviland, Hattula Moholy-Nagy, T. Patrick
Culbert, Robert Fry, Marshall Becker, and Dennis Puleston, will always be known for their work at Tikal and forever associated with the Tikal project.

The Guatemalan government resumed excavations at Tikal in 1979 with the Proyecto Nacional Tikal under the direction of Juan Pedro Laporte, once a member of the University of Pennsylvania Tikal project. Laporte would shift the focus of investigations to the Lost World Complex or Mundo Perdido, where deep architectural stratigraphy would mirror previous investigations in the North Acropolis and Central Acropolis (Harrison 1999:37-39). Concurrent with, and subsequent to the completion of, the Proyecto Nacional Tikal in 1985, several other projects would continue to investigate particular areas of the Tikal Park, consolidate large temple architecture (Temples I, III, IV), and excavate more architectural complexes in the site’s epicentral area (see Laporte 2003 for project dates and objectives).

Investigations in the Lost World Complex amplified and augmented our knowledge of Teotihuacan ‘influence’ or ‘presence,’ as well as clarified portions of the ceramic sequence, particularly the Preclassic to Early Classic transition (Cimi ceramic complex, A.D. 150 – 250), and the subdivisions of the Early Classic Manik ceramic complex (A.D. 250 – 550, Manik I, II, IIIA, IIIB) originally proposed by C. C. Coggins (1975). These excavations would also parallel those of the North Acropolis in documenting elite burials and consecutive construction episodes over time.
3.2 – Archaeological Investigations in the Epicenter of Tikal

The North Acropolis

“Scrupulous studies of monuments were begun by Linton Satterthwaite in the first season of the project, 1956. Excavations pertinent to our topic [Group 5D-2, or The Great Plaza] started in 1958, and in fact were not to end until January 1970 when George Guillemin closed his notebook on a ballcourt adjacent to Str. 5D-1-1st, or in its more familiar guise, Temple 1…That the project moved early on to excavate in and about the Great Plaza (within a somewhat haphazard research design TR. 12 limns) deserves to be attributed to an entrenched fascination with ‘temples and tombs,’ or with ‘stelae dusting’ and concomitant interests…” (W. R. Coe 1990:1)

The University of Pennsylvania conducted large-scale trenching and tunneling excavations into the enormous architectural core of Tikal. These large-scale operations encountered a plethora of cultural levels, indicating a long sequence of occupation. Even very early levels contained burials and caches filled with imported goods, indicating both the differentiated social hierarchy of Tikal’s inhabitants and their penchant for trade (or at least the acquisition of imported materials). What began as excavations quickly turned into vast puzzles. Defining the relationships among stratigraphic levels and recording artifact deposits required the coordinated efforts of many archaeologists. These core excavations still represent the largest and most complex sequence investigated in the Maya lowlands, although they would prompt similar investigation programs at other lowland Maya centers such as Copán, Caracol, and Calakmul.

“[I]t should be noted that rightly or wrongly the work has proceeded on the presumption of an ‘hierarchic’ or ‘ceremonial’ aspect at Tikal and an equally important ‘secular’ one. Excavation in and about the Great Plaza…has been frankly oriented to exploring further this hierarchic aspect, while the ‘house-mound’ work has been conducted in the hope that information on the secular components of the site might be forthcoming. The expense and effort involved in such work is warranted by a very real ignorance of hierarchic development, of the definition and duration of cultural stages, of class structure, of the significance of monuments and caches, and of the buildings that have been conveniently but tentatively labeled as ‘temples’ and ‘palaces.’” (W. R. Coe 1962:482)
Trenching and tunneling excavations into the North Acropolis at Tikal revealed a complex stratigraphic sequence dating from the Middle Preclassic (800 – 350 B.C.) into Late Classic (A.D. 550 – 850) period. The convoluted sequence of successive construction stages can be seen clearly in the composite cross-section drawing produced by the University of Pennsylvania Tikal Project (W. R. Coe 1988[1967]:40-41). This schematic cross-section shows the remodeling efforts which, over the course of fourteen hundred years, resulted in the impressively monumental North Acropolis as it stands today (Figure 3.2.1-3.2.4). As project director William R. Coe explained,

“Our primary textual task is the assembly of floors and constructional units to form entities which communicate their sequential position in an incremental development of a total Plat. 5D-4. These ten fundamental architectural products are by convention ordinally numbered, the most recent being Plat. 5D-4. When stratigraphy is absent, a conscientiously limited number of well-identified considerations enter the agglutinative process, but it is not assumed that each cardinally numbered Acropolis floor was necessarily part of a truly new Plat. 5D-4.” (W. R. Coe 1990:13)

To paraphrase, approximately ten consecutive North Acropolis platforms were constructed by the ancient Maya of Tikal. That the complex stratigraphy cannot always be clearly associated with discrete construction phases is a function of the complex architectural sequence encountered during trenching and tunneling operations. I will summarize a portion of the North Acropolis architectural stratigraphy, highlighting specific finds which underscore the convoluted series of remodeling episodes that this complex underwent over the centuries.

Early in the history of investigation of Maya architecture, the cumulative growth in size of structures and compounds was, as yet, not established as a ‘rule of thumb.’ At Tikal, excavation of two of the temple structures atop the North Acropolis down through to bedrock below the initial platform construction confirmed the growth through accretion hypothesis that had been demonstrated earlier with the excavation of Uaxactun group E.
Figure 3.2.1 – Map of epicentral Tikal, 1 x 2 km [north is to the top of the page, the North Acropolis is at the top of quad 5D] (after Coe 1967:20).
Figure 3.2.2 – Map of epicentral Tikal quads 5D and 5E [the North Acropolis is at top center] (after Coe 1967:20).
Figure 3.2.3 – Plan of the North Acropolis at Tikal (after Coe 1967:42).
Figure 3.2.4 – Schematic cross-section of the North Acropolis at Tikal (after Coe 1967:40-41).
“Superpositioning of massive structures as a rule has again been borne out in the cases of Structures 5D-34, 5D-33, and 5D-1. The North Acropolis proper consists of a series of mammoth raised platforms, each marked by a top plaster floor. At the conclusion of construction, the North Acropolis sustained eight formally arranged ‘temple’ type structures.” (W. R. Coe 1962:501)

At the very bottom of the large-scale stratigraphic excavation at the earliest level of the North Acropolis [Plat. 5D-4-10th] two burials were encountered. The earliest, Burial 120, is dated by surrounding Eb ceramic complex [800 – 600 B.C.] material incorporated into the construction fill of a simple grave or cyst containing the skeletal remains of a single occupant, probably a male between the age of 20 and 30 years. Burial 121, also within Plat. 5D-4-10th, consisted of a round pit cut into bedrock and contained the remains of an 11-13 year old individual (probably female) adorned with 8 shell pendants, 3 *spondylus* shell beads, and 3 jade beads – most likely forming a single necklace. The fill ceramics suggest a probable Eb ceramic complex date as well, with the inclusion of a single sherd from the following Tzec ceramic complex [600 – 350 B.C.] arguing for a slightly later date than Burial 120. Two caches containing Sierra Red ceramic vessels from the Chuen ceramic complex [350 – 0 B.C.] postdate these two burials – still within the initial construction(s) of the North Acropolis [Plat. 5D-4-10th] – and place the initial construction within the Middle Preclassic period (W. R. Coe 1990:22).

After some remodeling efforts had been made to the North Acropolis over time, Burial 164 [Platform 5D-4-8th] consisting of a cyst or crypt burial housing a single male individual under 50 years of age was accompanied by a Sierra Red dish, two Sierra Red jars, and a Polvero Black dish of the Chuen ceramic complex [350 – 0 B. C.] (Culbert 1993:Figures 3). This individual had been interred with numerous ‘elite’ grave goods, including 3 jade beads, 27 oliva shell ‘tinklers,’ a 10 cm long stingray spine, cinnabar, and organic material identified as textiles or hide (W. R. Coe 1990:51).

From these deposits excavated out of the earliest levels of the North Acropolis platform incarnation, researchers recognized the occupational time depth represented
here. This was also an early excavation of a large central complex which clearly proved that the monumental architecture seen at Classic Maya sites had grown by accretion, through successive remodeling efforts over time. Early levels of the North Acropolis also provided information about the sophistication, wealth, and power of early Tikal elites. The rich Preclassic burial assemblages indicated that the inhabitants of Tikal were already practicing the kind of elaborate funerary rites associated with Early and Late Classic Maya culture.

“Preclassic Tikal…was a city of some significance, and several of its later architectural landmarks have their origin in this era. The superimposed layers of the most important of these, the North Acropolis provides an invaluable record of the city’s evolution …A major expansion of the complex in the 1st century A. D. was associated with Burial 85, an especially rich interment that signals some important social or political development.” (Martin and Grube 2000:26)

Deep within the North Acropolis, below Structure 5D-Sub 2-2nd, archaeologists uncovered the Late Preclassic tomb designated Burial 85. The 2.4 x 1.1 m chamber had been cut into architecture during a remodeling phase. As Wiliam R. Coe reported, “Mud-plastered lower side walls supported rustic vaulting of amorphous small slabs…” (1990:218). Although smaller and more crudely built than later tombs, Burial 85 marks the initial appearance of vaulted tomb chambers at Tikal by the first century A.D. This burial of a “relatively tall robust male” is a prime example of the ‘mysterious’ quality of Maya burial practices. Still difficult to interpret or explain, the disarticulated body had certainly been prepared for burial with great care and circumstance.

“…we reconstruct deposition of the corpse as seated within a bundle, the torso facing S[outh] with arms close to its sides; what remained of the apparently mutilated legs had been placed against the individual’s stomach. No traces of cranium, mandible, dentition, nor femurs were found.” (W. R. Coe 1990:218)

The disarticulated and bundled body was accompanied by a rich assortment of grave goods, including stone, bone, and shell artifacts as well as a mosaic mask which was probably sewn to the headless bundle (W. R. Coe 1990:218-220). Twenty-six
ceramic vessels of the Cauac ceramic complex [A.D. 0 – 150] were also interred within Burial 85, including a few brown-black incised vessels identified as imports (Culbert 1993:Figures 4-7).

On this early temporal horizon, the inhabitants of Central Tikal were already burying important individuals within the North Acropolis with all the trappings of elite Maya culture – imported jade and marine shell, stingray spines, cinnabar, and technically and aesthetically refined ceramic vessel assemblages. Subsequent Early Classic burials would become increasingly more elaborate within larger and more sophisticated tomb chambers filled with greater quantities of elite grave furnishings. Other exotic finds within the North Acropolis would further document Classic Maya caching practice and the reverence for architectural complexes they imply. The North Acropolis had turned out to be one great box of chocolates.

Two infant burials were uncovered in the course of excavation within the North Acropolis complex. Late Preclassic Burial 117 [Plat. 5D-4-7th] contained the remains of an infant, 6-9 months old, placed within a crude stone and mud crypt cut into the platform and capped with stone slabs. Seven jade and fourteen spondylus shell beads most likely formed a necklace which was placed inside the small crypt with the infant. A second burial of an infant less than one year old [Burial 197] was later recovered from the Early Classic level designated 5D-4-2nd, placed within a shallow oval cyst cut into the floor and then sealed with a packed white marl cap (W. R. Coe 1990:64, 136-137).

The reason for interring infants within the North Acropolis is still not clear; these may be human sacrifices meant as dedicatory offerings or they may be important individuals by birthright whose unexpected early demises made reverential interment in the royal necropolis necessary. If the latter is the case, we have a clear cut example of ascribed status from birth, which fits well with what we know of Classic Maya royal dynastic succession. On the other hand, if the infant burials were intended as offerings to imbue the building with animate force or in response to other perceived difficulties in the
construction of the edifices which required dedicatory offerings, they are not atypical of what we have learned of Classic Maya construction practices as they relate to dedication.

Again, the North Acropolis at Tikal provides multiple examples of Classic Maya behavior which continue to defy explanation. The documentation of varied tombs and caches within important central architectural complexes at many Classic Maya centers has continued to this day, only adding to the ‘mystique’ of the Classic Maya. Human burials were not the only focus of caches at the North Acropolis. ‘Dedicatory’ caches without human remains from these deep stratigraphic excavations provide insight into Classic Maya caching practices and stratigraphic dates corroborating the depth of time represented by consecutive construction episodes.


Cache 10, dated by Early Classic Muul offeratory assemblage vessels (Culbert 1993:Figure 100a,b), contained mostly lithic material [24 chert and 22 obsidian eccentric, 6 obsidian blade-core fragments, 206 obsidian blades and 576 obsidian flake-blade fragments] placed within a small pit cut into an Acropolis floor. Cache 57 consisted entirely of marine shell, while cache 63 contained both lithics and marine shell. Stratigraphically contemporaneous Cache 58 was another whole (although crushed) Aguila Red-Orange: Aguila Variety flaring-sided vessel of the Early Classic Manik ceramic complex (Culbert 1993:Figure 114a), and Cache 130 (W. R. Coe 1990:123-125), also dating to the Early Classic Manik ceramic complex [Lucum offeratory assemblage], consisted of two Balanza Black vessels, a flaring-sided cache vessel covered by a shallow
dish (Culbert 1993:Figure 114d) which probably once contained some perishable component for which only residue remained when excavated.

Tunneling excavations below Structure 5D-33, at the south side of the North Acropolis [Platform 5D-4-3^rd], uncovered the burial chamber of the 16\textsuperscript{th} recorded ruler of Tikal, Stormy Sky (Coggins 1975:187-193), or Siyaj Chan K’awiil II as he is known today (Martin and Grube 2000:34-36). This rich burial mirrors Preclassic Burial 85 in many regards, most notably being the headless bundled corpse of the principle occupant. A long count date of 9.1.1.10.10 [A.D. 457] was painted on the back wall of the tomb chamber, which had been cut into bedrock. Two possibly sacrificed adolescent skeletons accompanied the principle occupant along with a rich assortment of grave furnishings. These included shells, stingray spines, hundreds of jade beads, and a possible composite mask. A varied assemblage of ceramic vessels from the Manik ceramic complex, a few identified as imports (Culbert 1993:Figures 28c-32a), had been filled with perishable materials and set upon a stuccoed wooden tray within the tomb chamber (W. R. Coe 1990:120-123).

This locale at the southern edge of the North Acropolis would continue to grow taller with consecutive construction efforts that eventually brought Temple 5D-33, built over the southern edge of Platform 5D-4 and Burial 48, to a height of 33 m (before it was dismantled by the University of Pennsylvania Tikal project – see Berlin 1967). Before reaching its ultimate constructed height, Temple 5D-33 would see the burial of two other important Tikal individuals. Burial 23 was cut down into bedrock and a vaulted roof was constructed above to enclose this rich elite grave. A second elite burial, nearly contemporaneous with Burial 23, was deposited into the underlying platform of Temple 5D-33-2nd and is numbered as Burial 24. Even more fascinating than these elite, possibly rulers’, tombs was the removal and redeposition of Stela 31.
“Of all the finds at Tikal Stela 31 is surely one of the most extraordinary. In 1960, tunneling south from the [North] Acropolis into [Temple 5D-] 33, we found Stela 31 standing in the solidly filled rear room of [5D-] 33-2nd. Stela 31, now standing in the Tikal Museum, is one of the finest Early Classic carvings ever found. Although burned and shattered by the Maya prior to building [5D-] 33-1st, its protected position, sealed by the hearting of [5D-] 33-1st, permitted the fascinating sculptured surfaces to survive. This limestone monument appears to have been ceremonially “killed,” after having stood long at the base of [5D-] 33-2nd. It was finally reset askew in a crude, specially excavated pit in the rear room of [5D-] 33-2nd. The Maya burned the lower part of the stela here and went on to smash elaborate pottery incense burners about it, all as part of some enigmatic ceremony marking the end of both the stela and its temple. The vaults and roof comb were brought down and the construction of [5D-] 33-1st begun.” (W. R. Coe 1988[1967]:48)

This last set of finds, below Structure 5D-33, exemplifies the kind of behavior uncovered by deep stratigraphic excavations at Tikal and other Classic Maya centers. Burial chambers were cut down through architectural platforms and exotic materials were cached within platforms. Carved monuments were removed and reset (and buried) with great ceremony, only to have temple walls and roofs collapsed over them before newer, even larger temples were constructed over these frozen-in-time events. Through the years, decades, and centuries, Tikal’s monumental architectural core grew into the site that visitors witness today by the tens of thousands.

“The North Acropolis sequence…shows a progressive trend toward increasing monumentality and greater formal coherence, followed by stasis in the face of continued development, as though some kind of search had been underway, seeking and eventually finding the most powerful architectural expression appropriate to that particular place.” (Loten 2003:251)

The purpose of reviewing this portion of the stratigraphic excavations conducted by the University of Pennsylvania Tikal project in the North Acropolis has been to demonstrate the complexity of superimposed architecture and related tombs and caches contained within. These initial excavations represent the beginnings of investigations at major Maya centers, investigations which are still at the heart of Maya archaeology today – and still firmly entrenched in the fascination with tombs and temples. As impressive as the North Acropolis is, several other contemporaneous excavations by the University of
Pennsylvania Tikal project, as well as subsequent investigations by the Proyecto Nacional Tikal (1979-1985) in the Mundo Perdido, or Lost World Complex, would complement and parallel the large-scale excavations into the North Acropolis.

The Mundo Perdido Complex

The Mundo Perdido is a ceremonial astronomical complex (Fialko 1988) located in the southeast sector of Central Tikal inhabited for twelve to fifteen centuries from the Middle Preclassic until the Terminal Classic period (Laporte 1993:299-301; Laporte 2003:285). Tzec complex ceramics [500-300 B.C.] from the earliest architectural levels of this complex (Laporte 1993:301) and Eb complex ceramics [pre-700 B.C.] from rubbish deposits encountered below these earliest architectural levels (Laporte 2003:285) place construction on a contemporaneous temporal horizon with the North Acropolis. The character of burials and caches recovered from the Mundo Perdido largely parallels that of the North Acropolis. Peter Harrison’s jubilation with the fantastic finds within the Mundo Perdido, especially the tombs, prompted him to equate this complex with the previously excavated North Acropolis.

“The location exceeded anyone’s expectations, revealing yet another royal necropolis that served as an alternative to the North Acropolis excavated by the earlier project.” (Harrison 1999:38)

The “entrenched fascination with ‘temples and tombs’,” noted by William R. Coe, continued unabated. Harrison’s feeling is echoed by Juan Pedro Laporte, who clearly recognized the elite nature of the Mundo Perdido as expressed through various deposits which were uncovered through deep stratigraphic excavations there under his auspices.

“The group that built and used these structures was part of the elite of Tikal, as can be seen in burials, caches, ceremonial deposits, and other elements recovered during the excavations.” (Laporte 1993:306)
Structure 5C-54, the Lost World Pyramid, reached a height of 31 m by the onset of the Early Classic period (A.D. 250) – the tallest structure at Tikal at that time and situated within a compound enclosing 50,000-60,000 m² of space (Laporte 1993:303-304, 2003:288). While the Great Pyramid (5C-54) was not remodeled as often as buildings in the North Acropolis, other portions of the Lost World Complex did see constant growth through the erection of new edifices and modification of other platforms and structures. In general, Laporte sees changing function in the remodeling efforts at Mundo Perdido over time, many of these associated with elite or dynastic burial episodes.

The Early Classic levels from the Mundo Perdido have greatly advanced our understanding of the ceramic sequence, dynastic burial locations, and the influence of Teotihuacán cultural traits at Tikal. Abundant Early Classic ceramics permitted a more accurate faceting of the Manik ceramic complex [A.D. 250 – 550] into the following sub-phases (Coggins 1975; Iglesias 1988, 1996; Laporte 1989; Laporte, Hermes, de Zea and Iglesias 1992):

Manik I: A.D. 250-300
Manik II: A.D. 300-380
Manik IIIa: A.D. 380-480
Manik IIIb: A.D. 480-550

While constructing the Tikal ceramic sequence, T. Patrick Culbert (1979, 1993) defined nine ceramic groups and 25 ceramic types for the Manik complex. Laporte (Laporte and Fialko 1986; Laporte and Iglesias 1992) defined 46 new ceramic types from the Mundo Perdido excavations alone (Laporte 2003:290). Many of these newly recognized types are directly associated with elite, quite probably dynastic, burials.

“In Early Classic times, Mundo Perdido was used for the deposition of burials of dynastic character, specifically connected to the Jaguar Paw lineage (Laporte and Fialko 1990). In the Manik 3 phase we found no evidence that the compound was used for funerary purposes.” (Laporte 1993:310)
Laporte believed that the 17\textsuperscript{th} katun ending recorded on Tikal Stela 39 was somehow related to a parallel funerary event documented within the Mundo Perdido complex. Mirroring the removal and re-erection of Stela 31 in the North Acropolis, the lower half of Stela 39 – which commemorates an A.D. 376 event – was reset within Mundo Perdido Structure 5D-86 in the eighth century A.D. (Laporte 2003:291-292, 304). Stela 39 was recovered from Str. 5D-86-7 which is situated on the East Platform on the east-west orienting axis of the Mundo Perdido complex (Ayala 1987; Laporte and Fialko 1990:42-45; Laporte 2003:291-292; Martin 2003:10).

Recovered from secondary context, Stela 39 features a single figure bedecked in elite costume standing on a captive, who is also portrayed wearing a headdress, earflares, and a nose adorno, all indicative of high status. Dedicated on the 17\textsuperscript{th} katun ending by the Tikal ruler Chak Tok Ich’aak I on 8.17.0.0.0 (A.D. 376), the extant lower portion of this monument features a standing figure (likely the king Chak Tok Ich’aak I himself) from the neck down (where the monument was broken in half) subjugating an elite prisoner. Given the size of this stela fragment, it is likely that the missing upper section portrayed the central figure’s head with headdress and perhaps a floating ancestor figure, battle standard, and/or lengthy text.

Six tombs dating to the end of the fourth century A.D. were constructed inside the temples of the East Platform and sealed with interred individuals and high quality grave furnishings, including very similar pottery vessels among the interments (Laporte 2003:292-293). Several of these vessels have extremely similar compositional signatures to many Balanza Black vessels recovered from the Tikal peripheries by the PST Project during the 2005 and 2006 field seasons.

These compositional similarities were analyzed through INAA, and a statistically significant compositional reference group was easily refined (my “Blacks” group). It is likely that both the tomb vessels from the Mundo Perdido excavations and the various sherds recovered from the periphery of Tikal were, in fact, manufactured by a single
production unit. Although the size and composition of this production unit cannot be determined at present, I will suggest that there may have been one or more ceramic workshops producing highly elaborate vessels for elite clients in the Mundo Perdido complex, as well as producing ceramics which were distributed throughout the periphery. Alternately, potters producing vessels for wider circulation throughout the Tikal periphery may have produced the tomb pieces on demand. This situation would be classified as attached or tethered specialization, or ceramic specialists working for elites on a patronized basis; producing specific pieces for elite burials and working independently producing other vessels which were distributed more widely throughout the Tikal periphery. The Balanza sherds within this compositional group were recovered from the farthest reaches of the PST Project survey, up to 9 km from the Mundo Perdido. The results of this ceramic compositional study are discussed at length in Chapter 9.5.

“Considering the high aesthetic and technical quality of the offerings and the location of the tombs, it is clear that the deceased were members of a high-ranking group in Tikal. They might have been members of the ruling dynasty, but perhaps a segment that had lost power and was eliminated during the political changes that occurred at the end of the fourth century A.D.” (Laporte 2003:293)

Dated to the Manik II ceramic complex [A.D. 320 – 380], these tombs were placed here within the reign of either the 13th ruler, K’inich Muwaan Jol (Bird Skull – A.D. 330 – 359), or, more likely, the 14th ruler of Tikal, Chak Tok Ich’aak I (Great Jaguar Paw – A.D. 360 – 378) (Laporte 2003:293). The rule of Chak Tok Ich’aak I ended with a momentous event involving the arrival of a foreign political faction or military force, possibly from Teotihuacán in central Mexico (Stuart 2000).
A Possible Teotihuacán Enclave

“Also, a zone to the south of the Lost World Pyramid which had appeared to be devoid of any significant architecture was given a test-pit series of excavations; the results were expected to be merely routine. Instead, these tests revealed a vast array of buried structures that had been undetected beneath the deceptively flat surface. Excavations in what was called the 6C-XVI Group have revealed an entire buried acropolis dating to the Early Classic period.” (Harrison 1999:38-39)

Laporte stressed the syncretic Maya-Teotihuacánoid style of compound 6C-XVI. In support of his argument for a more complex relationship between the two centers, Laporte noted that talud-tablero architecture elements, considered a hallmark of Teotihuacán culture, are documented earlier at Tikal. Laporte’s excavations also document the lack of Teotihuacán cultural markers in nearby residential zones. He argued for a complex relationship between Tikal and Teotihuacán which would account for the ‘foreign’ elements found at Tikal.

“Why is 6C-XVI associated with Teotihuacan? Because it fits the easy premises of comparative characteristics: it is composed of multiple intercommunicating patios; there are talud-tableros in a small percentage of its more than 90 structures; and a controversial sculpture, the so-called ‘Ball Court Marker of Tikal,’ was found there. Even if one uses a simplistic but functional concept of settlement, however, the surge in residential complexes cannot be attributed to a single center in Mesoamerica. Despite the apparent structural similarity between the residential complexes of Teotihuacan and Tikal, there are significant differences, particularly in social groupings, the organization of the complexes, and above all, their functions. The key point is that 6C-XVI is not a dwelling, as can be found in Teotihuacan, because – after an extensive investigation – no remains such as hearths, middens, or burials, which would characterize a concentration of inhabitants, were found.” (Laporte 2003:297-298)

Rich elite burials resumed in the Mundo Perdido complex in the seventh century A.D., though not identified as dynastic elites (Laporte 1993:310). Architectural renovations and expansion continued through the time of use of Ik and Imix complex ceramics – dated by Laporte to A.D. 550 – 650 and 650 – 800, respectively (Laporte 2003:304-310). Structure 5C-49 was enlarged at least five times, and was used for elite
burials – very likely from the ruling dynastic lineage of the eighth century A.D. (Laporte 2003: Fig. 10.8, 302-303).

Imix burials were located in small surface structures of the Mundo Perdido Complex. Below this more ephemeral occupation were quite impressive Early Classic structures with murals and stone and stucco sculpture dating to the third – sixth centuries A.D. (Laporte 2003:306-307). Taken together, these findings attest to a continual occupation of this precinct from Preclassic through Terminal Classic times, and a specific Early Classic focus on architecture, burials, and ceremonies of a dynastic character likely related to Teotihuacán cultural influence.

Given the Central Mexican or Teotihuacán cultural affiliations noted at Tikal and other lowland Maya centers (Ball 1983; Braswell 2003; Coggins 1975; Santley 2004), and the Mundo Perdido complex specifically at the end of the fourth century A.D., the precise nature of this relationship is still debated. Two basic models of Teotihuacán influence in the Maya lowlands in the Early Classic have dominated culture history reconstructions. The first speculates a more economically motivated connection whereby Teotihuacános exerted control over the highland Guatemalan center of Kaminiljuyu (and the nearby El Chayal obsidian source) and subsequently influenced political and economic arrangements at Tikal. A second model, heavily based on the more recent interpretations of hieroglyphic texts at Tikal, Uaxactun, and El Peru, has proposed a political ‘entrada’ from central Mexico into the Maya lowlands, resulting in a top-down takeover of Tikal by a political-military group of Teotihuacános (Stuart 2000). A variant of this model views Teotihuacán cultural markers in the Maya lowlands, especially in the founding of Copán, as evidence of a more profound and consistent Teotihuacán presence sweeping southward, establishing new ruling dynasties at several lowland Maya centers on this late fourth century A.D. horizon.

A third model of Teotihuacán ‘expansion’ has recently been forwarded for the Classic Period center of Matacapan in Vera Cruz, Mexico. Dynamic fluctuations in the
settlement pattern and population density of Matacapan, in the Tuxtla Mountains, have been investigated through survey and excavation for two decades (Arnold and Santley 1993, 2008; Pool and Mudd Britt 2000; Pool and Santley 1992; Santley 2004; Santley and Arnold 1996). A Teotihuacán presence has been documented in the form of talud-tablero architecture, green obsidian from Pachuca, and Teotihuacán figurines and tripod vessels at the center of Matacapan and throughout the central Tuxtlas region. These Teotihuacán-style ceramic forms are rendered in a local paste and represent a local ceramic manufacturing industry, not imports from central Mexico (Arnold and Santley 1993:235).

Valenzuela (1945) is the earliest author to explicitly posit direct Teotihuacán influence at Matacapan, based on architectural and artifactual similarities (see Arnold and Santley 2008 for a review of the evidence for Teotihuacán interaction and presence at Matacapan). Researchers at Matacapan originally postulated a small Teotihuacán enclave moving into the area following a local volcanic eruption in the Tuxtla Mountains which brought the previous local occupation to a halt.

“Our regional data indicate that the Teotihuacán presence at Matacapan began within the sociopolitical vacuum fostered by this [c. A.D. 250-300 volcanic] eruption. The site became a small center sometime after A.D. 300; coincident with the growth was the appearance of Teotihuacán-related artifacts and iconography within the region. Over the next century, Matacapan developed into the largest community within our [central Tuxtlas] survey area. Nonetheless, the regional population remained sparse and, by the end of the Early Classic (A.D. 450), is estimated at no more than two thousand persons.” (Arnold and Santley 2008:298-299)

Arnold and Santley (2008:308-310) cite evidence for social turmoil at Teotihuacán apparent in episodes of desecration or termination of central architectural complexes at the central Mexican capital around A.D. 250. Given newer archaeological evidence of perturbation events at Teotihuacán on a ca. A.D. 250 – 300 temporal horizon (see Cowgill 2003; Manzanilla 2003; Sugiyama 1998), Arnold and Santley (2008) now favor a scenario of immigrants voluntarily leaving (or expelled from) Teotihuacán to
resettle the resource rich Tuxtla Mountain area of Vera Cruz over the previously emphasized supposition that the influx of Teotihuacán cultural elements represented a political entrada based in economic concerns of the Teotihuacán state – the acquisition of local resources in exchange for obsidian. They also note that years of survey and excavation at Matacapan and the entire Central Tuxtlas survey area have verified the widespread evidence of Teotihuacán-related cultural artifacts throughout peripheries, as well as in the ceremonial core of Matacapan, supporting their reformulated model of a Teotihuacán seed community making this area their home.

The central Mexican influence at Tikal has been clearly demonstrated in the Mundo Perdido even if the exact source and nature of this influence has yet to be settled. While Tikal began, developed, and always remained a Classic Maya center, influence from other centers or regions certainly influenced its development at specific points in time. While the ‘arrival of strangers’ originally noted at Tikal in the fourth century A.D. (Coggins 1975; Proskouriakoff 1993) has been further documented, a more precise characterization of this foreign influence, and the circumstances surrounding this entrada remain largely illusive. The lengthy history of occupation at Tikal, documented through decades of excavation, certainly involved contact with neighbors from near and far, as well as a considerable internal development.

### 3.3 – Investigations Outside the Tikal Epicenter

“In an outright attempt to balance the attention given to the elaborate and ostensibly socially distinct central portion of Tikal, considerable effort had gone into the investigation of those ‘small structures’ mapped within a 500-m. wide radius extending a maximum 2000 m. northeast from the Great Plaza.” (W. R. Coe 1962:502)

In 1959-1961 the small structure program was initiated while Edwin Shook was the Tikal project director. Excavations in the NE quadrant of the 16 km² Tikal map (Becker 1999; W. R. Coe 1962; Haviland 1963, 1965, 1985) would extend the database
concerning households outside Tikal’s epicenter. Under project director Robert Dyson, in 1962, six of the nine plaza plan II groups (Groups 4G-1, 4H-1, 4H-4, 5G-1, 5G-2) forming a ‘barrio’ or ‘lineage’ situated on a ‘peninsula’ jutting out into the Bajo de Santa Fe were extensively tested with trenches through individual structures and substructure platforms (Becker 1999:2) (see Figure 2.4.1). Several large-scale excavations of residential groups (4F-1, 4F-2, 4H-1, and 7F-1) during this era produced data that continue to influence discussion of Tikal’s social and economic organization. Craft production was documented outside the epicenter through these excavations although these households were all still within Central Tikal, not the peripheris. Dennis Puleston’s (1973) mapping efforts extended investigations further away from the central precinct, but to this day no extensive excavations of peripheral or hinterland household groups have been done.

Investigation of a ‘Minor Center’

The first substantial, controlled excavation at Tikal was at Group 7F-1 (W. R. Coe 1962:479), “a relatively small but formal ceremonial cluster well to the southwest of the central plaza of Tikal” (W. R. Coe and Broman 1958). Located 1.25 km southeast of the Great Plaza, Group 7F-1 proved to be the residence of high-status elites, probably related to a royal dynasty (see Haviland 1981; Martin and Grube 2000:38-39). This group was, in fact, selected for excavation from two candidates for minor centers (6B-# and 7F-1) located within the central 16 km² Tikal map specifically to acquire information on social rank and/or administrative organization. The earlier recovery of a reset stela at Group 7F-1 supported the hypothesis that this was not a typical residence and certainly not representative of households at Tikal in general. To counterbalance this investigation, more humble residences were subsequently investigated.
“According to Bullard (1960:359-60) minor centers should be appreciably larger than house ruins but smaller than major centers. Ordinarily, they should include one or more pyramidal structures arranged in company with lower buildings around one, two or three adjacent plazas. Vaulted range-type structures may be present, but should not form extensive compounds.” (Haviland 1981:90)

Following limited investigation of Group 7F-1 by W. R. Coe and Broman in 1957, this “minor center” was the focus of excavations by Marshall Becker in 1963 and William Haviland in 1965. Stela 23 was recovered from 7F-1, broken in half, effaced, and reset within this group. The artifact assemblage here was a relatively rich one and grave goods indicate elite status of some of the individuals buried at Group 7F-1.

Around A.D. 500 a small plazuela grouping of structures were buried by constructions which would continue to be modified for approximately 450 years. Burial 160 was placed in the platform of Structure 7F-30, a palace-type structure that would be modified over time and the locus for a total of eight burials. Burial 160 has been interpreted as the interment of an elite male, one who may have ruled at Tikal, accompanied by two sacrificial victims. The chamber burial has many characteristics in common with epicentral burials, including a painted back wall text and a rich assemblage of elite grave furnishings, including abundant jade, cinnabar, stingray spines, and obsidian. “Nine plus one” spondylus shells were placed with the body, along with lithic eccentrics and a variety of vessels; ten ceramic, two alabaster, and two perishable vessels. Following the placement of this burial, no other caches were interred within the structure for the next 100 years (Haviland 1981).

“Although the burial included abundant artifacts of other materials, associated ceramics are rather somber, lacking highly decorated types and including several poorly constructed vessels. Unusually good preservation of the burial chamber, however, revealed the presence of two richly stuccoed and painted vessels of perishable materials (probably gourds or wooden vessels)…” (Culbert 1993:Figure 36 caption)

The principle male occupant of Burial 160 was once tentatively identified as the Tikal Ruler Jaguar Paw Skull (Chak Tok Ich’aak II) by Haviland (see Culbert 1993: Figure 36 caption), and as the ruler now known as Kaloomte’ B’alam by Coggins
(1975:215-233; Haviland 1981:106). The burial chamber of Chak Tok Ich’aak II is now accepted as Burial 10, within structure 5D-34 of the North Acropolis; he was the son of the foreigner Spearthrower Owl (Martin and Grube 2000:32-33). The identification of Kaloomte’ B’alam as the occupant of Burial 160 rests on epigraphic information from Stela 23, 25, 6, and 10 and the recovery context of Stela 23 and 25. Haviland has argued that Burial 162, placed within Structure 7F-30 soon after Burial 162, represents the “Lady of Tikal,” who is the subject of Stela 23, the monument reset within this group. The lady of Tikal became ajaw of Tikal on 9.3.16.8.4 [A.D. 511], at the age of six, and apparently ruled in conjunction with Kaloomte’ B’alam, a much older individual (Coggins 1975:215-233; Haviland 1981:107-110; Martin 2003:18-21; Martin and Grube 2000:36-39; Schele and Freidel 1990:167).

The connections between the inhabitants of Group 7F-1 and the royal dynastic line of Tikal have been the subject of much speculation and hypothetical reconstructions of Tikal’s political history. Haviland (1981:114) estimates the resetting of Stela 23 in Group 7F-1 at around A.D. 700, during the reign of Jasaw Chan K’awiil I [Ruler A]. Other lines of evidence led Haviland to conclude that the two inhabitants of Group 7F-1 interred in Burials 160 and 162 were co-rulers themselves, from A.D. 511 to 527>, and that other members of the same lineage buried at 7F-1 were closely related through kinship ties to the ruling dynasty of Tikal.

Later burials within Structure 7F-30 reinforce the notion of close dynastic ties; Burial 190 contained a carved bone with a “manikin head” title and Tikal emblem glyph; Burial 191 contained an insect motif bowl13 (Zacatel Cream Polychrome) with painted

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13 The insect motif is highly restricted at Tikal, and is slightly more common at Uaxactun (see Rickerton and Rickerton 1937:Figuers 178, 183b, pl. 80f; Smith 1955 Figuers 34c7, 39b1-3, 61a18-21, 73b9-11). Insect motifs occur on polychrome bowls from the Ik and Imix ceramic complexes (Saxche or Palmar ceramic groups). At Tikal, ceramic vessels or sherds with insect motifs have been recovered from burial 191 in Group 7F-1, burial 183 (Culbert 1993: Figure 49a1), Problematic Deposit 4 from the Lost World Complex (Laporte 2000:Figure 30), a “sherd from the central acropolis” (Haviland 1981: 113), and a large group [Group 45] at the western end of the northern earthwork corridor investigated by Webster et al. (2004, 2007). I recovered this last sherd (see Figure 9.4.4), along with dozens of other polychrome sherds, from the looted and collapsing range structure along the western side of the main plaza of Group 45, it appears to be identical to the Saxche Orange Polychrome sherd illustrated and described by Culbert from Burial 183, including the interior black rim band on orange and the exterior red bar design (Culbert 1993:Figure 49a1 caption).
ajaw sign on the interior base (Haviland 1981:113-114). Haviland sees similarities between the burials in Structure 7F-30 and royal burials from the Tikal epicenter. Burial 160 has many similarities in common with royal Burial 48 (within Structure 5D-33 of the North Acropolis), the tomb of Siyaj Chan K’awiil II. Burial 190 and 191 have features in common with Burial 23 (within Structure 5D-33 of the North Acropolis), including ceramic style and inlaid teeth; Burial 116 (within Temple 1), the tomb of Jasaw Chan K’awiil I [Ruler A]; and Burial 196 (within Temple 73 at the southwest corner of the Great Plaza), the tomb of Yik’in Chan K’awill [Ruler B], or possibly his son who ruled following his death and before Ruler Yax Nuun Ayiin II [Ruler C] took the throne (see Martin and Grube 2000:50).

All evidence taken together supports the hypothesis that 7F-1 was an elite residential group inhabited by rulers and/or close relatives of one of the ruling dynasties of Tikal. The circumstances surrounding the burial of the Tikal king and founding of a residential compound outside the epicenter will probably remain a mystery. Tikal’s epigraphic record does attest to breaks in the dynastic sequence and warfare events with other southern lowland Maya centers. Haviland dismisses the idea of viewing Group 7F-1 as a dedicated administrative complex or minor center on the grounds that it was primarily residential in function, and that the elites there were probably ousted from positions of power by a powerful group that maintained political control of the center. It would be worth pointing out earlier that “minor center” really meant “minor ceremonial center” at the beginning of the Tikal project.

“Group 7F-1, then, was not a minor center. Rather its primary purpose was to serve as a residence for people of elite social status. Ceremonial activity did take place in the group, but was intense only during a period of time (ca. 9.8.0.0.0 to 9.12.10.0.0) when these people were on the outs with Tikal’s rulers, who presumably were at the head of any regional administrative and religious hierarchy. Conversely, the ceremonial importance of Group 7F-1 evidently was minimal at those times that the group’s occupants were involved in dynastic affairs at Tikal.” (Haviland 1981:116)
William T. Sanders equated Classic Maya major and minor ceremonial centers with households, noting the similarities between smaller house compounds and larger architectural configurations; both comprised of buildings arranged around plazas. Sanders viewed minor ceremonial centers as complex family compounds for community leaders of lower status than the more powerful central elites of the major ceremonial centers (1981:359). William A. Haviland (1988) followed a similar theoretical slant, viewing households, even so-called “minor centers” such as 7F-1, as the living spaces of dynamic growing families that fissioned into new households while still retaining residence within the expanding architectural compound. Convinced that the Classic Maya lived in relatively large extended-family households, he viewed larger architectural compounds, such as 7F-1, as evolving physical settings representing decades or centuries of family development (Haviland 1988:121). He interprets the lower status houses within this group as the residences of either lower ranking members of the kin group residing there (following a developmental model of household growth), or as the houses of lower status servants attached to the higher status kin group (Haviland 1981:101-102, 1992:939).

“Since houses were, from first to last, prominent features of group 7F-1, the logical question to ask is, what sort of people called the group home? Evidence suggests that is was home to people of elite or upper-class status in Tikal society, but that some people of lower-class status may have lived here, too.” (Haviland: 1981:100)

**Humble Residential Compounds**

Continuing the evaluation of rank at Tikal, and in line with the University of Pennsylvania Project’s balanced view of investigating compounds of different sizes, smaller residential groups were targeted for excavation. The excavation of several household groups or plazuelas at Tikal led some researchers to suggest that a number of these were workshops or the residences of specialist producers. Full excavation of the quite humble Groups 4F-1 and 4F-2 (Haviland 1985) produced rather complete artifact
assemblages; limited excavation of Group 4H-1 produced quantities of ceramics interpreted as strong evidence for specialized ceramic production (Becker 1973b, 2003a).

“Various structures do seem to have served for something more than presumed residence, as in the cases of those that have produced flint objects and flakes in quantities perhaps sufficient to suggest additional function as workshops.” (W. R. Coe 1962:503)

This is an early suggestion that household level specialization occurred within a domestic context of dispersed settlement around the core of Tikal. This concept of household level production has become the basis for most reconstructions of the organization of production and exchange at Maya centers (Ball 1983, 1993; Houston and Inomata 2009:294; Marcus 1983:477; Rice 1987a; West 2002), although attached specialization (Arnold and Santley 1993; Ball 1993; Widmer 1997, 2009) or artistic crafting within elite households (Aoyama 2007, 2009; Emory and Aoyama 2007; Inomata 2001, 2007) has been increasingly documented.

“Chipped stone artifacts from Gp. 4F-1 and 2 are overall obviously utilitarian. The ancient inventory was diverse, exemplifying tools suited to cutting, chopping, pounding, scraping, drilling, graving, tattooing, and killing.” (Haviland 1985:172)

The artifact inventories from Groups 4F-1 and 4F-2 show obsidian flake blades to be relatively numerous. It is interesting that flake blades, not prismatic blades or prismatic cores, are most common at these groups; even ovate biface and mano and metate fragment counts are relatively abundant as well. Structure 4F-15, a single structure within Group 4F-2, was singled out by Haviland as the locus for higher rates of production, or at least, use of obsidian.

“PD. 217 credibly documents occupants of Str. 4F-15 to have been specialists in obsidian production. If a ‘home industry,’ we might consider 4F-15 a dual residence and an obsidian workshop. Since workshop deposits are exceedingly rare at Tikal, we feel confident that obsidian working was a highly restricted occupation.” (Haviland 1985:160)
The obsidian cache, PD. 217, consisted of "953 unused obsidian flakes, 2 used and 376 unused obsidian flake-blades, and 20 obsidian core fragments and 3 flakes" placed within a shallow depression of a Manik phase platform (Haviland 1985:67, 158). The core fragments are not described as polyhedral cores for the production of prismatic blades and no obsidian blades are listed from the cache. If the core fragments represent multidirection cores for the production of obsidian flakes and flake blades, then the production at this residential group was likely for household consumption without exchange beyond Group 4F-2 and possibly Group 4F-1. Haviland clearly suggests that lithic tool manufacture occurred within a household level mode of organization.

"It is well established that Str. 4F-15, whatever else it may have been, was an obsidian workshop."
(Haviland 1985:172)

The published artifact inventory for Structure 4F-15 (Haviland 1985:Table 54) records more chipped "flint" than obsidian; it also seems to confirm the residential nature of the structure. Haviland (1974) found evidence of monument carving at Structure 4F-3 within Group 4F-1: chert biface elongate picks, polished greenstone celts, and monument fragments.

The evidence for shell working at Group 4F-2 suggested that specialized shell production was oriented toward exchange outside the group; only one burial within the group was accompanied by shell objects although shell debitage was present (Haviland, 1992). The occupants of Groups 4F-1 and 4F-2 produced shell and obsidian objects, yet retained mostly obsidian flake-blades; prismatic obsidian blades were rare. It is tempting to view the obsidian flake-blade production in terms of the occupants making their own tools for the working of other materials, such as shell. None of the burials from 4F-1 or 4F-2 contained elite items, such as eccentric flints or obsidians, jades, hematite, carved bone, or stingray spines, while these were plentiful in the elite Burial 160 from Group 7F-1 (Haviland 1992:939). Burial 160 "is comparable in its size and grave goods only to the royal tombs of Tikal’s epicenter" (Haviland 1985:39). These differences in rank or social status, as well as the restricted nature of production within households, have continued to
influence Haviland’s reconstructions of Tikal’s social and economic organization until the present.

Marshal Becker (1973a, 1973b, 1999, 2003a), also from the University of Pennsylvania research team, has discussed the identification of specialized workshops, also within a domestic context at Tikal. His evidence comes from both extensively excavated residential groups and from less intensive test-pitting of others. Citing the high percentage of lithic forms and production waste, he concludes that several groups in the periphery were specialized production loci.

In line with anthropological inquiry of the day, Becker (1973b), in a similar vein as R. E. W. Adams (1970) and Mann (1973), inferred certain specialist occupations based on their products. Addressing the published works of Tourtellot and Sabloff (1972) and A. V. Kidder (1947), Becker (1973a, 1973b) suggested that a center the size of Tikal had indeed developed hierarchical social classes and other hallmarks of civilization, including specialist producers. At the time, craft specialization was usually considered a contributing factor in the development of social complexity (Childe 1950; Kidder 1950 *contra* Kidder 1947) and not a product of this complexity, as has recently more compellingly been argued (Clark and Perry 1990; Earle and Brumfiel 1987). Reacting against the supposedly prevalent priest/peasant, two-class model of Bullard (1960) and Thompson (1931, 1954, 1970) and others, Becker sought to directly document specialist craft workshops at Tikal. His argument posited that “occupational specializations existed among the Classic Maya” and could be “recognized through an analysis of the archaeological data” (Becker 1973b). He also felt that archaeological investigation and documentation of actual Classic Maya workshops was imperative.

“The ability of archaeologists to locate the actual workshop areas of craft specialists would help to verify the hypothesis which infers the existence of occupational specialties. Furthermore, information recovered from such workshops might provide added dimensions to ideas concerning social class differences. The primary task at hand, however, is the location of the postulated workshops in order to give substance to Adams’ [1970] hypothesis and direct future research.” (Becker 1973b:397)
Based on high artifact counts, Becker (1973b) identified three lithic workshops at individual groups. Reasoning by the principle of abundance, the majority of these groups must be residential. Becker also equates the group, not the individual structure, with a household, which he equates with a single extended-family.

As a further logical step, one might infer that a “workshop,” as in a dedicated work area separated from domestic activities (Peacock 1981, 1982; Underhill 1991; Van de Leeuw 1976, 1984), would differ in many respects from the numerically-dominant purely domestic groups, or that the “workshop” would occupy a single building within the family compound comprised of houses, kitchens, shrines, and storage buildings (i.e., household industry). This last stage of reasoning is notably absent in Becker’s (1973a, 1973b) early writings where he clearly views most groups as household residences, and yet fails to clearly define or differentiate the actual “workshops” within these compounds. The implication is that production occurred somewhere within, or near to, the group.

What Becker describes as high percentages of finished forms and waste debitage supports the conclusion that some level of production was occurring at these loci. However, the 125 pieces of obsidian recovered from a single 1.5 m test pit (admittedly out of proportion with usual household midden levels) from one peripheral location along the South Brecha (Fry 1969:6-7) seem to pale in comparison to known Maya workshop debris patterns from Colha (Hester and Shafer 1984; Shafer and Hester 1983, 1986, 1991), where reliable estimates as high as as 4,956,125 pieces of debitage per m³ have been calculated. Recent work at San Bartolo (approx. 60 km. from Tikal) has yielded surface deposits of chert debitage reaching 80,000 pieces per m³, some quite large macroflakes (Joshua Kwoka, personal communication 2005). The obsidian workshop excavated by Tulane University at the central Mexican center of Tula (Healan et al. 1983; Healan and Stoudtamire 1989) produced obsidian debitage in the hundreds of thousands of pieces, from partial excavation of a single workshop. Obsidian deposits recovered by the University of Pennsylvania during central excavations also evidence a large scale of
debitage disposal perhaps indicative of workshop-level production, although this does not rest on the same firm analytical techniques as the calculations from Colha (W. R. Coe 1990; Moholy-Nagy 1990, 1997; see also Hester and Shafer 1992; Healan 1992; Moholy-Nagy 1992) or Tula (Healan et al. 1983; Healan, Cobean and Diehl 1989; Healan and Stoudtamire 1989).

At Tikal, the designation as an obsidian workshop was based on artifact numbers in excess of normal expectations of household use recovered from a single test-pit and associated tree fall. Becker does state that the composition of the assemblage (“blades, cores, flakes, and chips”) was also a factor in his identification of the local as a site of obsidian tool manufacture.

“The diversity of the material suggests general knapping activity rather than the use of a specialized tool in some occupation such as woodworking or bone carving.” (Becker 1973b:399, *italics* mine)

The core and blades suggest pressure flaking of prismatic blades, while the “flakes and chips” usually indicate forming or rejuvenation of polyhedral cores prior to pressure flaking blades, bifacial implement knapping, or even just simple expedient cutting flake production from a multidirectional core. Becker’s statement that “general” knapping activity, as opposed to specialized knapping activity (i.e., manufacture of a standardized or uniform product), suggests that the lithic assemblage recovered from this test-pit is indicative of limited exchange beyond the household, not necessarily a high degree of specialization in the manufacture of a single or limited range of tools destined for widespread circulation. Without a more detailed analysis of the artifacts themselves, or a more extensive excavation of the area, the identification of a workshop is premature and cannot be evaluated further.

Citing excavation data (artifact counts) from two other groups within the NE quadrant of the 16 km² Tikal map, excavated during the 1959 and 1960 field seasons, Becker opined that at least one of these groups housed specialist knappers manufacturing
chert biface implements. As noted above, Haviland (1985:160, 172) identified a single structure [4F-15] within Group 4F-2 as the household of specialist obsidian workers. Combining the conclusions of Haviland and Becker, there would be two groups of specialist lithic producers, or one group with two specialties, residing at Group 4F-2. An alternate hypothesis would suggest that lithic workers of the two groups exchanged lithic tools between the two families.

“A few statistics will indicate quite clearly just how different the quantities of stone artifacts are in association with these groups as compared to other groups excavated at Tikal. One of the more easily recognized stone tools is the flint biface-ovate [chert celtiform], of which approximately 1100 have been recovered intact or as fragments from the entire site of Tikal (Tikal Project files). Of these, some 176 (16%) were found in Gr. 4F-1 (Ops. 20B through 20G), and 118 (10.7%) from Gr. 4F-2 (Op. 20A). A group comparable in size to either of these is Gr. 4H-1 (Op. 33), the residence believed occupied by potters, as noted below. Only 9 biface-ovates were found in this group, a mere .8% of the total from Tikal.” (Becker 1973b:398-399)

At Tikal, chert celtiform bifaces were most often produced through the reduction of nodules of local chert. The reduction process requires the removal of the cortex and then bifacial shaping and thinning of the nodule, a process which may reduce the original nodule by 50-80% (Wittaker and Kaldahl 2001:56). Large amounts of debitage, enough to account for the high numbers of finished implements, would be a clearer indication that these were manufactured at this location as opposed to being used or stored here.

Similarly high numbers of lithic tool forms have been recovered from household excavations in the Peten. At Itzán, about 50 km southwest of Tikal, Kevin J. Johnston (2004) recovered comparable numbers of artifacts from complete excavation of “invisible” or vacant terrain structures. Tikal Groups 4F-1 and 4F-2 are patio quads with low mounds. Even after clearing the low stone foundations were barely visible (Haviland 1985, 2003:112, Figure 4.1); these Tikal groups are basically similar to the Itzán ones and comparison between the two sites is appropriate. Stripping excavations of the very low, crudely constructed building platforms arranged as patio quads (i.e., residential groups) at Itzán produced relatively high artifact counts.
“Artifact densities in the IT3A sheet midden are high. In one 52 m² area, archaeologists recovered 7,400 sherds, 3,000 chert flakes, 70 chert cores and hammerstones, 27 chert tools or tool fragments, 163 obsidian blade fragments, as well as groundstone and food remains (animal bone, ash, river clams, and lagoon snails). Beyond 14 m from the structure artifact densities decrease markedly, although low-density debris continues for 44 m.” (Johnston 2004:158)

The investigation of another residential group within the northeast quadrant of the central 16 km² Tikal map produced quantities of ceramic sherds and a couple of figurine molds. The identification of Group 4H-1 as the locus of specialized pottery production was initially proposed by Becker in the 1970s. He would later return to the discussion of ceramic production and the location of ceramic industry after decades of contemplating the excavations conducted at that group during the University of Pennsylvania Tikal project. I discuss the identification of Group 4H-1 as the residence of specialist potters in Chapter 4.3.

3.4 – Investigations in the Periphery and Hinterland of Tikal

“Obviously, continued exclusive attention to the excavation of temples and the like can only perpetuate an unbalanced view of site growth and cultural development. Consequently, an equitable program in its very simplest terms is one which weighs ‘temples’ against ‘house mounds,’ lunar counts against inferences as to settlement pattern.” (W. R. Coe 1962:482)

The Tikal Sustaining Area Project was formulated in order to survey a sufficiently large sample of structure groups (i.e., households) beyond the center of Tikal into the peripheries and hinterlands or intersite areas (Puleston 1973, 1974). The paucity of survey data sufficient to make reasonable estimates of population density or establish the boundaries of a center was a serious motivating factor in establishing this pioneering project. The subject of urbanism was on everyone’s minds; a great debate concerning the organization of Classic Maya centers was steadily becoming polarized between two camps of thought: those following the ceremonial center model and those following the social complexity model.
“There is no evidence thus far that the archaeological sites of the classic stage are the ruins of cities and towns; there is on the other hand, much evidence that they were religious centers to which the Maya resorted only for ceremonies.” (Morley:1956:261 quoted in Puleston 1973:60)

What Puleston (1973) referred to as the “ceremonial center” model maintained that the core architectural complex at the heart of a center such as Tikal was not inhabited year round and was primarily a religious pilgrimage center. Such an epicenter had few permanent residents and was periodically visited by the very low-density population of undifferentiated rural farmers living in the surrounding sustaining area. He claimed that the ceremonial center model was rooted in the “Harvard School,” represented by Brainerd, Thompson, Willey, and Bullard (and others) and largely based on the strong belief that swidden agriculture would support no more than about 30 persons per mi² [approx. 19 per km²]. The social complexity model held that Maya centers were active political capitals, the physical loci for full-time administrative institutions supported by a differentially-ranked peripheral population involved in primary agricultural production capable of supporting relatively high population densities.

“On the basis of the optimistic arguments of Conklin (1961), Leach (1957), Dumond (1961) and Cowgill (1960, 1962), [Haviland] concludes rather cautiously that ‘agriculture in the Peten may be more productive than previously judged’ (Haviland 1966:38). [Haviland] argues strongly for complex social stratification on the basis of the great variety in the quantity and quality of artifacts found in his excavations of house ruins at Tikal.” (Puleston 1973:30, 31)

The center of Tikal was, in fact, initially chosen as the subject for the long-term, large-scale investigation program by the University of Pennsylvania Museum precisely because it was a huge center. It was hoped that these investigations would document the apex of societal complexity achieved by the Classic lowland Maya. It did. However, the debate over the degree or definition of urbanism, and the proper classification of Classic Maya centers remains a controversial subject.
“Regarding the final matter of urbanism, [Willey and Bullard (1965)] discuss the current question of whether the major centers were ‘cities’ or not. According to their assessment, Classic Maya centers, on the scale of Tikal, fulfill all the criteria established by Childe (1950) for urbanism except ‘what is probably the most diagnostic one, sheer size of dwelling aggregates.’ In contrast, Sanders (1956) has put the emphasis on functional, economic criteria by stating that in order to qualify as urban, such communities must have at least 75% non-farmers and show signs of heterogeneous functions and interests in various elements of the population. On the basis of these considerations, they conclude that while the Classic Maya may have been moving towards urbanism and heterogeneity, they did not attain it and can be characterized as ‘civilization without cities.’” (Puleston 1973:30)

Haviland (1969, 1970) and Puleston (1973, 1974) would document a settlement density which both believed called the swidden primary production hypothesis into question; they would also question ‘conventional wisdom’ regarding the nature of Classic Maya urbanism and social structure. Contemplating high population densities in the Tikal peripheries and hinterlands (Puleston 1973, 1974) during the Late Classic, Puleston envisioned households with associated gardens living in such close proximity to one another that the conservation of raw materials, even construction beams and thatching for house construction, would have become essential. While not denying the possibility of peripheral markets, he seems to have been suggesting that peripheral inhabitants would have maintained reciprocal strategies of resource allocation and distribution based on kinship ties over larger more institutional arrangements of redistribution or complex market exchange.

“Distribution of locally intermittent resources of this kind may have been partially served by a market of some kind, but kin-based exchange relationships and systems of resource allocation with kin groups may have played a major role, too.” (Puleston 1973:298)

Initiation of the Tikal Sustaining Area Project in 1965 (Becker 1971:4; Haviland 1963:44, 1965; Puleston 1973:1vii-1vix) promised to add new dimensions to the growing body of evidence accumulating from Tikal research. Concerns about social organization and population density, agricultural production capacity and organization, craft specialization and the circulation of goods were all issues to be addressed. With each
successive foray further out from the epicenter new excavation data would provoke new hypotheses. As the Tikal researchers continued to publish more data, new arguments, theories, and models would continually be challenged, reinterpreted, and refined.

Dennis Puleston credits the initiation of the Tikal Sustaining Area Project to a ‘faith’ in three factors: 1) swidden agriculture formed the basis of primary production, 2) there was insufficient land within the central 9 km² to support the projected population of this same area (based on maize agriculture), 3) and the presumption that the bulk of the population residing in this central 9 km² was not involved in food production at all (Puleston 1973:65). Puleston, like W. R. Coe, Haviland, and others, wanted to know where primary agricultural production occurred and how it had influenced the settlement pattern around Tikal.

“The social aspect of occupation is a worrisome matter. Was there a strict milpero or farmer class, socially and economically below a middle class composed of artisans, traders, and other such functional groups?” (W. R. Coe 1962:503)

As Puleston’s (1973) dissertation details, transects or brechas were established based on the existing Tikal National Park footpaths radiating out 12 km from the Tikal epicenter heading north, south, east, and west. Accompanied by a crew of workmen and armed with Brunton compasses and metric tapes, Puleston and his crews recorded structure remains, or mounds, within 250 m of either side of the transects. Settlement maps measuring 500 m in width extending 12 km to the north and south of the Tikal epicenter were produced and published (Puleston 1973; 1983). These settlement maps provided the foundation for estimating settlement densities and population estimates for the entire polity of Tikal. Forty-three groups on the south radial strip and forty-seven groups on the north radial strip were investigated by test-pit excavations by Robert Fry; another fourteen groups were more intensively excavated by Haviland, Puleston, and others (Fry 1969; Haviland 1969:430).
Excavations at these groups provided chronological information, deduced from ceramic collections, as well as artifacts used to support the identification of specialist craft producers (Becker 1973a, 1973b; Fry 1969; Haviland 1974; O. Puleston 1969) and artifact distributions used to infer exchange mechanisms (Fry 1969, 1979, 1980, 2003; Fry and Cox 1974). An additional 500 m-wide transect was mapped from the northern limit of the Tikal Park and connected to the previously mapped 500 m-wide transect extending south from the center of Uaxactun (Ricketson and Ricketson 1937). A dedication to complete survey coverage (within the 500 m-wide transects) characterized this work.

“I would suggest that the completeness of the survey was in the range of 95% as far as structures are concerned…The completeness of coverage…is certainly very near comparable to that of the map of the central nine km² of Tikal.” (Puleston 1973:75, 78)

The discovery, in 1966, of the “defensive earthworks” to the north and south of Central Tikal seemed to mark a definitive emic boundary to the site of Tikal, if not the polity altogether. Puleston (1983:2) found confirmation that the northern earthwork defined the site of Tikal in the corresponding drop-off in settlement density as mapped within the 500 m-wide northern survey transect. The earthworks were interpreted within a sustaining area model as supporting the supposition that the inhabitants of central Tikal were, in fact, supported by primary agricultural production by rural farmers within this apparently well-defined sustaining area.

“[T]he inhabitants of Tikal, including the upper echelons of nobles and priests, were interested in protecting the agricultural resources upon which they ultimately depended.” (Puleston and Callender 1967:48)

My own dissertation in part represents an offshoot of the Pennsylvania State University Project’s re-evaluation of the Tikal earthworks (Webster et al. 2004, Webster et al. 2007). We recorded all settlement within a 250 m-wide corridor running the 13.6 km east-west length of the northern earthwork. The settlement density we recorded is
slightly higher [approximately 52 structures/km²] than the settlement recorded to the north of the earthwork by Puleston [approximately 39 structures/km²]. We did note more structures to the north (outside, n=93) of the northern earthwork than to the south (inside, n=65) of the northern earthwork. The ‘southern’ earthwork segment appears to form part of an unfinished eastern earthwork line and the western earthwork runs farther to the west and south than previous models anticipated. The “sustaining area” of Tikal would appear to be considerably greater than has been conventionally reckoned since the late 1960s, if the earthworks are used as the defining boundary. While the Tikal earthworks represent some form of perimeter built (but not necessarily finished) by the Tikal Maya, what they demarcate is still unclear, as is the precise function(s) of the constructions. In regard to settlement density, this seems to gradually thin out going north from the site center, without any sudden drop-off point, correlating with the northern earthwork or otherwise. I suspect that this pattern holds going west, east, and south, as well. A reanalysis of the earthworks (Webster et al. 2004; Webster et al. 2007) suggests that reconstructions of the extent of the Late Classic polity (ca. A.D. 700 – 850) may incorrectly assume that the earthwork system figured prominently in delimiting the settlement of the mature kingdom at its demographic peak. Questions persist as to the construction date of the earthwork system, whether or not all segments were constructed within a short time frame, or even if they were ever completed.

The formulation of a fairly high population estimate for Tikal greatly influenced Dennis Puleston’s view of Classic Maya societal organization and led him to seriously question the form of agriculture practiced. Based on the estimated territory bracketed by the “defensive earthworks,” (Puleston and Callender 1967:Figure 1) between 4.6 km north and 6.5 km south of the epicenter, Puleston (1973) calculated the area for “Residential Tikal” at 120.5 km². Omitting the large epicentral core or ‘downtown’ area of the center, he used the structure counts from the 5 km² of mapped and test-pitted north and south survey strips to calculate average structure densities which he applied to the entire 120.5 km² area of “Residential Tikal” in order to calculate an absolute population estimate for the center.
Several steps in the calculation method are worth reviewing. Well aware of the commonly applied multiplier of 5.6 inhabitants per house, calculated from the Yucatecan community of Chan Kom by Redfield and Villa Rojas (1934:91; Wauchope 1938:148), Puleston first attempted to verify and refine this figure (1973:171-178). This figure of 5.6 inhabitants per house was used by Haviland in his formulations of population estimates for Tikal through 1970 (Haviland 1965:19, 1969:429, 1970:193) when he switched to an average figure of 5.0 inhabitants per house (Haviland 1972:138) largely based on review of the early historic demographic data from Cozumel recorded in 1570 (Roys, Scholes, and Adams 1940). The 1570 census of Cozumel reported an abundance of complex-family households; the normative household consisted of 3.7 couples (1 “elderly” couple and 2.7 married couples with children). The census also suggested that married couples had four surviving children on average, a mortality rate supported by skeletal data recovered archaeologically from Tikal as well as data from contemporary Maya settlements ethnographically reported by Steggerda (1941). From this point on, Haviland uses this analogy in estimating populations at Tikal, assuming that complex households contained 3.7 couples on average and that these couples represent the nuclei of several simple families co-residing within a residential compound, each individual house occupied by a married couple with three children, or five individuals per house (Haviland 1972:136).

As Haviland had before, Puleston calculated population estimates for Tikal based on the occupation of individual houses, not residential groups, assuming that complex joint-families occupied these groups with multiple nuclear-families living in the individual structures making up the residential group. Puleston found support for this perspective in Landa’s descriptions of early historic Maya settlement and his use of the term “casa” to refer to one house within a residential patio quad (Tozzer 1941:86-87, 216 cited in Puleston 1973:176).

Reviewing the demographic data used by Haviland, Puleston (1973:173) did note that the assumed mortality rate translated to a population doubling rate every twenty
years, and that 30,000 inhabitants in A.D. 600 would reach 430,000 by A.D. 700! Puleston assumed a greater mortality rate for Tikal inhabitants suggesting that many houses would have been occupied by “unmarried adults, widows, widowers, or childless couples” (1973:173). He leaves this point open and does not return to this inherent contradiction again in his dissertation even though he finally settled on using a slightly higher average family size in constructing his own population estimates.

Puleston preferred ethnohistoric data from X-cacal Maya settlements of Central Quintana Roo, characterizing these communities as the least acculturated Maya. These nine communities were very small, with 20 – 206 inhabitants per community and an average of 6.07 inhabitants per house [range of 3.33 – 7.36] (Puleston 1973:Table II, data after Villa Rojas [1945]). However, in the final analysis, Puleston (1973:178-183) calculated an average number of individuals per house at 5.4, in lieu of 6, 5.6 or 5.0, based on Naroll’s (1962) method of calculating archaic populations from floor space. Due to perceived inaccuracies in Naroll’s data, Puleston reconstructed his own sample from ethnographic sources. He used two of Naroll’s examples as they were reported by Naroll, refined four others from Naroll’s list, and collected data on sixteen more societies himself. Four of these societies were nomadic and were eventually thrown out, leaving eighteen for comparison and statistical analysis. Puleston finally concluded that, in spite of the deficiencies in Naroll’s data, the figure of 10 m² of floor space per person was accurate (cf. Kolb 1985 [6.12 m²] and LeBlanc 1971 [7.3 m²]).

Using Naroll’s (1962) cross-cultural study as a template, Puleston (1973:188) noted that structures for cooking or storage were not included in Naroll’s calculations, just domiciles or “houses.” Using a list of accurate dimensions from 30 excavated structures at Tikal which Haviland (1963) identified as houses after horizontal excavation, Puleston calculated an average floor space of 54.1 m² per house. From this average he extrapolated a figure of 5.4 individuals per house based on the 10 m² of floor space he and Naroll had calculated from ethnographic documentation.
Having settled on the 5.4 individuals per house multiplier, Puleston proceeded to calculate the density of houses per km² from his north and south survey brecha strips. This was accomplished by first counting all mapped structures within the 5 km² of mapped and test-pitted area within the north and south survey strips. Then removing 16% of the structures as “residential adjuncts” (Haviland 1970:143), or non-domicile buildings, Puleston arrived at a total figure of 660 houses for an average density of 132 houses/km² (n=105 for the north strip; n=150 for the south strip). He then estimated the number of mounds occupied during each time period as defined by ceramic phases from Fry’s (1969) test-pitting program; for each survey block he calculated maximal numbers (Tables 3.4.1 and 3.4.2). Also of interest, unlike archaeologists at Copán and elsewhere, Puleston did not classify sites in terms of their group characteristics – Becker (2003) would bring this classification axis to the forefront slightly later.

“It is important to point out here my assumption that the percentage representation of occupation in terms of groups is equivalent to percentage representation in terms of structures. For the calculation of population density, this means we are using the maximum number of structures occupied per group in the calculations in spite of the fact that groups invariably start out with one or two structures, with others being added later.” (Puleston 1973:186)

In other words, each group which produced evidence of occupation during a specific ceramic phase was assumed to have had 84% of its structures occupied by nuclear-families during that phase. Puleston then multiplied the number of houses occupied per phase by 5.4 to arrive at a population density of 713 inhabitants per km² (1973:187-188) (Tables 3.4.3). He also extrapolated data from all six survey strips, including those areas not test-pitted, to arrive at 1,120 houses within an 11.25 km² area for an overall average of about 100 houses per km² [538 inhabitants/km²] for all surveyed portions of Tikal outside the epicenter (Figure 3.4.4). Based on data from the four radial transects within “Residential Tikal” [657 people/km²], Puleston (1973:Tables IV and V) calculated a Late Classic population of 79,168 for all of “Residential Tikal” (the 120.5 km² area within the assumed earthwork boundaries [see Puleston 1973:Figure 20], noting that this was twice Haviland’s “rock bottom” estimate of 40,000 inhabitants within
“Residential Tikal” (Haviland 1972:138) for a “median figure” of 80,000 (Puleston 1973:203). The difference between the two researchers’ figures does not rely on the individuals per house multiplier, but in the definition of “Residential Tikal,” which Haviland estimated at about 60 km² (Puleston 1073:203).

The dispersed settlement around the core of Tikal led Puleston to new questions and conclusions. Assuming a centrally located, dense population of non-food producers, a vast peripheral area was needed for the rotational swidden agricultural system which supported them. High population figures for central Tikal implied a corresponding low density peripheral support population. However, the sustaining area survey registered a relatively high peripheral population density as well, so high, in fact, that Puleston questioned the prevailing milpa model. Nonetheless, no evidence of terracing or irrigation were identified, no good evidence was found for raised-field production in bajos, and although slight improvements in yield could have been managed through hand-weeding, intercropping, and the use of manioc as a staple (Bronson 1968), there was no simply way to reason around the relatively long-fallow milpa system model (Puleston 1973:290).

With the newly documented, seemingly contiguous settlement pattern, Puleston could not identify any ‘breadbasket’ areas dedicated to the large scale agriculture necessary to support the estimated high population of non-food producers at Tikal’s core. Similarly high population densities would later be documented around the Yaxha lake area (P. Rice 1984; Rice and Rice 1979) and between Tikal and Yaxha (Ford 1981, 1986). These surveys would also provide comparative data on ceramic and lithic artifacts from areas to the southeast of Tikal.
Table 3.4.1 – Chronological occupation levels from the north and south brechas test-pitted by the Tikal Sustaining Area Project based on definite and probable categories (after Puleston 1973 based on Fry 1969).

<table>
<thead>
<tr>
<th>North Brecha:</th>
<th>Universe</th>
<th># tests</th>
<th># occ.</th>
<th>Post</th>
<th>Term.</th>
<th>Late</th>
<th>Early</th>
<th>Pre</th>
<th>totals:</th>
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<tr>
<td></td>
<td></td>
<td></td>
<td>%</td>
<td>#</td>
<td>%</td>
<td>%</td>
<td>%</td>
<td>%</td>
<td>%</td>
</tr>
<tr>
<td>N-I</td>
<td>24</td>
<td>54</td>
<td>11.0%</td>
<td>6</td>
<td>35.0%</td>
<td>19</td>
<td>43.0%</td>
<td>23</td>
<td>11.0%</td>
</tr>
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<td>N-II</td>
<td>14</td>
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<td>8.0%</td>
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<td>11</td>
<td>50.0%</td>
<td>13</td>
<td></td>
</tr>
<tr>
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<td>4</td>
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<td>9</td>
<td>41.0%</td>
<td>9</td>
<td></td>
</tr>
<tr>
<td>South Brecha:</td>
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<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>S-IV</td>
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<td>63.0%</td>
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<td>10</td>
<td>6.0%</td>
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</tr>
<tr>
<td></td>
<td>90</td>
<td>185</td>
<td>0.5%</td>
<td>1</td>
<td>14.6%</td>
<td>27</td>
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<td>66</td>
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</table>

Table 3.4.2 – Chronological occupation levels from the north and south brechas test-pitted by the Tikal Sustaining Area Project based on definite, probable and possible categories (after Puleston 1973 based on Fry 1969).

<table>
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<th>Universe</th>
<th># tests</th>
<th># occ.</th>
<th>Post</th>
<th>Term.</th>
<th>Late</th>
<th>Early</th>
<th>Pre</th>
<th>totals:</th>
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<td>#</td>
<td>%</td>
<td>%</td>
<td>%</td>
<td>%</td>
<td>%</td>
</tr>
<tr>
<td>N-I</td>
<td>24</td>
<td>69</td>
<td>14%</td>
<td>10</td>
<td>33%</td>
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<td>17%</td>
</tr>
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<td>14</td>
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<td>13%</td>
<td>4</td>
<td>42%</td>
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<td>39%</td>
<td>13</td>
<td>6%</td>
</tr>
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<td>24%</td>
<td>6</td>
<td>36%</td>
<td>9</td>
<td>36%</td>
<td>9</td>
<td>4%</td>
</tr>
<tr>
<td>South Brecha:</td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
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<td>20%</td>
<td>2</td>
<td>30%</td>
<td>3</td>
<td>50%</td>
<td>5</td>
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</tr>
<tr>
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<td>23</td>
<td>9.00%</td>
<td>2</td>
<td>35%</td>
<td>8</td>
<td>47%</td>
<td>11</td>
<td>9%</td>
</tr>
<tr>
<td>S-III</td>
<td>20</td>
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<td>35%</td>
<td>20</td>
<td>12%</td>
</tr>
<tr>
<td>S-I</td>
<td>7</td>
<td>21</td>
<td>28.5%</td>
<td>6</td>
<td>33%</td>
<td>7</td>
<td>28.5%</td>
<td>6</td>
<td>10%</td>
</tr>
<tr>
<td>overall:</td>
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<td></td>
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<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>90</td>
<td>238</td>
<td>0.8%</td>
<td>2</td>
<td>16.0%</td>
<td>38</td>
<td>35.3%</td>
<td>84</td>
<td>37.0%</td>
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</tr>
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</table>
Table 3.4.3 – Tikal Sustaining Area Project settlement dating (after Puleston 1973).

<table>
<thead>
<tr>
<th>Area</th>
<th>km²</th>
<th>Total area (km²)</th>
<th>Total residential strs. in use (density/km²)</th>
<th>Population density/km² on total area</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>PC</td>
<td>EC</td>
<td>LC</td>
</tr>
<tr>
<td>Residential Tikal</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Overall (N and S)</td>
<td></td>
<td>0.5</td>
<td>5.0</td>
<td>5.0</td>
</tr>
<tr>
<td>Late Classic (N)</td>
<td>1.0-5.0</td>
<td>2.0</td>
<td>3.0</td>
<td>449.7</td>
</tr>
<tr>
<td>Late Classic (S)</td>
<td>0.5-6.5</td>
<td>3.0</td>
<td>149.9</td>
<td>809.5</td>
</tr>
<tr>
<td>Early Classic (N)</td>
<td>1.0-5.0</td>
<td>2.0</td>
<td>204.4</td>
<td>102.2</td>
</tr>
<tr>
<td>Early Classic (S)</td>
<td>0.5-6.5</td>
<td>3.0</td>
<td>423.3</td>
<td>141.3</td>
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<tr>
<td>Preclassic (N)</td>
<td>1.0-1.0</td>
<td>0.5</td>
<td>107.3</td>
<td>214.6</td>
</tr>
<tr>
<td>Preclassic (S)</td>
<td>5.5-1.5</td>
<td>6.3</td>
<td>6.3</td>
<td>189.9</td>
</tr>
<tr>
<td>Intersite areas</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Overall (N and S)</td>
<td>10.8</td>
<td>6.3</td>
<td>6.3</td>
<td>189.9</td>
</tr>
<tr>
<td>Late Classic (N)</td>
<td>5.0-12.0</td>
<td>3.5</td>
<td>138.8</td>
<td>37.4</td>
</tr>
<tr>
<td>Late Classic (S)</td>
<td>6.5-12.0</td>
<td>2.8</td>
<td>43.8</td>
<td>15.9</td>
</tr>
<tr>
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<td>5.0-12.0</td>
<td>3.5</td>
<td>126.8</td>
<td>36.2</td>
</tr>
<tr>
<td>Early Classic (S)</td>
<td>6.5-12.0</td>
<td>2.8</td>
<td>67.2</td>
<td>24.4</td>
</tr>
<tr>
<td>Preclassic (N)</td>
<td>1.0-12.0</td>
<td>5.5</td>
<td>94.9</td>
<td>17.3</td>
</tr>
<tr>
<td>Preclassic (S)</td>
<td>1.5-12.0</td>
<td>5.3</td>
<td>95.0</td>
<td>18.1</td>
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Table 3.4.4 – Population estimates for *all* surveyed portions of Tikal outside the epicenter (after Puleston 1973).

<table>
<thead>
<tr>
<th>Survey strip</th>
<th>Residential Tikal km</th>
<th>Strs.</th>
<th>Residential Strs.</th>
<th>Area (km²)</th>
<th>Bajo (km²)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Total</td>
<td>EC</td>
<td>LC</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Total area upland</td>
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</tr>
<tr>
<td>West</td>
<td>1.0-5.5</td>
<td>213</td>
<td>178.92</td>
<td>2.25</td>
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<td></td>
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<td></td>
<td></td>
<td>0.67</td>
<td>0.67</td>
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<td>280.56</td>
<td>4.00</td>
<td>1.09</td>
</tr>
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<td></td>
<td></td>
<td>2.68</td>
<td>1.16</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td>1.52</td>
<td></td>
</tr>
<tr>
<td>North</td>
<td>1.0-5.5</td>
<td>258</td>
<td>216.72</td>
<td>2.00</td>
<td>1.69</td>
</tr>
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<td></td>
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<td>0.31</td>
<td>0.31</td>
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<tr>
<td>South</td>
<td>0.5-6.5</td>
<td>542</td>
<td>455.28</td>
<td>3.00</td>
<td>2.32</td>
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<td>1131.48</td>
<td>11.25</td>
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<td></td>
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<td>1074.9</td>
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<td>1120.2</td>
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<tr>
<td>Intersite area</td>
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<td></td>
</tr>
<tr>
<td>West</td>
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<td>1.89</td>
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<tr>
<td>N. Border</td>
<td>0.0-3.5</td>
<td>58</td>
<td>48.72</td>
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<td>1.09</td>
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<tr>
<td>Uaxactun</td>
<td>2.0-6.24</td>
<td>71</td>
<td>59.64</td>
<td>2.12</td>
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<td>Total</td>
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<td>596</td>
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* this figure is registered as 15.12 in the original, a mathematical calculation error.
This apparently high population density led Puleston (1973:287-288) to reject the swidden agriculture hypothesis in favor of arboriculture based on the breadnut or ramón tree [Brosimum alicastrum] (Puleston 1971), a suggestion which has not been sustained on multiple lines of inquiry. Households have mano and metate matched grinding stones for the processing of small grains, a shift to grinding apparatus for the processing of the larger breadfruit should be noticeable in the groundstone assemblage; isotope analysis of skeletal material indicate a reliance on maize as the dominant staple crop in Classic times (Geary and Krueger 1997; C. White 1997; Wittington and Reed 1997; L. Wright 1997); the distribution of ramón trees at Tikal probably represents their growth and reproduction requirements, not a progression of descendant populations once planted by the ancient Maya (Lambert and Arnason 1978, 1982); Classic Maya art is rife with imagery of maize, not breadnuts.

3.5 – the Tikal Artifact Catalog

“A large sample of artifacts was collected by the Tikal Project of the University of Pennsylvania Museum during its fourteen years of survey and excavation of the site. Even though it was acquired before the salutary influence of the New Archaeology, the collection is outstanding in its size, variety, and excellent documentation. What we have are the durable remnants of an assemblage of portable material culture that figured into virtually all the activities of those who once lived at Tikal.” (Moholy-Nagy 2003a:83)

Hattula Moholy-Nagy (1976, 1990, 1991, 1992, 1994, 1997, 1999, 2003a, 2003b, 2003c, 2008; Moholy Nagy et al. 1984) has been largely responsible for the publication of artifact data from Tikal. A lifetime spent working with this catalog has allowed her to evaluate the finished and fragmented forms, recovery contexts, geological sources, and distribution patterns of artifact classes from this enormous assemblage. I am most interested in the chert and obsidian recovered from Tikal, although information on jade, groundstone, hematite, pyrite, and shell also help to elucidate patterns of acquisition, manufacture, exchange, use, and discard.
Artifacts and debitage from several classes of exotic or imported materials (obsidian, jade, marine shell) initially pointed to a complex situation of raw material acquisition, production, consumption, and exchange within (and without) the Tikal polity. Concentration of these materials in the core of Tikal, by and large a function of the excavation strategy, seemed to indicate that Tikal was a trading center, a central place for the production and distribution of craft items (Moholy-Nagy 1997:296). Lesser amounts of debitage outside the epicenter suggested that manufacture of artifacts from these substances also involved inhabitants residing in the surrounding agricultural lands.

The category “debitage” is described as biface production residue from local chert nods. Large polyhedral cores of obsidian were imported primarily for blade production and ‘debitage’ here includes a greater assortment of polyhedral core forming debris. Chert is usually dominant by weight while obsidian is dominant by count of ‘pieces’ in excavations within the epicenter of Tikal. Chert is described as ubiquitous in peripheral excavation, though it was not always counted or weighed. The University of Pennsylvania Tikal project recorded\textsuperscript{14} the following lithic counts from excavations from 1956 to 1969 (Table 3.5.1).

Table 3.5.1 – Lithics recovered by the University of Pennsylvania Tikal Project, 1956-1969.

<table>
<thead>
<tr>
<th>FLAKED CHERT ARTIFACTS</th>
<th>FLAKED OBSIDIAN ARTIFACTS</th>
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<tbody>
<tr>
<td>6449</td>
<td>268</td>
</tr>
<tr>
<td>*72812</td>
<td>*1927</td>
</tr>
<tr>
<td>*3037</td>
<td>8269</td>
</tr>
<tr>
<td>*734</td>
<td>40837</td>
</tr>
<tr>
<td>Debitage</td>
<td>Other</td>
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</tbody>
</table>

\textsuperscript{14} Not all classes of Lithic material were fully recovered or recorded – these are marked with an * on the chart.
The overwhelming majority of obsidian recovered from The University of Pennsylvania excavations (approximately 56,000 pieces) relates to prismatic blade production with 98% of the recovered obsidian represented by manufactured blades,debitage, and reworked forms (Moholy-Nagy et al. 1984:105). Most obsidian recovered from Tikal is grey or black in color and was initially assumed to have come from one or more highland Guatemalan sources which lie at around 300 km distance. Some green obsidian artifacts, assumed to have been made of Pachuca obsidian from the highland Mexican source near Teotihuacán, have been recovered from all time periods at Tikal, although the intensity of green obsidian import varies temporally.

From Preclassic times, Peten centers imported obsidian from highland Guatemala, though certain centers favored specific quarries and all centers imported obsidian from multiple sources, although the percentages varied through time (Moholy-Nagy et al. 1984; Nelson 1983; Rice 1984; Rice et al. 1985). The San Martin Jilotepeque source, a series of outcrops in the Chimaltenango basin approximately 40 km northwest of the Valley of Guatemala, was the predominant obsidian source utilized in the Maya lowlands in the Middle and Late Preclassic periods (800 B.C. – A.D. 300). A shift in the focus of obsidian importation from San Martin Jilotepeque to the El Chayal source, a series of quarries and outcrops approximately 15 km north of modern day Guatemala City just north of Classic period Kaminiljuyu, began in the Late Preclassic and continued throughout the Classic Period (A.D. 300 – 950), although important sub-regional procurement patterns have been documented.

“The increase in importance of the El Chayal obsidian source [at El Mirador] during the Late Preclassic is also reflected at other important centers of Preclassic settlement in the Maya Lowlands. A similar pattern has been documented in obsidian-source data from Edzna, Becan, Tikal, Palenque, and Seibal (Nelson, Phillips, and Rubio 1983; Nelson 1985). The shift in dominance to the El Chayal source was not an even development throughout the lowlands, however, and San Martin Jilotepeque was still the major source at Seibal and Tikal and in the central Peten Lakes region during the Late Preclassic (Nelson, Sidrys, and Holmes 1978; Moholy-Nagy 1975; Moholy-Nagy, Asaro, and Stross 1984; Rice et al. 1985).” (Fowler et al 1989:161)
In the Late Classic period, the importance of the Ixtepeque source, located in eastern Guatemala, grew and continued through the Pastclassic (A.D. 950 – 1450). Hammond (1972) suspected competing trade networks with their major zone of overlap occurring in the Peten, while Stross et al. (1985) interpreted this scenario as indicative of risk management in maintaining a constant supply of the raw material coming into any given center; Rathje (1971) linked obsidian importation with elite control giving rise to social complexity. Moholy-Nagy (2003; Moholy-Nagy et al. 1984) pointed out that certain quarries could be associated with specific artifact forms, specifically noting that bifacial knapped projectile points and thin knives recovered from Tikal were most likely imported from central Mexico as finished forms.

The analysis and publication of the Tikal artifact collections have continued until present. An initial program of obsidian sourcing (Moholy-Nagy et al. 1984) set the stage for modeling procurement and exchange patterns. Source variation indicated importation of obsidian from multiple highland Guatemalan sources, as well as several Central Mexican sources, leading to speculation about trade routes and modes of economic interaction (Dreiss and Brown 1989; Moholy-Nagy 1999, 2003; Spence 1996). A later realization that several large deposits of lithic debitage represented production debris in secondary contexts led to a reevaluation of the organization of production (Moholy-Nagy 1990, 1997). Data from epicentral, central, and peripheral excavations would be evaluated in order to piece together a picture of the organization of craft production at Tikal.

Evaluating models of the organization of production would focus on the identification of “workshops,” or “workshop dumps” (Moholy-Nagy 1990, 1992). The identification the scale of production as well as where this was done and who controlled it has been discussed in press (Moholy-Nagy 1990, 1992, 1997, 2003a). I review the documentation for (primarily lithic) craft production and evaluate organizational models derived from this data in Chapter 9.
Obsidian Sourcing

Tikal obsidian artifacts have been sourced to at least ten different quarries first determined by XRF, and then confirmed by abbreviated INAA, and finally submitted to more intensive, high precision INAA measurements of 20 to 30 elements (Moholy-Nagy et al. 1984:112). Sourcing the green obsidian artifacts from Tikal to the highland Mexico Pachuca source, approximately 50 kilometers northeast of Teotihuacán, was not much of a surprise. This unique stone was always considered proof of central Mexican culture contact (Brown 1977; Clark 1986:65-67; Kidder 1947:10; Moholy-Nagy et al. 1984; Sanders 1977; Spence 1977:295, 1981:781, 1996:21-22; Stross et al. 1968). However, many of the grey and black obsidian artifacts recovered from Tikal were also found to have originated at central Mexican sources. Moholy-Nagy sums up several decades of source attribution testing as follows:

“In the late 1960s, the origin of the green obsidian found at Tikal was confirmed by trace-element analysis of prismatic blades by X-ray fluorescence (XRF) and neutron activation analysis (NAA) (Stross et al. 1968: Table 2). Additional analysis of prismatic blades, flakes, and thin bifaces (projectile points and knives) in the 1970s (Moholy-Nagy et al. 1984: Table 2) and 1980s (Moholy-Nagy and Nelson 1990:Table S) established the presence of obsidian from six additional central Mexican sources: Otumba, Mexico, represented by nine artifacts; Zaragoza, Puebla, by two; Ucareo, Michoacan, by two; probably Zinapceuaro, Michoacan, by one; Tulancingo or Pizarrin, Hidalgo, by one; and Paredon, Hidalgo, by one. These sources are used for the same types of artifacts made of Pachuca obsidian, and artifacts of Pachuca and other sources often co-occur in archaeological context. All of the Mexican sources appear to have been present during the Early Classic (Moholy-Nagy and Nelson 1990: Table 5). Obsidian from Tulancingo also is green, but of a darker, less golden color than the Pachuca obsidian and the two types of obsidian are easily determined by visual examination. Obsidian from the other Mexican sources is gray or black.” (Moholy-Nagy 1999:301-302)

The center of El Mirador in Guatemala produced three artifacts of Otumba material, two each from the Zaragoza and Ucareo sources, and one each of Zinapceuaro and Paredon materials, all dated to the Early or Middle Classic periods (Nelson and Howard 1986:Table 2; Spence 1996: 22-23). Spence (1996) has stressed the fact that we
do not know the volume of grey obsidian in the Maya lowlands which was imported from the Basin of Mexico, although XRF and INAA sourcing of grey obsidian artifacts from numerous lowland Maya centers indicates that Mexican grey obsidian may have been imported in volume equal to that of the green obsidian trade.

Instrumental Neutron Activation Analysis has shown that many black or grey obsidian artifacts recovered from Tikal were also manufactured on highland Mexican obsidian (Moholy-Nagy 1999:301-302). While the sample of artifacts of obsidian from Pachuca or other Central Mexican sources recovered by the University of Pennsylvania project numbers over 1,200 (Moholy-Nagy 1999:300), very little green Mexican obsidian appears to have been used for prismatic blade production. Only six prismatic blade cores (represented by 12 fragments) and 42 small, irregular flakes and chips, 41 of Pachuca and one of Ucareo obsidian, have been recorded (Moholy-Nagy 1999:304). Out of 21 gray obsidian cores and blades from Tikal which were sourced through compositional analysis, 18 are from Guatemalan sources and one each is from the highland Mexican sources of Otumba, Paredon, and Zaragoza (Moholy-Nagy and Nelson 1990; Moholy-Nagy et al. 1984), indicating at least some procurement of Central Mexican obsidian for blade production.

Many projectile points or thin bifaces from Tikal appear to correspond to Spence's Stemmed Biface A types found at Teotihuacán (Spence 1996:Figure 2b; Tolstoy 1971:Figure 2 and 3) on morphological grounds; these are recovered at Tikal from at least Early Classic times. Testing of 580 obsidian thin biface fragments from Tikal sourced 182 (31%) to highland Mexican sources. The Pachuca obsidian source dominates in the thin biface category, with 171 artifacts (29%) attributed to this source. The similarity in form of the Tikal artifacts to thin bifaces from highland Mexico and the positive assignment of 11 out of 13 gray thin bifaces from Tikal sourced by XRF and INAA to Mexican obsidian sources led Moholy-Nagy to speculate that nearly all examples of this artifact type may have been imported in finished from. The remaining two grey thin bifaces tested were of obsidian from the highland Guatemalan source of
Ixtpeque. It is of note that absolutely no thin biface or thin biface production debitage from the site which has been submitted to physiochemical testing has been attributed to the El Chayal source. This absence of El Chayal obsidian in thin biface production is all the more peculiar considering the extensive exploitation of this highland Guatemalan source in the prismatic blade industry of the Peten from Late Preclassic through Classic times (Moholy-Nagy et al. 1984).

“These first source analyses reinforced a preliminary impression gained from typology alone that secondarily-worked artifacts of green obsidian and of Central Mexican types, such as stemmed points or knives, rare eccentrics, and the single scraper, were probably imported in finished form. The presence of a few prismatic blade core fragments and pieces of debitage indicated that at least some green obsidian prismatic blades were made at Tikal from imported large polyhedral cores. It is possible that all of them were made there (Sheets, personal communication 1981; Sheets and Muto 1972). It was also hypothesized that grey obsidian eccentrics and incised obsidians were locally manufactured initially or ultimately from Highland Guatemalan large polyhedral cores that had been imported for the production of prismatic blades. Most Tikal eccentrics were in fact made from exhausted prismatic blade cores. During the Middle and early Late Classic periods, examples occur which were made from large flakes, macroblades, and the platforms of large polyhedral cores. Incised obsidians made on large flakes, macroblades, and large polyhedral core fragments appear to have been a Tikal specialty. With the exception of a single set from Tikal’s neighbor, Uaxactún (Kidder 1947:21–24, Figure 69), they have not been reported elsewhere.” (Moholy-Nagy et al. 1984:109)

Interestingly, there was always some overlap in source exploitation for any given artifact type. While Tikal was utilizing the El Chayal quarry primarily for prismatic blade production from imported polyhedral cores, a few blades and cores from the highland Mexican sources of Otumba, Paredon, and Zaragoza (Moholy-Nagy and Nelson 1990; Moholy-Nagy et al. 1984) as well as the green Pachuca obsidian which relates to blade manufacture were concurrently used. Two of the thirteen thin bifaces from Tikal which were made from grey obsidian were sourced to the Ixtepeque source in highland Guatemala, even if the other eleven were sourced to various Basin of Mexico sources. At Teotihuacán most thin bifaces are made from grey obsidian from highland Mexican sources and even the exportation of grey obsidian blanks for biface production has been
hypothesized (Spence 1981). Quantities of green Pachuca obsidian thin bifaces have been recovered from Tikal and the number of grey specimens which are made from highland Mexico obsidian is unknown, but suspected to be quite high.

The Ceramic Catalog

Ceramics excavated by the University of Pennsylvania Tikal Project [1956-1969] have been reported by C. C. Coggins (1975) and T. Patrick Culbert (Culbert 1993, 2003). Ceramics recovered by The Proyecto Nacional Tikal [1979-1985] under the direction of Juan Pedro Laporte have also been published (Iglesias 1988, 1996; Laporte 1988, 1989, 1995, 2000; Laporte and Fialko 1987; 1993; Laporte and Gómez 2000; Laporte, Hermes, de Zea and Iglesias 1992; Laporte and Iglesias 1992). In general, the classification of pottery from Tikal has followed established Type-Variety canons (Gifford 1960; Sabloff and Smith 1969; Smith 1955, 1971; Smith et al. 1960; Willey et al. 1965; Willey et al. 1967); although Culbert has also organized the Tikal sequence by form class (1993; see Culbert and Rands 2007).

Beyond the central collections of ceramics used to establishing the chronological framework of ceramic complexes for Tikal, these and other ceramic collections recovered from peripheral areas of the site (Fry 1969; Puleston 1973) have been analyzed in terms of production and distribution (Culbert and Schwalbe 1987; Fry 1979, 1980, 2003; Fry and Cox 1974).

3.6 – Concluding Remarks to Chapter 3

This chapter began with a synopsis of how Tikal came to the attention of academia and the general public. Large-scale excavations in the site’s core produced fantastic finds and demonstrated both the occupational time depth and the incremental architectural growth of the center and the kingdom. Long-distance importation of many
materials was apparent from the elite goods and caches recovered from the North Acropolis and the Lost World (Mundo Perdido) complexes. The recovery of jade ornaments, cinnabar, hematite, stingray spines and *spondylus* shells indicated a flourishing trade with various regions of Mesoamerica. The presence of imported stone for household manos and metates also pointed to economic interactions with distant regions (Borhegyi 1956; Rathje 1972). The application of XRF and INAA to obsidian specimens introduced an advanced technological perspective to the Tikal work, and more precisely discriminated the precise origins of this long-distance import. These studies indicated that the procurement of obsidian involved multiple sources, various sources in highland Guatemala as well as multiple sources in highland central Mexico. Not only were artifacts recognized as artistic expression and skilled craft production but as indicators of complex economic interactions between regions. Obsidian imported from highland Guatemala and from central Mexico signaled long-distance importation for a local lithic industry primarily dedicated to prismatic blade production.

The exotic materials imported into Tikal were mainly recovered from the central core, or epicenter of the site. Excavations at the more distant Group 4F-1 documented both the social rank of some residents outside the epicenter and the access they had to the trappings of elite culture. A program of excavations targeting the periphery and hinterland provided a wealth of information concerning population density, social rank, and craft production. Specialized “workshops” were identified based on high artifact counts, although none of these alleged workshops indicated specialized production within a highly efficient market-oriented system, commercially oriented toward mass production. Production within the periphery was usually described as “for exchange beyond the household,” and the domestic context of production was interpreted through a household-level industry prism. The tentative identification of a physical marketplace within the epicenter, and the recovery of large secondary context lithic debitage deposits, or “workshop dumps,” suggested that industry and exchange might have been organized at a scale beyond simple household-level exchange along kinship lines. The exotic materials recovered from the epicenter supported this interpretation of complex economic
patterns, and Tikal’s epicenter was interpreted as a major production locus, complemented by peripheral production. By the 1960s many archaeologists viewed Tikal as both a local and pan-Mesoamerican market center and a production center, befitting its status as the dominant political and administrative center of an extremely large Maya polity. This perspective emerged while effective decipherment of Maya inscriptions was still in its infancy, and before the great boom in field research at many Maya centers that began in the 1970s. Characterizations both of Tikal and the wider Maya world based on the University of Pennsylvania fieldwork thus require considerable refinement and reconsideration.

As the first large-scale, long-term investigation of a Classic Maya center, the Tikal data must be compared with data from other investigations of Classic Maya centers that were conducted during a different era of research. Physical craft production loci were rarely encountered by the University of Pennsylvania Tikal Project, and both the epicentral obsidian “workshop dumps” and the production evidence from peripheral and hinterland excavations are difficult to evaluate mainly because of the nature of the recovery program. Epicentral craft debitage was not directly associated with architectural compounds or workshop areas, leaving the organization of production obscure. Peripheral and hinterland evidence of production come from either trenching structure mounds or from test pit excavations. Even the peripheral groups investigated were very close to the epicentral precinct; there have been no horizontal excavations of residential groups more than 2 km from the epicenter.

While investigations beyond the central monumental architectural precinct at Tikal were revolutionary in scope for their day, unfortunately they were never continued into the 1970s through 2000s. The archaeological investigation of Tikal has regretfully been neglected by subsequent generations of archaeologists. My dissertation relies heavily on discussions of and comparisons with the University of Pennsylvania published data, data that is often difficult to interpret solely because it was collected during the incipient era of Classic Maya archaeological investigations. In light of these difficulties,
I have spent considerable space reviewing these data and the theories and models they have given rise to.
Chapter 4 - Tikal’s Place in Anthropological Theory

4.1 – Early Models of Maya Social, Political, and Economic Organization

The conclusions of the University of Pennsylvania’s Project at Tikal can be compared to and contrasted against both previous and subsequent reconstructions. Over time, academic thought concerning Classic Maya social, political, and economic organization has evolved. Often, this has included reviewing and reevaluating older hypotheses. As stances on the Classic Maya tend to be cyclical over time with older theories coming back into vogue with a new generation of researchers, the next section reviews some seminal hypotheses and models in order to put these fundamental theoretical building blocks within a historical framework. The remainder of Chapter 4 situates Tikal within the general anthropological theory of the Classic Maya and complex society in general.

Primary Production

Agrarian societies are built upon the primary production of foodstuffs and domestic necessities such as basic tools or craft items and any economic analysis of complex agrarian society should begin with an evaluation of agriculture (e.g., Ford 1934). Edward Higbee (1948) stressed that the Maya of the Tikal peripheries were not engaged in commercial agriculture; production for export was not a dominant feature of their economy, and farming was sustained through a household-based system of extensive rotational agriculture. These fundamental viewpoints are often dismissed today by researchers faced with newly acquired, seemingly contradictory data and anxious to prove the sophistication and ‘complexity’ of the Classic Maya in opposition of previous generations of theorists.
“Sometimes it is forgotten that the Maya, who were predominantly a rural people, were not engaged in commercial agriculture. They had no foreign markets to supply, no large urban populations that were purchasers of food. Crops were grown primarily to provide subsistence for the tiller’s family and to pay his taxes. These taxes were parts of his harvest that the state collected to support civic and religious dignitaries and their retinues of officials, artisans, and servants. Tikal was not an urban center in the modern sense, not a place where large masses of the population lived the year round.” (Higbee 1948:458)

Of course, Higbee is also implying a ceremonial center model, perhaps with influxes of peripheral inhabitants at festival times. Robert Rands (1967) considered ceremonial center ‘allegiance’ and the possibility that a central market, periodic festivals, or regional fairs acted to consolidate society in his discussion of ceramic exchange in the Palenque region when he began testing his inward- and outward-looking models. Rands’ model was highly influential on Robert Fry’s studies of ceramic exchange at Tikal (Fry 1979, 1980; Fry and Cox 1974).

Higbee viewed the ecology and environment of the Peten as conducive to extensive agriculture and moderately dense settlement. His viewpoint also predicts the “sustaining area” model of William Haviland (1970) and Dennis Puleston (1973, 1983) for Tikal – a general framework with great merit to this day.

“The landscape of southern Yucatan, particularly the area about Tikal, has a feature that made it especially attractive to primitive man. A profusion of little ponds, aguadas, dot the countryside. They are seldom more than a few miles apart, and in between them most of the soils are well drained. This splendid mosaic of aguadas and arable land made the region suitable for concentrated settlement…To recognize the significance of aguada distribution around Tikal is to appreciate why it was so desirable a site for the development of the first great city of the Old Mayan Empire. A broad hinterland could be occupied!” (Higbee 1948:459)

Viewing Tikal as the capital city of a unified Maya empire (as was commonly asserted in the era), Higbee explained how an extensive shifting agriculture system (swidden) might have been practiced in the Peten under a fairly low population density [28 persons per km²]. Michael Coe (1961) appears to have envisioned a similar scale for
the Mayan “empire” when he originally compared the settlement pattern of the southern Maya lowlands to that of the Khmer empire of Cambodia centered on the capital of Angkor, a low-density city at the heart of a great sustaining area (M. D. Coe and Coe 1957; M. D. Coe 1961). Higbee continues to hypothetically reconstruct Classic Maya sociopolitical structure based in capital centers with supporting peripheries and hinterlands.

“If half a million people occupied an area about Tikal as little as 60 miles in radius, they could have had nearly 15 acres of land per capita. Sixty miles is simply a suggestion. They probably utilized a larger area – more intensively near the city, less intensively toward the periphery...The primary considerations were land and water, and these were available in all directions. Even people on the periphery could carry their food supplies and tax assessments to the city in three or four days.” (Higbee 1948:460)

The major flaw in Higbee’s model is the apparent absence of other centers of various sizes within this great sustaining area, a situation that would be more fully documented in the coming decades, and lead to models based in greater societal and political complexity involving a greater degree of administrative competition by various centers. Higbee believed that the Classic Maya of the Peten employed a long fallow system of 30-45 years or more combined with quite low population densities [28/km² overall]. If we replace the long fallow variable of his equation with a shorter fallow, say 2:10 or 2:12, then the overall population supported within his 60 mile (ca. 100 km) radius could have been 3 or 4 times as great – perhaps 84-112 persons/km². However, the population of the Peten is not evenly distributed, there are concentrations of monumental architecture indicating greater population densities and focal points of social activity; some authors believe that this pattern demonstrates a complex political hierarchy. It should not be forgotten that not all parts of this landscape are cultivable or of the same productive capacity. Roughly 40% of the landscape is covered by seasonally inundated lowland, or bajo, area (although this may be the cultivation area) and 60% upslope, although this is just an average for the Peten and subregional variation from these averages is substantial (Griffin 2012). There is a consistent correlation between uplands
and residential compounds (see Puleston 1983:Tables 17-19); bajo lands are typically devoid of settlement.

Betty Meggers’ (1954) asserted that Maya civilization was introduced into the Lowlands and that the subsistence base of the Classic Maya (swidden agriculture) was insufficient to have supported the development of an occupational division of labor. William R. Coe (1957) challenged this view by citing agricultural studies demonstrating the effective ‘surplus’-generating potential of slash-and-burn farming. He noted that Morley (1947:154) had demonstrated how Yucatecan farmers working 190 days on 10-12 acres were producing twice the annually needed maize for a family; Emerson and Kempton (1935:140) had reported a marketable surplus of 20% that could be maintained for long periods of time, suggesting that this could also be increased because much land could be brought under cultivation. Cautious of overstating ethnographic analogies, W. R. Coe mentioned that the Peten, in Classic times, might have been as productive as the Yucatan peninsula was in the twentieth century, permitting the generation of agricultural surpluses leading to the development of a division of labor. This comparison is all the more meaningful in light of the current trend of characterizing the Peten as a more fertile agricultural area with greater yields per hectare possible than on the thin soils of the northern Yucatan.

“In Classic times, far to the south, individual acreage and production might not have been the same. But still, considerable free time was there to be utilized by the priests. A good degree of surplus is also suggested for the maintenance of artisans and other specialists.” (W. R. Coe 1957:333)

Another well-cited early agricultural study (U. Cowgill 1960, 1962) demonstrated that swidden agriculture in the Peten could have supported population densities around 60 persons/km². By the same logic, rough estimates of agricultural potential under a medium fallow system (i.e., 2:10 or 2:12) could have supported around 108 persons/km² in the peripheries of Tikal (see Webster et al. 2008). It was clear by at least the 1960s that primary production by swidden farming could sustain a considerable population, with population densities high enough for the emergence of non-agricultural specialists,
as well as taxation in staple grain permitting the development of an elite class. Milton Altschuler (1958) also rejected Meggers’ hypothesis or ‘law’ based on the *sui generis* development of the Classic Maya, within limits.

“[W. R.] Coe’s statement that the ‘Lowland Mayan accomplishments deserve to stand as an impressive rejection of the ‘Law of Environmental Limitation on Culture’;’ can perhaps be modified. While Meggers’ environmental determinism is clearly untenable, it would appear that the limits of environmental probabilism are quite applicable. The Classic Maya are a special case of environmental limitation.” (Altschuler 1958:196)

Higbee appears to be one of the earliest writers to reasonably balance agricultural potential with population densities under a swidden system. Interestingly, he does suggest that agricultural production would have been more intensive near great centers like Tikal, less so at the peripheries. This is also in line with more recent thought on the management of land within a permanently settled region such as Tikal and its peripheries and hinterlands. Caracol has been described as a ‘garden city’ (A. Chase and D. Chase 1987:53) with agriculture practiced throughout the settlement, not just outside the most densely populated core. Studies of the African Kofyar and Swiss Törbel communities demonstrate that smallholders in different parts of the world will also switch from intensive household techniques to swiddening on the peripheries as a logical management tactic (Netting 1965, 1984, 1993; Stone 1991; Stone et al. 1984, 1990). Even if fairly dense populations could be sustained in the tropical forest setting of the Maya lowlands, Higbee asked if agricultural development would have supported permanent trade and industry.

“Modern man is a specialist. He depends on others for most of the things and services he requires. As his world has become more complex, he himself has become more and more of an ignoramus except in his chosen craft. The community life of the Maya was simple, but the individual had to be both a jack of all trades and a master of them to survive.” (Higbee 1948:462)

Higbee was pointing out that the Maya were household based and that production was usually on the household level. Specialization, as in the sub-dividing of specific
tasks, was underdeveloped and individuals did not specialize in one or a few tasks. Instead, much production was more generalized and for household use rather than geared toward mass production and exchange. Within a large area of relatively homogenous resources and few transportation improvements, interrelated communities with distinct specializations did not develop in the Peten. This perspective was contradicted by other researchers (cf. Borhegyi 1956, Miles 1957) who generated models of sociopolitical and economic organization based on ethnographic research (i.e., Armillas 1948; LaFarge 1940; Redfield 1940, 1941, 1947; Tax 1941; Termer 1951; J. E. S. Thompson 1943, 1954).

The generally positive and respectful tone of Higbee’s early article reminds us that the achievements of the Classic Maya are a testament to the human propensity for complex cultural evolution in any environment, even a tropical forest one. These achievements and developments within the Peten should be viewed within the context of societal development and longevity, as a relationship between humans and the environments.

“For anyone capable of living without money, of spinning and weaving his own cloth, of hunting with a blowgun, and fishing with a spear, of making his own pottery and brewing his own medicinal teas from wild herbs, these regions are still the land of agricultural opportunity they were in [Classic] Mayan times.” (Higbee 1948:463)

This does bring us back to the enigma of the large Peten centers and why they developed. Large centers were certainly not necessary for the basic survival of agriculturalists, so what advantages did they provide, and to whom? How developed was the “class” system of the ancient Maya, if indeed they had such a system? Were large central markets necessary to provision an elite segment of society? Did the majority of rural farmers funnel foodstuffs and craft items into a market system through local peripheral marketplaces? While smallholder agriculture could have supported largely self-sufficient households, these same households might also have utilized a market
system to convert surplus crops into other goods. This would have been possible and logical whether or not a strong centralized government had developed.

“Mayan agriculture practices, by their very nature, did not involve the necessary development of central control for their ordinary operation. Such administration as was needed was probably done on a kinship base, either through the family or lineage heads. Construction of the many religious city centers required some form of governmental authority for obvious reasons. But governmental authority per se does not necessarily imply a state organization with a politically structured class society.” (Altschuler 1958:194)

**Societal Complexity**

In his early article entitled, “Social Typology and the Tropical Forest Civilizations,” Michael D. Coe (1961) explains Classic Maya (and Khmer) social and economic organization in terms of cultural evolution and cultural ecology. Borrowing from the theories of Durkheim and Mauss, Coe attempts to explain why “civilizations without cities,” including the Classic Maya, did not develop into societies with a greater division of labor necessitating urban centers facilitating greater marketplace exchange. As Coe reads Durkheim, societies have always followed two broad types of solidarity, termed ‘mechanical solidarity’ and ‘organic solidarity.’ Mechanical solidarity refers to the essentially undifferentiated status of individuals, or segments of society (i.e., clans or lineages) “bound up under a single moral system,” “collective consciousness,” or “religion of the people.” Organic solidarity has arisen from formerly undifferentiated segments acting as “organs” within a society where the division of labor has made them functionally interdependent rather than redundant.

“[Durkheim] maintained that there has been throughout history a definite evolutionary trend from the one to the other, beginning with the primitive, almost completely undifferentiated horde, through segmental societies which are nevertheless still mechanical, into truly organic societies based upon the division of labor.” (M. D. Coe 1961:65)
This suggests that societies move from less complex kinship based structures into more evolved forms where a greater division of labor promotes secular exchange. However, Coe emphasizes that the exchange of ceremonial or prestige items may be quite complex and act to bring societies into organic cohesion as well.

“In [Marcel Mauss’] cross-cultural study of prestation, he demonstrated that the seemingly useless exchanges of gifts or competitive banquets in native societies (such as the kula of the Trobrianders or potlatch of the Northwest Coast tribes) actually play an overwhelmingly important role in these societies. That is, organic solidarity is brought about by the exchange of goods which often seem to bind even distant peoples into a single system of reciprocity.” (M. D. Coe 1961:66)

Michael D. Coe appears to have been following a strict elite/commoner or priest/peasant model in which little or no social ranking beyond the two-class system had developed in Classic Maya society, a model now considered quite simplistic, unrealistic, and outdated. Even in the 1960s a few authors were already proposing that the Classic lowland Maya were socially and politically (and by extension, economically) organized in a hierarchical fashion, not just as a mass of farmers subservient to one or a few religious leaders, as the ceremonial center model predicted (e.g., Morley and Brainerd 1956; O. G. Ricketson 1937:15; J. E. S. Thompson 1927, 1931, 1950, 1954, see Becker 1976 for a review of the history of this model). A dominant motivation behind the large scale archaeological project at Tikal in the 1950s and 1960s was to investigate the “hierarchic” aspects of Classic Maya society (W. R. Coe 1962). Some even saw a division of labor indicative of organic solidarity in the distribution of imported obsidian, volcanic stone (for manos/metates), and marine shell recovered at Classic Maya centers (Borhegyi 1956:349), as Rathje (1971, 1972) would later emphatically argue. In fact, the consumption of goods made from raw materials of distant origin was a major influence in accepting the view of more social and institutional complexity for the Classic Maya.

In 1961, before the decipherment of the majority of the Classic Mayan hieroglyphic corpus, Michael D. Coe suggested that Maya centers were, in fact, cult centers with the southern lowlands forming a vast unified Maya state or empire ruled by a
single suzerain living at Tikal (M. D. Coe 1961:76). A few years earlier, J. E. S. Thompson (1954:81) had opined that the Maya lowlands “represented a loose federation of autonomous city states, each governed by a small quasi-religious minority of priests and nobles” (quoted in Mann 1973:227). Thompson still viewed Classic Maya society in terms of two classes, a small ruling elite supported by a mass of farmers, or a predominantly folk class. By the mid-1960s William Haviland characterized Tikal as a complex functioning center (see Haviland 1966), not at all equivalent with the cargo or ceremonial center models of the Harvard School (i.e., Bullard 1960, 1964; Thompson 1927, 1931, 1954; Vogt 1961, 1969; Willey 1956). Out of these two perspectives grew a more modern view of Classic Maya society – without ever consolidating into an empire, some lowland centers of the Classic period were large polities, certainly civic-ceremonial centers or regal-ritual cities, but probably much more than this (Haviland 1966:627) and possibly the centers of bureaucratic states (A. Chase and D. Chase 1996; D. Chase, A. Chase, and Haviland 1990; Culbert et al. 1990; Folan 1992; Folan, Marcus, and Miller 1995; Folan et al. 2008; Marcus 1973, 1976, 1983, 1993; Haviland 1992, 1997; Martin and Grube 1995).

Michael D. Coe (and William Sanders and Barbara Price [1968] among others), contrasted the degree of urbanization achieved by the Central Mexican centers and those that developed in the Maya Lowlands. Coe equated urbanism with social classes and administration, but also with merchants, which he saw growing out of the regional differences in ecology and productive capacity. Many researchers today continue to compare and contrast the development of Central Mexican urbanism and social organization with that of the lowland Classic Maya.

“‘The capital of the Aztec Empire, Tenochtitlan, was urban in every sense of the word. It was a huge city of priests, politicians, artisans, and traders. Irrigation may have contributed to urbanism in the valley of Mexico, but the evidence indicates that such concentrations of full-time merchant specialists were a function of large-scale trade resulting from regional differentiation of products and ease of transportation. In the Durkheimian sense, the urban civilizations of the Mexican highlands were organic… In contrast [to Mechanical societies, i.e., the Classic Maya], the organic civilizations were characterized by urban
concentrations of merchants and administrators, surrounded by peasant farmers, and organized into a state in which the most rich and powerful of a number of crystallizing social classes selected or controlled the ruler." (M. D. Coe 1961:68, 83)

The Aztec capital was certainly favorably situated in respect to water transport and chinampa fields which grew a wide variety of complementary crops year-round, permitting surplus food to be exchanged for crafts and services provided by urban non-food producers. At the same time that a huge population of farmers supported this urban development, rural lives remained virtually unchanged and local concerns continued to dominate folk ideology more so than concerns with the central government, exchange rates, or infrastructure building. Stephen de Borhegyi (1956) accepted the possibility of a monetized economy for the Classic Maya with long-distance traders, but felt that this did not affect the basic householding practices of the numerically dominant folk class.

“While a money economy (if cacao beans were really such) and a widespread system of organized trade was well received by most members of the folk culture by virtue of their impersonal nature they left unchanged the basic folk mentality.” (Borhegyi 1956:354)

The introduction of “money” does not necessarily bring about great changes in society, or affect all segments of society equally. Even in Ptolemaic Egypt of the third century B.C., monetization of the economy did not greatly affect the folk agriculturalists’ way of life. Even mandatory corvée labor requirements by the state only changed slightly in form. Taxes required in coin urged residents to participate in local public works programs for a portion of the year in order to earn money to pay the newly introduced salt-tax. The basic structure of household sufficiency of the general populous and the state labor demands remained about the same, taxation in money was an innovation for the benefit of the elite and the government; it did not change the average citizens’ daily life in any revolutionary way.
“Moreover, the salt-tax was collected by the household... The means of paying the salt-tax was normally earned through wages, and it was used by the administration locally for public work, especially the maintenance of the irrigation and drainage network. It was a small monetary cycle in which people were paid with the tax money collected from them. (Von Reden 2007:65)

Basing his analysis solely on work from highland Maya sites (as Gordon Willey [1956] pointed out long ago), Stephen de Borhegyi (1956) discussed the Classic Maya in terms of folk and urban segments which formed one whole society. Perhaps he overstated the social gulf which separated the two segments of Classic society, as well as the scale of trade, but his comments remain a good barometer of academic thought on the subject of trade and societal complexity as it stood in the 1950s. Of course, in 1956, the archaeological information with which to evaluate ancient organizational features was notably sparse, especially for the large lowland centers which Borhegyi effectively ignored in his analysis. He also largely derived his model of Classic Maya economic organization from the ethnographic reporting on modern Guatemalan communities, projecting these patterns onto the past.

“Regional division of labor must have been quite extensive because some areas show craft centers where one type of pottery or artifact was made to the exclusion of others. In order that these regional products could be traded from one area to another, organized transportation and the building of road networks became important. As trade increased the highly-prized self-sufficiency of the village units was gradually sacrificed and the villagers became dependent upon many imported goods which were no longer luxury objects but vital necessities in the changed village life.” (Borhegyi 1956:349)

Borhegyi mentions obsidian, volcanic stone for corn grinders, and marine shell as examples of these luxury items turned everyday necessities. Given his dichotomous view of folk versus ‘urban’ populations, marine shell seems an odd ‘commodity’ to put on this list. Many researchers today would now stress the highly skewed distribution of obsidian and shell artifacts; the majority of these exotic substances found their way into the hands of the elite segment of Classic Maya society and did not trickle down to the folk component in sufficient quantities to be called ‘necessities.’ Obsidian is a particularly tricky raw material to evaluate in this context, evincing difficult to interpret distribution
patterns. Large deposits of eccentric forms and “debitage” are predominantly recovered from epicentral caches while obsidian blades are recovered from all residential sites, although the density of obsidian decreases drastically with distance from a center into the periphery and further into hinterland areas (Rice 1984; Sidrys 1976). Even so, in Borhegyi’s day, the importation of materials from hundreds of kilometers away was read as an indication of well organized, large-scale trade operations, which he suspected grew in scale as a function of population growth (Borhegyi 1956:349). Aware of Sol Tax’s (1941) ethnographic work with contemporary Maya from the highlands of Guatemala, Borhegyi concluded that the folk component of Classic Maya society must have thrived within a system of marketplace exchange, with the possible concomitants of universal money and transportation improvements.

“The plazas within the ceremonial centers must have been the scene of regular market gatherings. Although there is no direct evidence of the existence of a form of currency at this time, some standardized medium of exchange may have been devised to facilitate the many and varied trading and marketing activities.” (Borhegyi 1956:349)

Addressing Borhegyi’s (1956) belief that Mayas formed a strictly two class society, folk and elite, Gordon Willey argued that settlement excavations in the lowlands were supporting a different interpretation of the non-elite or commoner class.

“The British Honduras occurrence of these [luxury] items in what is clearly a rural context, several miles from a ceremonial center of any size or significance, suggests that these people were, in Redfield’s (1953:31) definition of the term, ‘peasant’ rather than ‘folk.’ They were, moreover, a peasantry participating in an appreciable amount of the wealth and, perhaps, the ideology of the associated urban culture of the time…All of these British Honduras discoveries add up, I think, to a conception of a Maya peasant class that was reasonably prosperous and participating in a cultural tradition not markedly apart from the inhabitants of the great religious centers.” (Willey 1956:779)

In 1965, Michael Coe hit upon a false dichotomy between ‘tribal’ or ‘clan’ organization and territorial loyalty without kinship affiliations in archaic states (M. D. Coe 1965:98), a possibility that Haviland (1997) emphasizes as well.
“The probability of a third social type lying between ‘societas’ and ‘civitas’ has often been overlooked, namely, that of the primitive state in which political power has been constructed out of already existing and far older social units based upon kinship, as in some of the urbanized kingdoms of western Africa.” (M. D. Coe 1965:98)

Comparing the social organization of the Classic lowland Maya to that of the Postclassic Chontal Maya of the sixteenth century, M. D. Coe suggested that even the largest of the lowland Maya centers of the Classic period might have been organized within a ‘community,’ or ‘cargo’ model; a model that Haviland effectively dismissed in 1966, when he replied that archaeological investigations at Tikal had documented tombs and monuments probably relating to a hereditary ruling class.

“As for the possible sociopolitical structure of the Classic Maya, I see no reason why a great ceremonial center like Tikal, along with its supporting district…could not have been organized along the lines of the Chontal Maya dispersed center, with four major divisions made up of endogamous wards, the wards comprised of exogamous patriline.” (M. D. Coe 1965:110)

This relates back to M. D. Coe’s (1961) ideas concerning social organization along Durkheim’s mechanical or organic solidarity trajectories. Specifically, how did the central governing body of a Classic Maya center maintain control over a folk or peasant population dispersed throughout the center’s periphery? The structure and organization of political control and economic exchange throughout dispersed agrarian communities in the Classic Maya lowlands is a reoccurring theme. M. Coe’s solution was to borrow a cargo model of rotational political office holding from ethnographic accounts of modern Maya.

“I would like to point out that the community model proposed here is relevant to the problem of how a society with an unusually dispersed settlement pattern might have maintained its social and political cohesion.” (M. D. Coe 1965:112)
Making an analogy between the Classic Maya and the contact period Pokom Maya of the later part of the sixteenth century, Miles (1957) equated the settlement patterns of the Classic and Late Postclassic versions of the Maya with a common social structure, which included a large court apparatus, a feudal power hierarchy, and marketplaces. This reconstruction is much closer to the accepted consensus today, though again based on a Postclassic Maya analogy with the Classic Maya.

“The lord and his appointed officers were supported by regular taxes in kind from every citizen – so much in so many days. His household received in addition direct income in kind from the lord’s lands cultivated by his slaves…The form of power hierarchy in a province is reminiscent of Western Europe in the 800-900’s and is essentially feudal in style. The relationship between the supreme lord of the province and the secondary and tertiary lords was expressed in the use of kinship terms…Markets were large and included basic necessities as well as luxuries, locally produced as well as imported from Tehuantepeque, the Atlantic and Pacific slopes. Exchanges were standardized and markets were presided over by appointed officials to insure standards of quality and fair value.” (Miles 1957:241, 242)

Contra Borhegyi (1956), Miles (1957) saw no great distinction between the ‘urban’ and folk segments of Maya society in terms of world view or everyday life. Miles was speaking of ‘towns,’ or civic centers with populations in the 3000-10,000 range, with an equivalent number of rural farmers living in surrounding small villages and hamlets.

“There is no evidence that their [rural farmers’] activities, opportunities, and point of view were such as to differentiate them as folk or peasants contrasting with the town dwellers.” (Miles 1957:243)

Obviously, analogies between Classic Maya social organization and other Maya or non-Maya settlement patterns will be greatly influenced by the group which any given author decides to use for comparison. Some models will be rejected based on newer survey, excavation, and epigraphic data. The cargo model had great support until hereditary dynastic lines were clearly documented through the epigraphic study of monuments (e.g.; Proskouriakoff 1960, 1963, 1964).
“The scraps of information from the Maya Lowland murals and surveys strongly suggest the early and continued existence of an arrangement of population with relation to the ceremonial-civic center which resembles the town pattern of the 16th century Highland Pokom. It raises the question of whether the extended boundary town with a central concentration of people and outlying dependent settlements is not a very widespread pattern with ancient beginnings and great durability in Maya history.” (Miles 1957:246)

The concept of a center with a surrounding sustaining area is commonly accepted for most if not all Classic Maya polities, but just how this symbiotic relationship was organized through social and economic institutions is still hotly debated. With increasing population size, new institutions and increased complexity are possible, probable, and expected. Miles himself noted that the settlement pattern reported by Ricketson and Ricketson (1937) for Uaxactun was a “special pattern,” adding that many subdivisions within the basic pattern which he proposed to be universal among the Maya would eventually be distinguished after further excavation and archaeological publication.

Large scale investigations at Tikal conducted by the University of Pennsylvania would be instrumental in challenging, modifying, and dismissing earlier theories based in analogy and/or a good dose of speculation. However, many fundamental issues raised during this time period continue to be debated, and unambiguous data are often still lacking.

4.2 – Archaeological Investigations and Tikal’s Changing Place in Anthropological Reconstructions

“There can be no doubt that Tikal was a ceremonial center. At the same time, it was indisputably more than this.” (Haviland 1966:627)

By 1966, William Haviland had concluded that Tikal had hereditary rulers, long-distance trade, and specialized production. He also read the archaeological evidence to indicate that palace-type structures in central Tikal were occupied on a full-time basis by elites, that the ‘sustaining area’ around the center had supported the central inhabitants,
and that the epicenter was likely a market or fair center which drew in peripheral inhabitants frequently. He was convinced that Tikal was not the ceremonial center proposed by the Harvard school, or the community center for a small chiefdom.

This was in sharp contrast to the impressions formulated by other scholars (e.g., M. D. Coe 1965; Sanders 1962a, 1962b, 1963; Sanders and Price 1968) who were not as intimately familiar with the archaeology of Tikal as Haviland was. Constantly confronted with unexpected evidence supporting higher than anticipated population densities, centralized political control, long-distance trade, specialized production, and efficient distribution, Haviland continually brought these findings to the attention of the broader archaeological community. He also interpreted such evidence within a cultural anthropology mindset and societal complexity framework.

The single greatest factor influencing anthropological thought about Tikal in the 1960s and 1970s seems to have been the growing evidence of high population estimates in the area around the architectural core of the center. Haviland estimated 10,000 inhabitants within the 16 km² of the Tikal map for an average population density of 750 persons/km², but raised this estimate by 10,000-11,000 persons within the sustaining area to reach a total population of 20,000-22,000 inhabitants for Late Classic Tikal (1966:627-628). In 1969, Haviland calculated that a central zone of 63.59 km² had an average population density of 600 persons/km², so there were 39,000 inhabitants within this area of heavy settlement. To this he added a peripheral zone of 99.19 km², with average population density of 100 inhabitants/km², arriving at a total population of 49,000 inhabitants for the site [162.78 km²].

In 1970, Haviland changed his estimated size of the site from 162.78 km² to 123 km², based on survey data and the north and south earthworks as defining territorial markers; subsequently, the 123 km² was slightly lowered, to 120.5 km² (Haviland 1978:180) based on Puleston’s calculations (1973:206-207). The 1970 (or 1978) calculations removed approximately 40 km² from the peripheral area, calculated at a
density of 100 inhabitants/km², or 4000 persons. This brought the Late Classic population of the site of Tikal from 49,000 to 45,000, an estimate that Haviland has maintained as a minimal estimate for Late Classic Tikal (A.D. 700) ever since (2003:129, 2008:279).

Puleston (1973:206-207) calculated the site of Tikal at 120.5 km² between the northern and southern earthworks. Using a figure of 7863 inhabitants for the central 9 km² Tikal map originally calculated by Haviland (1965), he calculated 58,314 inhabitants for the remaining 111.5 km² territory delimited by earthworks and bajos to come to an overall figure of 66,177 for Late Classic central Tikal and its immediate peripheries. Puleston also provided a range of estimates based on slight modifications of his calculation method: 65,000-80,000 for 120.5 km² area (542-667 inhabitants per km²). Haviland’s (and by extension, Puleston’s) calculation does not include the architectural core of Tikal, which covers roughly 4 km². Although this core includes palace-type residences (Harrison 1968:172, 1970; Haviland 1969, 1970), their populations were omitted just to be safe.

Culbert et al. (1990:116-117) estimate the Late Classic population at Tikal within the central 9 km² at 8300 (922 inhabitants/km²); the next 7 km² at 4975 (711 inhabitants/km²); and the remaining 104 km² at 45,720 (440 inhabitants/km²). The total population for the 120 km² area is thus 58,995, to which several thousand persons are added to account for the large range structures (i.e.; palaces) at the site core for a grand total of about 62,000 persons. Based on a 10 km radius from the center of Tikal, Culbert et al. estimate the size of the site at 314 km². After subtracting the previously calculated 120 km² area from the 314 km² total area, the remaining 194 km² of “rural” occupation was calculated as carrying another 29,695 inhabitants based on the 39 structure per km² figure from Puleston’s dissertation (1973). This brought the Late Classic population of a 314 km² Tikal to a grand total of about 92,000 inhabitants. Although Haviland did not specify a radius of control for the Tikal state, he seems to have envisioned a similar sized
“rural” area when he wrote that Tikal had a ca. 50,000 population “with at least that many more in the surrounding countryside” (1992:937).

Culbert et al. (1990) believe that the 39 structures per km² figure calculated by Puleston is too low, and probably represents sampling bias along the radial transects which “intersected an atypically large amount of bajo to the west and north.” Webster et al. (2004:16) report 53 structures per km² along their northern earthwork corridor and 474 structures for the entire 7 km² of peripheral settlement mapped by their project (2007:51-52). Using these structure counts (53 or 67) in lieu of the 39 structures/km² figure produce even higher population estimates for the “rural” sector of Tikal: 40,305 or 50,952 for the 194 km² “rural” area; 102,305 or 112,952 for the total 314 km² area of Tikal.

Culbert et al. (1990:117) also make a distinction between the site of Tikal and the state of Tikal. They estimate a radius of 25 km as the political realm controlled by the Tikal polity. Employing a standard 50 structures per km², based on surveys within the 25 km radius (Ford 1986; D. Rice and P. Rice 1990), they conclude that the minimal state of Tikal was inhabited by over 425,000 persons. This is a minimal estimate, given that major centers (Uaxactun, Yaxha) and minor centers (Jimbal, Ramonal/Chalpate) of higher population density are situated inside this alleged political realm.

Haviland’s population estimates, and those of Puleston, Culbert, and others, are consistently based on the territory within the limits of Tikal’s earthworks that Puleston referred to as “Residential Tikal” (see Puleston 1973, 1983; Puleston and Callender 1967). A recent remapping project has demonstrated that the earthworks delimit an area closer to 200 km² (Webster et al. 2007:59), a territory much larger than the 120.5 km² area traditionally used to calculate the size of Tikal and reconstruct the various population estimates (Webster et al. 2004; Webster et al. 2007). Aside from the territorial extent of residential Tikal, several other factors greatly influence the various population estimates. First, these estimates are all calculated for the demographic peak at
Tikal in Imix times (A.D. 700 – 850), a time when the earthworks may not have influenced Tikal’s settlement (see Webster et al. 2007:55-56). The number of structures inhabited at each group (i.e., houses), the average family size postulated for each house, and the contemporaneous habitation of all groups in Imix times are also factors influencing population estimates.

Beyond population density, Haviland’s (1966, 1969, 1970, 1978) argument for viewing Tikal as an “urban” center rested on the percentage of specialist craft producers residing within Tikal. As settlement survey documented a high population density beyond the central 16 km² map of Tikal, it was realized that any ‘periphery’ continued much further out from the epicenter than previously anticipated. Viewed as a single community, Tikal must have consisted of two basic zones differentiated by population density: a more densely populated central/peripheral area, and a lesser density hinterland. Excavations inside and outside the 16 km² area of Central Tikal documented debitage interpreted as workshop debris indicative of specialized production. Published works by Adams (1970) Becker (1973a, 1973b) and Haviland (1966, 1974, 1978) either documented debitage or tools indicative of production, or inferred other specialized occupations, included woodworkers, potters, monument carvers, stoneworkers, stucco workers, architects, and dentists.

Barbara Price (1977, 1978) criticized Haviland’s interpretation of Tikal as “urban” based on then available data for population density and occupational specialization. Price believed that the dispersed settlement pattern was indicative of multiple communities around the ceremonial core of Tikal and saw no reason to consider this area as a single center; likewise, no urban core was present because nucleation of settlement had never become sufficiently dense. Price compared the degree of nucleation at Tikal to centers in central Mexico (Teotihuacán, Tenochtitlan) concluding that Tikal was not nucleated enough to be considered urban. In Price’s evaluation of the urban nature of Tikal (and other Mesoamerican centers), heavy consideration was placed on the number of specialist craft producers in comparison to the overall population.
“Adams (1970) has documented the range of probable economic specialists in Classic Maya society. Compared, however, to Teotihuacán, or to documentary material for the Aztec in Central Mexico, there is a strangely fugitive quality about much of this evidence. In Central Mexico the evidence of craft specialization is so abundant, so obvious, that it shows up overtly in a multitude of contexts – so many, in fact, that it evidently permeated most aspects of the productive system.” (Price 1977:217)

Price (1977, 1978) viewed occupational specialization as a necessary component of urban development, but not necessarily proof of its existence. She was careful to explain that population growth, nucleation, and the proliferation of specialist production together formed the urban complex; these three factors were predicated upon effective primary agricultural production. Citing Becker’s (1973a, 1973b) published Tikal data, Price (1978:405-406) concluded that 20-25% of the excavated household groups had produced evidence of specialist production and, given that not all household members were actual specialist producers, estimated a 10-15% specialist rate for Tikal as a whole, if these households were representative of the entire site.

“Even the 25% maximal figure is significantly below any of the estimates for Teotihuacán, still more so for Tenochtitlán. This, and not merely the absence of the localized-guild pattern, gives Tikal its nonurban character.” (Price 1978:405)

Citing the “differential quality of evidence,” Price seems to imply that the count of specialists (whatever specialist means) for Teotihuacán were obvious and unequivocal, while those for Tikal were less so. It is difficult to evaluate these two different sets of archaeological data. On one hand, apartment complexes at Teotihuacán evidence abundant craft production. On the other hand, individual households at Tikal also evidence craft production of a different scale. Full excavation of peripheral households at Tikal is still needed to better understand the organization and scale of craft production. The absence of production evidence is certainly a function of the lack of areal excavation, and the excavation techniques of the Univeristy of Pennsylvania researchers did not necessarily sample areas of these groups where production may have occurred – outside of buildings, in open plazas, or away from architecture all together.
“But all such inferences become more reliable as (among other considerations) the directly observable base grows larger. For Tikal the maximal estimate of that base is still very small; all else being equal, this operation is epistemologically safer for a Teotihuacán than for a Tikal.” (Price 1978:406)

While it may be safer to estimate numbers of specialist producers at Teotihuacán, this does not help to explain the organization of production at Tikal. Quantitative analysis of craft specialization is still in order for all centers, within central Mexico or the Maya Lowlands. In respect to the inferred specialists listed by Adams (1970) and Becker (1973a, 1973b), Price rightly noted that, although the identification of such specialists was logical, the numbers of these specialists were unknown.

“This procedure documents the presence of specialists, as a list, but cannot generate any estimate of the numbers involved because we do not know how many customers each craftsman served.” (Price 1978:406)

This bespeaks a formal approach to investigating industry, from the viewpoint of minimal and maximal product thresholds, circulation ranges, and the redundancy of production units. However, the concept of “customer” may not be absolutely applicable to pre-industrial societies without money or a market economy. The quantitative analysis of specialist production has not been consistently investigated in either the Maya lowlands or central Mexico. The obvious abundance of “workshops” indicative of specialist production at Teotihuacán has been critically evaluated by Clark (1986) who does question the circulation range for obsidian implements and the number of customers served by these workshops. More rigidly quantitative analysis has been conducted at centers in central Mexico (Healan et al. 1983; Healan and Stoudtamire 1989; Hirth 2009a) and the Maya Lowlands (Aoyama 2007, 2009; Emory and Aoyama 2007; Hester and Shafer 1984, Shafer and Hester 1986, 1991), but has not proceeded consistently at all sites.

Tikal has still not been investigated through a targeted program aimed at locating production loci. Quantitative data concerning production debitage are limited to counts
of pieces and pottery distributions have seldom been interpreted with compositional data. Ironically, the great center of Tikal, once chosen for investigation because of its grand size and central position, and for so long the archetypical Maya site and polity, has not been investigated as fully as smaller centers such as Copán, Dos Pilas, Cancuen, or Aguateca.

Haviland also contemplated the social implications of marketplace exchange and a centrally located marketplace facility. He seems to have been developing a more realistic model of a functioning center than previous ceremonial center models had posited. Apparently disappointed by the persistence of applying outdated models of socio-political structure to Tikal by convention, Haviland speculated that a model of differentiated social rank, specialized craft production, and market exchange fit the Tikal data better than the vacant ceremonial center, simple chiefdom, or cargo community models could. He also noted that marketplace exchange would be a powerful institution promoting social integration.

“[T]here is the apparent economic symbiosis which is postulated between Tikal and its rural sustaining area. It is likely therefore, that marketing facilities would frequently have drawn the rural population to Tikal, as indeed such facilities today draw rural populations into the towns of highland Guatemala. This would be a powerful factor for integration, whether or not priestly control were involved.” (Haviland 1966:629)

Replacing (or appending) central priestly ritual with marketplace exchange might be a more tenable postulate, but the quintessential dilemma of social cohesion is not adequately addressed through this substitution alone. Centralized marketplace exchange does not explain the organization of production either; the fundamental issues of where production is concentrated and how production is organized remain to be addressed more fully.
4.3 – An Early Contemplation of Economic Organization for the Classic Maya

Arthur Mann (1973) assumed certain specialist craft producers either from their products or by ethnographic analogy (see also Becker 1973a, 1973b; Adams 1970). He compiled a list of Maya ‘occupations’ which included dyers, masons, painters, potters, salt-gatherers, sandal makers, tanners, stone-cutters, stone knappers, wood workers, and weavers. He also specified the probable household-level production of textiles, sleeping mats, cordage, and baskets, and the collection and processing of forest products, such as copal incense, paints, and dyes; also noting that, “lapidary art using jade was a familiar trade” (Mann 1973:218). Becker (1973b) had mentioned dentistry as an occupation, based on the Classic Maya penchant for inlaid incisors. A host of other ‘occupations’ that left little archaeological trace of their existence can be imagined including hunters, beekeepers, and tree tappers. Many of these might also have been unspecialized household activities engaged in by large numbers or even the majority of inhabitants, as bee-keeping is among traditional Maya households today in northern Yucatan. Nonetheless, ethnographic case studies have demonstrated that a number of occupational specializations do occur among contemporary Maya villages.

“[T]here are no archaeological indications of such occupational specialists, who might have been part of the economic fabric, as weavers, butchers, curers, brewers, embalmers, tailors, and so on. Yet, such specialists may be found in small Indian communities in Mesoamerica today.” (Haviland 1970:194)

Aware of Postclassic Maya long-distance trade, Mann made a clear distinction between trade and marketplace exchange. The specialist occupation of merchant is likewise set apart from the more common practice of selling or buying (or bartering) in the marketplace. The separation of international trade from peripheral markets is also documented for Whydah (Arnold 1957a, 1957b; Polanyi 1966) and other “ports of trade” discussed by substantivists. Chapman (1957) read the Postclassic Maya ethnographic literature as indicating administered trade by professional merchants closely associated with political elites and rulers.
“...long distance trading was an institution apart: geographically, it was a trade beyond the borders; its personnel formed a distinct social group; its members only exceptionally made their appearance in markets; both the organizing of caravans and the negotiating of exchange in foreign countries formed part of this specialized occupation. Luxury wares and their raw materials formed the main items of trade. It did not as a rule directly concern the common people as consumers. At no time does the trade over these vast areas appear as random activities of individuals. Rather it was the highly structured occupation of persons dedicated to performing their duties under the authority of their professional organizations. The locational focus of the exchange transactions was the port of trade...a name denoting those towns whose specific function was to serve as a meeting place of foreign traders.” (Chapman 1957:115, cited in Mann 1973:221)

Arjun Appadurai (1986) has discussed the power struggles between political and economic agents in archaic states. He sees a fundamental opposition between long-distance traders and political elites based on their divergent motives and necessary concerns. This fundamental opposition is credited with structuring the port of trade system to minimize social anxiety.

“The politics of demand frequently lies at the root of the tension between merchants and political elites; whereas merchants tend to be the social representatives of unfettered equivalence, new commodities, and strange tastes, political elites tend to be the custodians of restricted exchange, fixed commodity systems, and established tastes and sumptuary customs. This antagonism between ‘foreign goods’ and local sumptuary (and therefore political) structures is probably the fundamental reason for the oft remarked tendency of primitive societies to restrict trade to a limited set of commodities and to dealings with strangers rather than with kinsmen or friends.” (Appadurai 1986:33)

For the Aztecs of central Mexico, long-distance traders were both useful to the economic functioning of the empire and dangerous to the established political order and power base. For the Postclassic Maya, traders were often political elites themselves, monopolizing trade and hence skirting the problems of dealing with a merchant class. The extent to which trade was centrally controlled in Classic Maya times is uncertain, and models of elite patron-client relations and attached specialized production still warrant investigation.
For Mann, the four principle economic problems facing all societies were resource allocation, organization of production, organization of distribution, and savings and investment. He addressed each of these problems from the perspective of the Classic Maya, carefully distinguishing products produced by specialists from goods produced by the general populace. His assessment of the ancient Maya is phrased in the terminology of modern economics; however, he does not project a number of modern economic institutions onto the Classic Maya.

1.) resource allocation.

“None of the [Postclassic] Maya products involved in ‘international’ trade required a specialized labor force. All housewives wove cloth, salt was easily gathered by anyone near the coastal salt beds, flint deposits were readily available, and most families raised bees. Mayan imports of gold ornaments, copper, axes, precious and semiprecious stones, feathers, shells, and cacao did require greater specialization, especially in the case of gold artefacts and copper objects. This lack of specialization in production would reflect a fairly egalitarian distribution of income among the producers (the common man), possibly at rather low real levels. In contrast, the merchants apparently siphoned off a relatively large share of the gains from trade, with little filtering down to the actual productive units. That the merchants received a goodly proportion of trade-created income is evidenced by their close links to the ruling classes. In fact, Acalán was ruled directly by merchants, and the wealthiest of them all ruled the entire province.” (Mann 1973:222)

As Ford (1934) and Higbee (1948) had done earlier, Mann stressed primary production, dominantly maize agriculture, as the foundation from which Classic Maya civilization rose. Accepting early agricultural studies which confirmed the ‘surplus’ production possible under the presumed Classic Maya swidden agricultural system, Mann saw a stable political system growing out of local production used for subsistence and sustaining non-food producers within basically self-sufficient, autonomous Classic polities. Even for the more ‘commercialized’ Postclassic Maya, Mann stressed the peripheral nature of trade in all commodities – honey, cloth, copal, pottery – as outside the fundamental polity-confined production and taxation systems.
2.) organization of production.

“Secondary industry, confined within limits established by technology, was most definitely of minor importance relative to primary industry as far as ‘national’ output was concerned, although it did play a more proportionately prominent part in both internal and external commerce. On the other hand, if industry is defined to include the construction of religious centers, and the production of various religion-centered art objects it was of extreme cultural importance. But sight must never be lost of the fact that the primary sector formed the backbone of Maya culture; from the roots of a productive agricultural system sprung the achievements of the Classic period.” (Mann 1973:226)

Here Mann seems to view production within a predominantly redistribution framework with corveé labor and attached craft production, although he does speak of commerce. The overall framework of Mann’s 1973 article stresses the understanding of Classic Maya economics in formal terms. This is probably why he stresses primary production over craft production, and discounts commercial activity as basically insignificant. He also does not consider marketplace exchange necessary for the workings of everyday life or the development of stratification. Neither is the control of exchange (other than long-distance trade) linked to the rise of the great lowland centers. Household production and smallholding would appear to be his answer for provisioning inhabitants with the necessities of everyday life. His paper characterizes the Maya almost as a non-economic people from the standpoint of modern economic analysis. Indeed, the Classic and even Postclassic Maya economy cannot be characterized as a market economy, nor were money, credit, interest, commercial exchange, or commercial agriculture overwhelmingly important to the state. Instead, religious art and artifacts and epicentral edifices are seen as the core of Maya production capacity; exchange and profit are basically discounted for the masses. However, raw materials and finished goods are present at Tikal and other Classic Maya centers, leading to questions concerning the degree and organization of trade and exchange and the institutions through which these operated.
“Evidence of trade in non-perishable items is clear at Tikal. Granite, quartzite, hematite, pyrite, jade, slate and obsidian were all imported, either as raw materials or finished objects. Marine materials came from coastal areas...What sort of flourishing trade went on in perishable goods such as textiles, feathers, salt, or cacao must remain unknown. All in all it is hard to believe that there were no full-time traders among the Tikal populace.” (Haviland 1970:194)

3.) distribution of production, including the degree of specialization or division of labor leading to specific forms of social organization and government.

Mann links the entire dilemma of modes of production, exchange, and taxation (economics in a word) to social organization, recalling the arguments that M. Coe and others had previously made (see Chapter 3). He explicitly avoids the assumption that one institution serves as a causal link to another institution, or that a general mode of craft production is associated with a specific form of social organization or level of complexity (other than the absence of a market economy). Perhaps due to the lack of empirical evidence available, Mann saw the organization of production and exchange as dependent upon socio-political organization relating to Durkheim’s mechanical versus organic solidarity. This position foreshadows the classification debates discussed in Chapter 4.5 between those who view Maya centers as regal-ritual centers with segmentary lineage organization and largely decentralized courtly administration versus those who sense administrative cities dominating large domains through a highly centralized bureaucratic government.

“This therefore, one's conception of how the Maya resolved the third economic problem is dependent upon which view one accepts as to the nature of the power structure.” (Mann 1973:228)

This is a truly prescient statement as discussion of Classic Maya economics has focused on a frustratingly small sample, while socio-political models of the structure and degree of power wielded have proliferated based on much better evidence. In 1973, Mann was uncertain about the social organization of the Classic Maya and tended to assume a great social gulf between ruler and ruled. He did note that growing evidence
might support a more hierarchical social organization and, by extension, a more complex economic organization.

“However, it may be wrong to visualize Classic [Maya] society as severely dichotomized between urban and rural and/or between rulers and peasants. Willey [1956] opines that available evidence adds up to a ‘conception of a Maya peasant class that was reasonably prosperous and participating in a cultural tradition not markedly apart from the inhabitants of the great religious centers.’ He additionally finds evidence of an increasing degree of social mobility and greater homogeneity in Maya culture as the Classic era progressed.” (Mann 1973:227)

4.) saving and investing.

“Resolution of the fourth problem, that of saving and investment (in real terms), probably cannot be given meaning in a modern context…Other than ‘investment’ in religious edifices Mayan saving and investment was harshly restricted within the confines of primitive technology, and therefore amounted to little more than the production of digging instruments, knives, axes, ‘roads,’ wells, and irrigation facilities.” (Mann 1973:228)

From Mann’s formal economic perspective, the technologically “stone-aged” Maya certainly provide little grist for models of wealth accumulation and commercial exchange. However, he may have grossly underestimated the degree of exchange or circulation of craft items made from distinct raw materials or forest products. I doubt that the Classic Maya engaged in commercial activities requiring formal economic institutions for credit and banking or physical infrastructure such as manufactories, bulking houses, and large formal marketplace facilities. Nonetheless, goods and people may have been controlled and moved around more than Mann was willing to accept in the early 1970s.

A combination of household production, merchants, peripheral markets, itinerant peddlers and servicepersons might well have maintained a constant circulation of goods. In such a hypothetical system, production and distribution patterns would be helpful in sorting out the organization of production and exchange. The absence of obtrusive
infrastructure buildings does not equate to a stale economy. Exchanges are mostly invisible and a bustling marketplace on the first day of the week can be an empty field devoid of vendors, customers, and products on the second day of the week. It is the archaeologist’s task to investigate just how extensive and intensive any exchange network was, and how it may have been structured.

4.4 – Application of Formal Modeling

Spatial models of settlement location have focused on different levels of economic integration. The German school of central place/settlement location theory (i.e., Von Thünen, Christaller, Lösch; see Chisholm 1968 for a succinct summary) focused on the location of centers, with central place functions, in regard to their sustaining hinterlands and in relation to other centers. Building upon this theoretical framework in a distinctly economic direction, researchers have examined the threshold ranges of goods from the standpoint of sustained manufacturing and distribution (Berry and Garrison 1958; Lloyd and Dicken 1972:Chapter II) or optimally locating manufactories and industry in regard to service populations and raw materials (A. Weber 1969 [1929]). Walter Isard (1951a, 1951b, 1951c. 1953, 1954, 1956, 1960, 1969; Isard and Christine Smith 1990; Isard et al. 1972) spent a lifetime exploring locational analyses in an effort to construct one “general theory” of economic geography (see also Brakman, Garretsen, and Marrewijk 2001; Fujita 1989; Fujita, Krugman, and Venables 2001). In general, the earlier theoretical works attempt to describe and explain spatial phenomena, while later works emphasize predicting these arrangements.

Although few studies of spatial arrangements viewed from archaeological remains have specifically modeled the flow of goods within a threshold framework, central place models did see some heightened interest in the 1960s and 1970s among scholars, some of them working in Mesoamerica. These include both ethnographic studies of hierarchical market systems (G. W. Skinner 1964, 1965; C. Smith 1972, 1974, 1975, 1976, 1985) and
broad brush-stroke central place models using the distribution of lowland Maya archaeological sites with emblem glyphs (Flannery 1972; Hammond 1974; Marcus 1973, 1974, 1976). Studies investigating artifact distributions from archaeological data within a central place or locational analysis framework have also been published for Old World regions (e.g., I. Hodder 1972) and for Mesoamerican regions (e.g., Appel 1986; Evans 1980; Inomata and Aoyama 1996; Santley 1986; M. Smith 1979a, 1980).

**Locational Analysis, Central Place Models, and Detecting Markets**

**Classic Maya Centers**

Marcus’ article (1973, see also Marcus 1974, 1993) explained the “regular spacing” of lowland Maya centers at two distinct theoretical levels. The most all-encompassing level viewed the Late Classic Maya Lowlands as a single unified political organization with a four-way division borrowed from the work of Barthel (1968), which grew out of the pioneering work on emblem glyphs by Berlin (1958).

“I argue that there was, between A.D. 600 and 900, an overall organization of the entire Maya lowlands that was strongly influenced by the Maya’s quadripartite view of the universe and that featured four regional capitals.” (Marcus 1973:911)

This conclusion was based on the inscriptions from two monuments. The first, Copán Stela A, was interpreted as associating four “capitals” with the four cardinal directions – Copán (east), Tikal (west), Calakmul (south), and Palenque (north). Similarly, the second monument, Seibal Stela 10, portrayed four emblem glyphs – Seibal, Tikal, Calakmul, and Motul de San Jose. The ‘replacement’ of Copán and Palenque with Seibal and Motul de San Jose was interpreted as an indication of the loss of importance of the former two centers, and the rise in importance of the latter two centers; Copán Stela A dates to A.D. 730, while Seibal Stela 10 dates to A.D. 859.
Below this quadripartite cosmological partitioning of the entire Classic Maya Lowlands, the second level of organization was a “lattice of nested hexagonal cells,” formed by economic factors and predicted for “service centers” by central place theory. Marcus provided diagrams of the spacing of secondary centers around Palenque, Tikal, and Calakmul, and tertiary centers around one of the secondary centers around Calakmul (Marcus 1973: Figs. 4-6). The differences of average intersite distances between the Tikal (15.8 km) and Calakmul (27.8 km) region were explained as a function of population density.

“Assuming that major centers were designed to serve populations of roughly the same size, this suggests that the population of the Calakmul area may have been half that of the Tikal area.” (Marcus 1973:913)

Later in the same article, Marcus (1973) states,

“Since the hexagonal lattices were probably adjusted to variations in population density, each of the four quadrants of the Maya realm probably controlled a comparable number of persons.” (1973:915, italics mine)

Michael Romanov (1974) found the uniform hexagonal latticework spacing proposed by Marcus unconvincing. He rightly pointed out that only five centers were depicted in the Palenque region, and that these formed a “square” to his eye. Marcus responded to Romanov’s objections by pointing out the data set she was working from was rather incomplete.

“In the case of Palenque [Marcus 1973: Fig. 4], which worries Romanov, I purposefully drew no lines connecting the secondary centers because survey there is so incomplete that no one knows how many other sites are missing. I added Palenque merely to show that its secondary centers seem to be equidistant from the capital (not necessarily from each other).” (Marcus 1974:876)

This statement is baffling. First, Palenque is one of the four “capitals” from Copán Stela A, and as such, should have been included in the spatial analysis, as should
have Copán – which does not appear to be at the center of a regularly spaced latticework pattern either. Second, survey in the Palenque region had located dozens of centers. Chinikiha (with an emblem glyph and carved monuments), located on the Chinikiha river, was not included in the figure although this large center probably vied with Palenque for dominant center of the region in the Early Classic period. Furthermore, the secondary centers are roughly equidistant from each other, despite the complex geography of hills and rivers. Marcus actually downplayed the importance of geographic proximity and placed a heavy emphasis on the fact that the four emblem glyphs appeared together, that some emic expression of a political hierarchy must be implied.

“Out of the large number of primary centers available to them, the Maya selected four as regional capitals.” (Marcus 1973:915)

These four sites were not selected by me: the Maya themselves carved their emblems glyphs in a clause.” (Marcus 1974:876)

The Maya were not a politically unified people, and the monuments carved at Copán and Seibal more properly reflect the perspective of elite persons residing at those centers at those times. The emblems were not carved by a coalition of ambassador scribes representing the four polities, rather by an artist or artists residing at the center where each monument was carved. Copán Stela A mentions Copán as one of the four centers, while Seibal Stela 10 mentions Seibal, predictably enough. Altar 3 from the site of Altar de los Reyes in southeastern Campeche records 13 different emblem glyphs, including that of Palenque (Sprajc 2003). In 1974 Norman Hammond favored a particularistic explanation for the carving of these monuments over any far-reaching organizational structure, and his concern still carries weight.

“[S]ome local dynastic or political event seems a more likely explanation for the listing of emblem glyphs than a fundamental realignment of the territorial world view of the entire central area…” (Hammond 1974:876)
Hammond (1974) also questioned the exclusion of large lowland centers (Nohmul, Caracol) from consideration as “capitals,” as well as the assumption that “quadrants” around these “capitals” were home to populations of equal size. He brought up a long-known phenomenon whereby Tikal, the largest Center of the Peten, was circumscribed by other sites; in a voronoi map of lowland polities with emblem glyphs, Tikal occupies one of the smallest Thiessen polygons (A. Chase and D. Chase 1996:805; Marcus 1993:163). His objections were discounted as speculation by Marcus, particularly the idea that the central Peten area could have been different than other regions or “quadrants.”

“Moreover, the “core” theory that Hammond tries to resuscitate is doubly misleading, for it implies that social and political development might somehow be more advanced in Tikal’s quadrant. As far as anyone knows, all four quadrants had the same organization.” (Marcus 1974:877)

Organizational differences should be assumed and investigated, not the other way around – uniformity assumed and not investigated. Population densities should also be addressed, as well as total populations, especially within the framework of a central place model implying economic forces were the dominant influence on settlement pattern formation. Palenque and Copán were certainly not the centers of population that Tikal and Calakmul were in the Classic period, and both total service population and population densities do have an effect on economic models of central place functions, regardless of cosmological associations. Long-term settlement research led Webster et al. to conclude that “throughout its history the Copán polity, comparatively isolated on the southeastern Maya frontier, was always a local rather than regional power” (2000:191). Webster has also demonstrated the small size of Copán, in demographic terms (Webster 2005; Webster and Freter 1990; Webster, Freter, and Gonlin 2000; Webster, Sanders, and van Rossum 1992; see also Wingard 1992, 1996), especially when compared to Tikal or Calakmul (Webster and Sanders 2001).

This simplistic model, proposing an overarching cosmological view shared by all lowland Late Classic Maya divided into regions of equal population (though not equal
population density) with identical socio-political organization, did not become the dominant paradigm and investigation focus that Marcus had hoped for. Perhaps an analysis of this nature would be more productive with a more robust data set.

“Surely this burgeoning interest in the rules that underlie settlement patterns in archaic states will provide some of the archaeological breakthroughs of the 1970’s.” (Marcus 1974:877)

Modern Highland Guatemala

Carol Smith’s careful ethnographic analysis of marketing structure in highland Guatemala has been cited in numerous publications of Classic Maya economics. Although Smith meticulously tracked economic patterns and the hierarchical organization of these markets within a geographic region, a similar analysis of any region within Classic times has never been attempted. It would be very difficult to complete the kind of analysis that Smith accomplished using only archaeological data. Only occasionally have archaeologists even attempted to ascertain the K=7 value of a local or regional market system in Classic (or Postclassic, contact, or modern) times. A K=7 administrative system within a solar-type market system has been proposed for Tikal by Moholy-Nagy (2003a:108), although the reasons for this identification are not clearly stated. As Carol Smith explains, it is possible to define the marketing system for any given region, given that a hierarchical settlement pattern is present.

“Within the conceptual framework of central-place theory, one can define an organizational system at any level as long as the area encompassed includes a major market center, smaller dependent centers, and a contiguous related rural hinterland.” (C. Smith 1976:255)

In the absence of other clear evidence of the market function of centers within a region it is tempting to equate a hierarchy of centers, dependent or not, with the existence of an integrated market system. It is therefore important to recognize the limitations of central place models. They were designed to examine the structure of a hierarchically ordered market system, not to prove the existence of such a system in the absence of
direct information (see I. Hodder 1972). The distributions of recovered artifacts and the spatial arrangements of settlements recorded throughout Mesoamerica indicate the widespread circulation of goods, leading some researchers to contemplate market exchange or other complex institutional arrangements (i.e., complex redistribution) within the context of various regional political landscapes.

“Market economy or not, the recorded distributions and patterns of luxury items and architecture within the Valley of Mexico, the Valley of Oaxaca, and the lowland Maya area during the Classic and Postclassic periods are indicative of a complexity conforming with Carol Smith’s (1976) expectations of an extremely advanced economic system representing a high level of state organization.” (D. Chase and A. Chase 1992:10)

Continued research at the lowland Maya center of Caracol has only strengthened the Chases’ conviction that market forces were instrumental in the formulation of a hierarchical settlement pattern reflecting exchange relationships. The Caracol settlement pattern is interpreted as a function of elite control over exchange, but not of production, which is presumed to have occurred as household-level craft specialization outside the direct control of the central ruling apparatus (D. Chase and A. Chase 2008:3). The basis for this model is the road system connecting nodal architecture with the epicenter, interpreted as an expression of control of exchange.

“Causeways radiate from the epicenter, culminating in special function architecture nodes or termini in accord with a central place model and market distribution systems that would have followed K7 principles (A. Chase and D. Chase 2001; D. Chase and A. Chase 2004). These termini contain large open plazas, most bordered by long low buildings that are distinct in their location and association with causeways, non-residential structures, and elite housing compounds. They are consistent with ethnohistoric descriptions of markets from the contact period…” (D. Chase and A. Chase 2008:2-3)

Carol Smith’s (1976) regional analysis concentrated on western Guatemala, a highland area encompassing 10,000 square miles (about one-fourth of the modern nation of Guatemala) and 1.8 million people. The area is made up of 9 administrative districts (departamentos), 174 townships (municipios), and about 250 market centers (forming 12
local marketing systems. The 12 local marketing systems make up the regional system, and are patterned along different lines, leading to a number of divergences from the perfected overall pattern predicted by central place theory.

“Central-place theory is based on a number of quite rigid assumptions: an isotropic or featureless landscape, total dedication to profit maximization on part of the suppliers, complete rationality in the choice of market centers by consumers, and a differentiated and locally integrated marketing economy…” (C. Smith 1976b:257)

While some authors have objected to the rigid assumptions of central place theory (i.e., Bromley 1971; Nourse 1978; Weber 1971; Weber and Symanski 1973), especially the assumptions of maximization and rationality, Smith accepted these based on ethnographic work in the Guatemalan highlands that documented the rational, profit-oriented inclination of highland Guatemalans in the 20th century (McBryde 1947; Tax 1963[1953]). The maximization and profit orientation of Classic Maya living in the lowlands in Classic times were never documented by western scholars, of course.

Smith explains the distinctive regional identity of western Guatemala as a function of its pre-Columbian domination by Quichean peoples and subsequent battleground position against Spanish (and central Mexican) invaders. Following the establishment of administrative centers and the advent of Spanish rule, a regional marketing network developed – a situation which influenced the original spacing of communities and ‘commercial’ centers, introducing the first level of ‘irregularities’ into the marketing system (C. Smith 1976b:294). The region can be defined as a single marketing area centered on Quetzaltenango, the second largest center of modern Guatemala

Nonetheless, the twelve regional marketing systems that make up the western Guatemala system tend toward isolated “solar” systems; integration of marketing systems tends to be strengthened by long-distance trade through regional bulking centers linked to Quetzaltenango. A dual system of commercial bulking centers and Ladino marketing
towns characterizes the region, with many Ladino marketing towns poorly integrated into the overall regional system. Roads and communication networks as well as more efficient transport than was available in pre-Spanish times throughout this ‘unified’ region have undoubtedly influenced the commercial connections among marketing centers and subregions. Did this level of economic integration of marketing systems characterize pre-Columbian time periods?

*Highland Guatemala in the Sixteenth Century*

Although marketplaces were encountered by the Spanish in this region in the sixteenth century, no marketplace is depicted for Quetzaltenango in *The Lienzo de Quauhquechollan*, an indigenous Contact period pictoral document detailing the conquest of highland Guatemala. This prominent scene in the document depicts a battle; however, no K’iche’ are depicted and this scene may simply represent a conflict between two Spanish groups and their respective indigenous allies near Quetzaltenengo (Asselbergs 2004:158). A total of four marketplaces are identified in the *Lienzo*, but documentation of these earlier marketplaces alone is insufficient to deduce the structure of marketing activities. And of course this document was made some time after the conquest and represents a rapidly changed and still changing economic landscape. Although the existence of marketplaces in the region prior to conquest was occasionally documented, a more thorough analysis of their structure is not possible. The general character of marketplaces located at Late Postclassic Maya centers remains unknown; the presence of a marketplace is usually the extent of information recorded. I also assume that smaller, less informal marketplaces would not have been documented at contact, although these may have provided the majority of exchange opportunities for the most of the population.
Regression Modeling

A different, but related approach to the investigation of economic organization, the quantitative mathematical modeling of specific goods (expressed as regression lines or fall-off curves) also saw a peak of interest in the 1970s (I. Hodder, 1974, 1980; I. Hodder and Orton 1976; Renfrew 1975, 1977). These studies attempted to correlate different fall-off curves with specific modes of exchange. The dominant patterns that emerged relate to two basic classes of goods; these are what economists term high-order and low-order goods. High-order goods are those items which are high in value and low in weight or bulk, while low-order goods are the opposite: heavy, bulky items of low value. The shapes of the fall-off curves generated for these two classes of goods are easily distinguishable when plotted (I. Hodder and Orton 1976). A third type of fall-curve, the “plateaus and kinks” variety, is associated with social or political boundaries and supported by distribution studies of Roman coins in Syria (Clark 1979).

While there is some agreement that artifact distributions can be assigned to one of these three categories based on the shape of the fall-off curve from a production or redistribution center, a good deal of ambiguity and equifinality is also apparent. Ian Hodder (1980:152-153) notes that the fall-off curves for two different types of pottery circulated within the Baringo district of Kenya can be distinguished. The distribution of pottery circulated through reciprocal transfer approximates the “bounded” type fall-off curve with “plateaus and kinks,” while the distribution of low-value, heavy cooking pots obtained through marketplaces approximates the expected fall-off curve for high-order goods. I. Hodder finds the explanation for the distribution of low-order cooking pots approximating the high-order good curve based in social factors.

“The reason is that pots are obtained from markets as a result of special-purpose trips. Women travel considerable distances to the market. The visits are infrequent, on special occasions, and often for largely social reasons. Pots may be bought on these visits although they are not the sole or main purpose of the journey. Their resulting distribution is widespread with only a gradual fall-off because they are involved, as a by-product, in movements that occur for other purposes.” (I. Hodder 1980:153)
The effects of itinerant merchants or market periodicity on the distribution of goods throughout a region, within Mesoamerica or any other geographic or culture area, have not been fully evaluated in terms of predicting fall-off curves either. Nor have the cumulative effects of different goods flowing through distinctly different distribution systems, or circulating by different exchange modes.

Conclusions from Formal Modeling

Ian Hodder (1972) noted the similarity between the settlement pattern of lowland British walled towns in the third and fourth centuries A.D. and the predicted distribution of service centers anticipated by central place theory. The existence of ‘market places’ or rows of street shops in some of these towns were known through excavation. Administrative functions were also assumed for these towns and supported by archaeological investigation of basilica and other governmental buildings in the capitals. Hodder wanted to test two competing hypotheses: 1) that the settlement pattern was the product of marketing functions or 2) that this pattern was the result of administrative efficiency, or religious or social needs. He concluded that evaluating competing explanations required greater archaeological data on the functions of the towns through excavation of architecture, and the distributions of artifacts distributed through central marketplaces within these towns. Without documentation of the market activity conducted at each town, the central place analysis simply confirms the regular spacing of centers and not the causes of the settlement pattern.

“Binford (1968, p. 22) has stated that ‘data relevant to most, if not all, the components of past sociocultural systems are preserved in the archaeological record’. The major difficulty indeed is not in the archaeological evidence itself, but in the failure systematically to collect that evidence.” (Hodder 1972:223)

Ian Hodder’s main concern with the application of location theory to archaeological contexts was that settlement patterns approximating the expectations of central place theory would be taken as proof of unspecified economic forces and would
not address competing explanatory factors; the pattern itself would be taken as proof of the power of marketing forces to shape the use of space in a region. Taking the lowland Maya centers as a case in point, the spacing of primary, secondary, and tertiary centers can be regarded as proof of the operation of a hierarchical market system in Late Classic times. This assumption does not explain why this pattern developed or specify what goods and services formed the basis of exchange; nor does it address the differential influence of administrative service functions over economic ones. The functions performed by secondary or minor centers in the Maya Lowlands have not been adequately addressed. Maps have been consulted to search for patterns, but confirmation has not been sought through artifact distributions or architectural or epigraphic analysis. Nonetheless, unevaluated conclusions have been printed and repeated often.

Even the assumption that any Classic Maya economic system in any region was governed by the rules and laws of formal economics (i.e., scarcity, economizing, maximizing, supply, demand, elasticity, equilibrium price, rent) has not been empirically investigated. For traditional or primitive economies, where economy, ritual, and kinship are intrinsically intertwined within indigenous thought as well as indigenous practice, taking account of the embedded nature of ‘economics’ makes limited focus models (i.e., central place theory) inappropriate, or of limited utility (Piot 1992:35).

Fall-off curves have suffered a similar fate as central place models, with the degree of uncertainty in interpretation stymieing their consistent application to artifacts circulated across regions. Even if a single mode of distribution is overwhelmingly dominant, fall-off curves cannot accurately distinguish between reciprocity and redistribution, or between complex redistribution and marketplace exchange (Blanton et al. 1981; I. Hodder 1974; I. Hodder and Orton 1976; Renfrew 1977; P. Rice 1987a:198, 1987b:535). George Bey (1992:3) has noted that distribution patterns do not automatically equate with, or explain the structure of, distribution systems; the actual mechanisms or institutional arrangements responsible for observed distributions are a separate phenomenon (Earle 1982:7).
“The initial optimism visible in the earlier analysis of fall-off curves seems less well founded. In particular, the summary of a total exchange distribution into one fall-off line now seems inadequate. The complexities of primitive exchange are such that we cannot afford such gross simplification.” (I. Hodder 1980:153)

The view that ‘primitive’ or preindustrial exchange mechanisms were quite complex is a thoroughly anthropological one, firmly grounded theoretically and empirically in ethnographic reality. The concepts that inalienable possessions (Weimer 1992) have a social life of their own (Appadurai 1986; Kopytof 1986) and that reciprocal ‘gift-giving’ can be quite complex over vast regions have begun to augment or replace the anthropological or archaeological application of formal models based in formal economic logic (e.g., LeClair and Schneider 1968; Schneider 1974). As time moves forward, new theories and models receive attention, are refined, evaluated, rejected, reconstituted and rejuvenated.

George Dalton (1990) saw the utility in applying formal economic models to the kinds of post-colonial situations cultural or economic anthropologists tend to study ethnographically; but not to the study of archaic complex societies. The applicability of formal modeling to ancient societies should not be discounted completely however. Perhaps the technique is valid, even if the interpretations have been questionable or ambiguous. What is needed is a corpus of literature specifically targeting the study of economics through archaeological remains, along with much better archaeological samples. With respect to my dissertation, the distributions of pottery types or classes have been documented, although we are ignorant of the number, size, organization, or location of production units. If any lesson is to be learned from the prior application of spatial models, it is the caveat to be specific. Researchers are beginning to address issues of emic functional categories and relative standardization in pottery manufacture. The study of artifact distributions in areas of the world for which we have excellent written documentation of the modes of production and circulation are limited in two distinct ways. Modern ethnographic reality plays out within a world attached to the market.
economy and World System (i.e., Wallerstein 1974, 1979), while ancient settlements where artifact distributions can be directly observed were not always fully documented through written records.

Of fundamental importance to distribution studies of pottery working at the intra-site level of exchange, is that the products of specific workshops or production units cannot be readily isolated from the products of other discreet workshops or production units. Nonetheless, archaeologists are attempting to infer abstract institutional arrangements from archaeologically documented manifestations. Binford (1968) was correct when he stated that the archaeological record was intact enough to extract information; however, it is up to archaeologists to recover sufficient samples as well as use appropriate analytical techniques and models in order to reach solid conclusions. These techniques and models do need to be critically evaluated and constantly refined.

4.5 – Sociopolitical Structure of Classic Maya Centers

“Two general perspectives on ancient Maya political organization persist. Decentralized models portray kinship-based states undergirded by religion, fluctuating political alliance, and regal-ritual centers of various sizes. Centralized models portray hierarchical states with bureaucracies, urbanism, and populations with political and economic differentiation.” (Fox, Cook, A. Chase, and D. Chase 1996:801)

George Cowgill (2003a:1) has made the point that oft-used words, such as city, polity, urban etc., need to be defined in order to have meaningful discussion and avoid talking past one another. It is also possible to use less specific terms in order to continue discussion before applying a specific term to any given site. For example, Eric Taladoire prefers the term “power” over “state,” when discussing Maya ruling dynasties, Aztec tlatoani, or Tarascan calzonci (2008:623), arguing that cities and/or urbanization might exist in the absence of state-level political organization.
In addition to absolute population, population density, and service functions, the urban nature of any Mesoamerican center has been linked with craft production within the central urban core. Taladoire (2008) notes the difficulty in defining Mesoamerican centers as urban based on the criterion of urban craft production noted by several authors (Arnauld 2003; Hirth 2003; Pollard 2003; Stark 2003) involved in the Pennsylvania State University Urbanism in Mesoamerica conference (Sanders, Mastache, and Cobean 2003; Mastache et al. 2008). The overall theme of my dissertation is to document the circulation patterns for ceramics in an attempt to clarify specific points of the production and distribution systems acting in the Classic period. Tikal cannot be compared to other Mesoamerican centers if Tikal itself is not understood.

While it is now commonly accepted that Maya centers or polities of the Classic period were never unified under a single suzerain, or politically dominated from a single capital, the range of political unification at any given point in time is still debated. The political dominion of a center, especially one the size of Tikal, is also unknown, as are the specific modes of political and economic organization. Some stress the hegemonic control of subordinate centers by dominant ones (i.e., A. Chase and D. Chase 1996; D. Chase, A. Chase, and Haviland 1990; Culbert et al. 1990; Folan 1992; Folan, Marcus, and Miller 1995; Folan et al. 2008; Marcus 1973, 1976, 1983, 1993; Martin and Grube 1995), while others reject, or at least question the utility of, models of hegemonic control or the so-called “superstate” or “superpower” model derived from epigraphy (e.g., Marken and Straight 2007). Some researchers (e.g., Arnauld 2003; Price 1977; Sanders and Price 1968; Sanders and Webster 1988) have placed all Classic Maya centers into a single broad category, such as Fox’ (1977) regal-ritual city, while others stress the variable size and complexity of Maya centers over generalized categories (e.g., A. Chase and D. Chase 1996; D. Chase, A. Chase, and Haviland 1990; Folan 1992; Folan, Marcus, and Miller 1995; Haviland 1992). This last group tends to be made up of researchers investigating the largest Maya centers of the southern lowlands, themselves faced with data interpreted as signifying a degree of centralization not apparent at smaller Maya centers. The Classic
Maya are not anomalous in the history of ancient civilization; many regions of the world were never incorporated into a single political entity.

“Regional Mesopotamian states were far from typical entities in the course of Mesopotamian political events. Rather, they were rare occurrences, unable to establish a legitimate and institutionalized method of governance over various city-states that guarded their local autonomies.” (Yoffee 1988:63)

Within a system of basically autonomous Mesopotamian city-states agriculture remained extensive rather than intensive, and still large estates developed and stratification emerged in Sumer (R. M. Adams 1966:57). This happened in conjunction with the development of writing, complex redistribution, and increasing rank differentiation. This example demonstrates that unification is not necessary for political and economic development. The growth at individual centers can be sufficient impetus for the advancement of complex society and development of new institutions.

**Economic Record Keeping**

“At least down through the Akkadian period and perhaps somewhat later, the careful management and recording of a system for the redistribution of subsistence products in the form of rations was the central economic activity and concern of the state institutions.” (R. M. Adams 1966:52)

Economic record keeping has not been demonstrated for the Classic Maya. Perhaps the sophisticated Mayan script was employed on bark paper for economic record-keeping and these records have not survived. It is quite conceivable that most economic records (if they existed) were viewed as short-term documentation, not judicial documents or permanent records to be referenced beyond a short time period. Nevertheless, for the Classic Maya no permanent economic records survive in any perishable medium, such as the Fayum papyri (Casson 1984:Chapter 7; Rathbone 1991; Von Reden 2007). Neither have economic stone markers been found, such as the Horos land markers placed on private estates in Athens (Finley 1952) or the Kundurra boundary stones found on private lands with ‘legal’ inscriptions documenting exemption from
taxes, corvéé labor, or military service dating from the fourteenth to seventeenth centuries B. C. and particularly associated with the Kassite dynasty of Babylon (Critchley 1978:62). Nor have archaeologists recovered economic inscriptions on stone monuments such as the inscriptions documenting the support bases for large Khmer cult institutions (M. D. Coe 1961, 2003, 2008; Lustig 2009; for pre-Angkor cult institutions, see Vickery 1998). There are records of economic transactions written on clay tablets going back to the very beginnings of writing in Sumer. In fact, 80% of the inscriptions from the earliest levels at Uruk detail commodity exchanges. Only later was the evolving script used to record historical and literary information, and the majority of inscribed tablets still contained economic information (Crawford 1991:151-155).

While the epigraphic record for Classic Mayaland does contain indications of warfare, political subservience, and tribute extraction, in the long-run these seem to be ephemeral. No powerful Maya kingdom ever conquered a majority (or even a large number) of other autonomous Classic Maya centers, and those smaller integrative efforts we know about (e.g., in the Petexbatun region) seem to be short-lived. There are no clear indications in the epigraphic or archaeological record that any Classic Maya polity, even Tikal, successfully consolidated political authority over an area more than 40 km or so in radius (see Sabloff 1986). Consolidation of power within a relatively short period of time was either halted, never attempted, or never successful in the Classic Maya Lowlands. Maya polities are thus best viewed as city-states or peer-polities. However, these terms are not the best either.

Urban Population Density and “City” Organization

Evaluating ethnohistoric documents from contact/early Colonial period central Mexico, Sanders concluded that economic specialization and economic symbiosis had shaped the evolution of the Aztec capital city of Tenochtitlan-Tlatelolco. State redistribution (to the ruling class) of “preciosities,” such as finely woven cloth, cacao
beans, jade, copal, incense, and gold were contrasted against marketplace exchange of food and domestic items (Sanders 2000:354, 362-366). The number and kind of items circulated through the daily market at Tlatelolco indicated a high degree of specialization; goods and services must have been provided by a large group of non-food producers. The expansion of the empire through military and/or political conquest led to increases in the size of the ruling class, and hence, a concentration of consumers in the urban core of the empire which sustaining very large marketplaces (Sanders 2000:368).

“If we argue that urbanization developed basically out of the agricultural folk society that supported it, and economic specialization is one of the most characteristic traits of urbanism, then the process by which urbanism evolved in Central Mexico seems apparent.” (Sanders 1962:40)

Sanders’ other requirements for city-status include a high population density in the urban core, minimally 2000-3000 per km² (Sanders 1962) up to 5000 per km² (Sanders 2000), specialized production, and a high degree of “social differentiation based on occupation, status, control of power, and in some cases, ethnic diversity” (Sanders 1962:37). Sanders saw economic specialization and, by extension, redistribution or exchange between food producers and non-food producers as a major factor in the development of an urban settlement pattern and way of life.

Relatively high density “urban” cores have been documented for the Classic Maya centers of Chunchukmil (Beach 1998; Dahlin et al. 2005; Hutson et al. 2008, 2009; Magnoni 1995, 2007) Copán (Sanders and Webster 1988; Webster 2008; Webster et al. 2000), Dzibilchaltun (Kurjack 1974), and Palenque (Barnhart 2008). Are these population densities congruent with segmentary lineage organization or do they indication more centralized political control?
City-State and Peer-Polity Labels

“The “city-state” label has been among the most frequently applied to ancient Maya polities, but rarely has it been so with any clear and explicit statement of its meaning or appreciation for its implicit sociofunctional significance on the part of those who have used it. Properly, city-states are urban-based mercantile entities and any usage other than this is incorrect. They are characterized by ‘the importance of acquired wealth over hereditary status in access to power’ (Fox 1977:111), and a considerable consequent social mobility. In the absence of ascriptive offices, electoral systems typically emerge to resolve political issues. City-states develop where little or no centralized authority exists and a source of wealth and economic autonomy other than control over peasant subsistence agriculture is present. Their wealth may derive from long-distance trade or money-lending activities or from involvement in the large-scale local production of exportable handicrafts such as pottery, stone tools, or cotton cloth. In any event, the city itself ‘is a place for the production of riches, not merely a consumption center where wealth squeezed from peasant labor is expended by state rulers, or where artisans congregate to supply the needs of resident state administrators (Fox 1977:95).’” (Ball 1993:248).

By this definition it is debatable whether or not Athens would be considered a city-state, depending on one’s view of the center as primarily a consumption center or a production center (see Casson 1984:Chapter 1). Michael Rostovtzeff (1941:91) stressed the fact that the city-states of continental Greece “were purely agricultural communities with only embryonic trade and industry, the last mostly carried on in the home.” He also points out that they were not generally self-sufficient communities in terms of agricultural production of raw materials for ‘industry,’ and relied upon other regions for imports. This is why the Greek states have generally been characterized as consumption instead of production loci.

The term city-state has been applied to pre-Columbian centers in central Mexico, although the term was developed in order to describe a distinctive Old World tradition. Nichols and Charlton’s (1997) broad definition of city-states has been criticized by Cowgill (2003a) and others, specifically the strict “mercantile” association derived from Fox’s (1977) typological classificatory system. The mercantile-based city-state model may not be applicable to all Old World traditions, or adequately characterize their
economic organization(s). For instance, Sumer was not characterized by a money economy in the fourth and third millennia B.C., although a well-regulated system of exchanges is apparent. Nonetheless, it is unlikely that the majority of exchanges were regulated by private industry.

“The texts suggest that the major centres of production were run by the great public institutions, by the temples and palaces, but we must remember that our information is biased by the accident of recovery. The vast majority of the tablets recovered come from public rather than private estates, reflecting the interest of the early excavators in temples and palaces.” (Crawford 1991:124)

In early Sumer, a flourishing ‘industry’ did exist for the manufacture of items made from imported materials, but these items were mostly exchanged locally. With the exception of chlorite bowls and carnelian beads, few manufactured goods recovered archaeologically were made outside the plain (Crawford 1991:124-146).

Similar to the term city-state, the peer-polity label was developed in order to describe polities that developed in a quite different ecological setting and was later applied to the Classic Maya lowlands and other regions (Renfrew and Cherry 1986). A major tenet of the peer-polity model is that these peers are of equal size and complexity, a point which can be modified when speaking of Classic Maya peer polities (see Marken and Straight 2007:283-284). Perhaps just polity is the best neutral term to use when making broad, sweeping generalizations. These various socio-political labels have, in turn, been associated with related concepts in specific ways.

“Sabloff and Andrews (1986) and Schele and Freidel (1990:56-57) follow the city-state concept, applying predominantly peer-polity models (Renfrew and Cherry 1986) with segmentary principles to Maya interactions. Others argue that a gradient of successively smaller versions of a similar site pattern occurs among the Classic Maya as well as the Postclassic Maya (Willey 1980).” (Fox, Cook, A. Chase, and D. Chase 1996:796)

The idea of political control being exerted through kinship structures has had an enduring effect on reconstructions of Classic Maya socio-political organization. To this
day, a dichotomy between segmentary organization and non-kinship organization as the basis for Classic Maya sociopolitical organization remains (Ball 1993, 1994; A. Chase and D. Chase 1996; D. Chase, A. Chase, and Haviland 1990; Demarest 1992; Fox, Cook, and Demarest 1996; Fox, Cook, A. Chase, and D. Chase 1996; Haviland 1992, 1997; Houston 1993; Sanders and Webster 1988).

**Political Hegemonies and the Formation of Territorial States**

Aside from the dispute over Classic Maya centers of different sizes being integrated by different social institutions, some researchers base their analysis on even larger political units (polities) than the single site focused approach. Marcus states that the province was the most stable settlement unit in Postclassic Yucatan and discusses warfare, both within provinces and between provinces, asserting that polities were made up of capitals and their dependencies (Marcus 1993:120). For central Mexico, Sanders (1962:40-41) believed that the city-state, or altepetl was the fundamental stable unit, and largest level of political integration that could be directly linked to ecological factors. It represented the most enduring identifiable social unit even though individual altepeme could become incorporated into larger settlement hierarchies within the Aztec empire.

Whether one views indigenous territorial units in terms of *altepetl, batabil*, city-states, provinces, communities, or major, secondary and tertiary centers, the political integration of multiple settlement units is our concern here. Peter Mathews (1985, 1991) suggested that centers with emblem glyphs represented autonomous polities. Arguing from a different epigraphic angle, Marcus (1973, 1976, 1983, 1993) sees larger territorial settlements units in her analysis of the Late Classic Maya Lowlands; territorial states were headed by capital centers within a hierarchy of politically controlled settlement units.
The epigraphic record for the Classic Maya can be read and interpreted in various ways. Marcus once misread a portion of the epigraphic record [A.D. 696 to 761] to conclude that a military alliance between Tikal and Calakmul had been formed (1983:466). While the epigraphic record certainly suggests military alliance between centers, Tikal and Calakmul have never been found to have entered into an alliance together, quite the contrary – they are typically portrayed as superpower enemies (Martin and Grube 1995, 2000).

Concerning the broad issue of defining large territorial states from epigraphic evidence, the epigraphic record for the Classic lowland Maya indicates a degree of political interaction among centers of varied sizes. Marriage alliances (see Marcus 1983, 1993), warfare events, and political or courtly visits are clearly documented. Classic Maya centers mainly erected public monuments to aggrandize their own ruling dynasties, but no monument program has been found proclaiming the political subservience of many secondary sites by one capital. Although Martin and Grube (1995, 2000) read various clauses from carved Classic monuments as proof of a hierarchical political organization, we do not see monuments with the carved portraits of overlord kings from conqueror centers in the great plazas of their defeated subject centers.

Expressions of overlordship are typically written into the texts of public monuments, but do not represent the dominant theme of those monuments. The famous warfare event by Caracol over Tikal was carved into the long circular text of Caracol Altar 21 (Houston 1987) retrospectively, some 70 years after the fact. The monument itself was not carved as a victory statement, rather the victory was one event recorded within a long text recalling a series of events in Caracol’s recent history. No monuments bearing the portrait of the king of Caracol were ever erected at Tikal. This is an important, but often overlooked, point: political hierarchies are constructed by epigraphers reading through clauses on monuments, but no overt monumental program clearly marking a political territory was ever initiated by a more powerful king that had taken over a number of centers. Portraits of kings standing over prostrate captives are
always erected at the victor’s center. Only the kings of Tikal are portrayed as the protagonists on monuments at Tikal\textsuperscript{15}; the same is true of Calakmul, Caracol, Copán, Palenque, and all other Major Maya centers or “capitals.” Never were imperial statues of a Maya Augustus or Stalin imposed on a number of subject communities.

Archaeological evidence for warfare events is rare. Tikal’s Early Classic stelae were apparently defaced, smashed, and moved, indicating serious political upheaval at times, although Stanley Guenter (2002) has argued that the monumental hiatus at Tikal cannot be associated with a sacking of the center in the mid-sixth century A.D. Although other Classic Maya centers were clearly sacked and then abandoned (e.g., Aguateca, Cancuen, Dos Pilas), unambiguous archaeological evidence of political control or integration has not consistently emerged. In fact, the sacking of Dos Pilas, Aguateca, and Cancuen are followed by abandonment of those sites, not political take-overs.

“[T]here are no clear data in the archaeological record which can be strongly linked with the inference that various sites \textit{politically} controlled a number of other sites, particularly in regard to large sites controlling other large ones.” (Sabloff 1986:111 italics in original)

\textbf{Autonomous Centers - Ancient Building Blocks of States and Empires}

Several lines of reasoning suggest that the Classic Maya polity, in terms of the largely self-sufficient and autonomous (though not necessarily independent) center, was a fairly stable entity. By center I simply mean the monumental central architectural complex and symbiotic residential periphery of agriculturalists. Although political alliance, warfare, and dynastic disruption are clearly documented for the Classic Maya, these events are typical of archaic states. The complex architectural sequence of elite burials, caches, building dedications, and remodeling episodes within the North Acropolis at Tikal alone suggests a degree of political stability. Dynastic tombs,

\textsuperscript{15} Some monuments do portray the King as co-protagonist alongside an elite from another kingdom (i.e., Tikal Altar 5, or Caracol Altar 13), but these do not denote political subservience by the Tikal or Caracol rulers.
monumental architecture, and sculptured monument programs project a considerable degree of “permanence.” Although there are breaks in the Tikal dynastic sequence, kings continue to enumerate themselves in an uninterrupted sequence and to make reference to past rulers to whom they are not biologically related, even after the A.D. 378 entrada of foreigners (Marken and Straight 2007:282). Monuments also document political, religious, or courtly activities conducted jointly by rulers from different centers (e.g., Caracol Altar 13 or Tikal Altar 5); however, there is nothing to suggest that these centers should not be viewed as basically autonomous polities engaged in political negotiation and occasionally going to war with rival centers.

When I refer to Classic lowland Maya centers as “autonomous,” I do not mean to deny that political alliance, warfare, and intermarriage were not present or unimportant. I simply mean to stress the basic self-sufficiency of any given Classic Maya center, even if this autonomy was threatened by other centers or had originally derived from associations with the ruling dynasty of another center. In spite of the epigraphically derived conclusions of political hierarchies in the Classic Maya lowlands, I believe that the broader contextual patterns of monument placement and subject matter bespeak a general autonomy of Maya centers, much as Mathews (1985, 1991) once hypothesized. Speaking of Postclassic Maya political arrangements, Marcus says,

“No matter what happened to a province, whether it joined a confederacy or was subsumed under a more powerful unit, it retained its integrity.” (Marcus 1993:120)

When speaking of different levels of socio-political organization it is important to remember that the Aztecs unified the Basin of Mexico through alliance and conquest. Prior to ‘centralized’ control, autonomous centers were the norm, even if these were tributary to a dominant center such as Atzcapotzalco (Tepanecs). This is not to say that political alliances and tributary status were unimportant in the development of the area, but the basic level of integration, before and after the Aztec conquest would appear to have been the fairly stable city-state.
“The city-state capital – a small urban center home to one of the scores of petty kings in Aztec central Mexico – can be considered the dominant form of Aztec urban settlement. By ‘dominant’ I do not refer to political relationships (the imperial capital Tenochtitlan was the dominant political capital) but to the status of these cities as places where most people took care of most of their urban needs. People from the entire city-state paid their taxes at these settlements and performed their required rotational labor; they bought their obsidian tools and other goods in the urban marketplace and perhaps sold some items there; they attended religious ceremonies and watched ballgames; and they went to meet, mingle, and gossip with their friends. For millions of Nahautl speakers, their local city-state capital loomed larger in their daily lives than the distant imperial capital, which they probably visited only rarely.” (M. Smith 2008:447)

The point made by Smith, that communities are often incorporated into larger political systems (i.e., states or empires), is an important one when considering top-down and bottom-up reconstructions of political integration. Smith refers to small, previously independent polities maintaining basic political, social, and economic autonomy while they are subjected to tributary status within a larger political sphere. The important theoretical distinction being made is the difference between the autonomous inner-workings of the polity as a social unit and the political independence of that social unit in respect to political developments on a larger scale. A few more examples will help to clarify what I mean when I use the terms autonomous (as in self-sufficient) and independent (as in politically subservient).

Aiden Southall’s reconstruction of Asiatic city-state development and empire building suggests that the inner workings of basically autonomous communities were not drastically altered through conquest.

“The rise of empires brought expansion to their capital cities, some of them even more splendid than the city states, though hardly more brilliantly innovative than they…These first empires were multiple states, offering the conquerors great plunder, personal and communal enrichment, with mass labour of captives and slaves. The interests of the conquerors and their followings were enhanced, but apart from irregular tribute collection most of the conquered communities were left effectively autonomous.” (Southall 1998:17)
D. Chase and A. Chase (1996:804) argue that the pulsating character (wax and wane) of south Asian kingdoms cited by Marcus (1993) results from factors that are not characteristic of Maya centers (they seem to be referring to Caracol and Tikal here). The factors are: low population density, inefficient taxation, dependence on foreign trade monopolies, and centrifugal pressures promoting factionalism (after Bentley 1986:293). These factors seem rather likely for the Classic Maya to me. The Chases also appear to question the utility of applying general labels to preindustrial centers.

“Vijayanagara, India, has been referred to as a segmentary state (Fritz 1986:46; Southall 1988), a galactic polity (Fritz, Mitchell, and Rao 1984:148), and an empire (Sinopoli 1994:162) – thus running the gamut from regal-ritual city to imperial capital.” (A. Chase and D. Chase 1996:804)

Expansion (or formation) of the west African kingdom of Dahomey began with a concerted effort to capture and incorporate coastal trade ports that were controlled by autonomous polities with definite capitals. Dahomean conquest of the Aja kingdoms of Allada (Ardra) and Whydah, between 1724 and 1727 (M’Leod 1971[1820]:13; Ross 1989), initiated with military attacks and occupation of the capital settlements but required further pacification or consolidation efforts. These were not highly centralized states, but conglomerations of principalities (ca. 25 in the polity of Whydah) each headed by hereditary dignitaries under tributary status to the capital settlements; they were basically autonomous and the capital did not interfere in the day to day affairs of these lesser ‘kingdoms’ or ‘statelets.’ These numerous tiny statelets were characterized by constant quarreling and infighting as well as outward aggression toward one another. While this could be viewed as an instance of dynamic segmentary state operation, the minimal political units (the individual statelets) tended not to align against larger neighbors. Even the dominant political capitals of Allada and Whydah would not form an alliance against the expanding inland Dahomeans to repel their common enemy. Ross (1987, 1989) has stressed what a small group Dahomey was at this time, basically slave-raiders actively forging a larger economic and political polity. After capturing the capitals of Allada and Whydah, it took Dahomey another 25 years of military and
political maneuvering to complete the incorporation of all of southern Ajaland within the newly forming Dahomean state (Ross 1989).

Initially Dahomean control of the capitals of Allada and Whydah did not greatly affect the inner workings of the multitude of autonomous statelets; Dahomey simply assumed the tributary demands of the former independent capitals of the Allada and Whydah polities. However, Dahomey did stay the course and eventually depopulated and sold into slavery the majority of the western Aja people, assuming complete control of the area (Law 1977, Ross 1989).

Even while these newly conquered territories were nominally in their possession, the Kingdom of Dahomey suffered a brutal military defeat by their inland neighbors and persistent enemies, the Oyo, leaving Dahomey a tributary of that great kingdom and military power, from 1730 to ca. 1818 (Akinjogbin 1967:68; Dalzel 1967[1793]:72). After the 1730 defeat, the king of Dahomey, Agaja’s (aka, Guadja Trudo) son, Tegbesu, was held in Oyo custody in order to secure more passive relations between the two nations. The two rulers, Agaja (Dahomey) and Ojigi (Oyo), exchanged daughters as marriage partners to solidify the treaty between the two nations in which Dahomey entered as a tributary polity. Following Agaja’s’s death, his son, Tegbesu, was returned to rule over Dahomey and finalize the pacification of western Ajaland begun during his father’s reign. He reestablished the royal court at Abomey in 1743 and reaffirmed his allegiance to Oyo in 1748 by means of an augmented tribute agreement (Akinjobin 1967:110-123). Tribute payments were facilitated through an ethnic Yoruba barrio maintained within the Dahomey capital of Abomey at the insistence of the Oyo.

The Oyo themselves evidently stood in a tributary position to an even more powerful inland group at this time (Dalzel 1967[1793]:229). The previously autonomous center of Allada, now incorporated into the kingdom of Dahomey, remained a tributary of the Oyo as it had since 1680 (Akinjobin 1967:81). Yet Dahomey continued its own internal political development; external political pressure from the inland Oyo did not
overtly interfere with the day to day workings of the Dahomey polity (after 1748) as long as the port of trade at Whydah remained open. In fact, in an effort to ensure the economic stability of Dahomey, Oyo intervened in 1764, sending an army to defeat 20,000 Ashanti warriors trespassing on Dahomean territory (Akinjobin 1967:124); vassalage can have its advantages. This phenomenon of initially taking a capital settlement through military advance only to spend years or decades re-conquering or pacifying the entire region has been repeated historically (i.e., certain Aztec provinces, the Inka occupation of the Mantaro Valley, Distant Vijayanagara trade ports, or Spanish control of highland Guatemala [see Restall and Asselbergs 2007]).

**The Segmentary State Model**

Segmentary lineage structures were discussed by Myers Fortes and E. E. Evans-Pritchard (1940) who made an initial distinction between Type A “state” and Type B “acephalous” segmentary-lineage societies (see Fox 1977; M. G. Smith 1956; Southall 1956, 1988). In their classic appraisal of segmentary-lineage societies, tribal (i.e.; herders, nomads, pastoralists) Type B societies based in opposition – balanced or complementary (segmentary) (Salzman 1968) – are contrasted against Type A sedentary states. Lineages within Type A societies are defined based on their orientation toward a central government. Within a segmentary state, segmentary lineages are enumerated in relation to their function *vis a vis* the control bureaucracy or government in terms of power and influence (authority), control of land, labor, jurisdiction in conflict resolution, and ritual performance in the maintenance of cosmic harmony (M. G. Smith 1956).

Segmentary lineages within such a socio-political system do not just reflect kinship ties, they are corporate groups that organize productive resources and function as political (and economic) entities. M. G. Smith (1956) stressed that lineages (in the corporate group sense) regulate internal relations (through authority) and act as political bodies (through power) on a society-wide scale. As such, segmentary lineages should not
be viewed as strictly kinship structures, but as flexible political and economic units. L. Bohannon (1952) described the Nuer propensity of bending kinship relations to maintain a corporate lineage group. Biological kinship does not strictly enforce segmentary lineage structure; lineage members make pragmatic adjustments to real-life situations (Carsten and Hugh-Jones 1995:15-16). When discussing sociopolitical structure in anthropological terms, Susan G. Gillespie (2000) suggests replacing the overused term “lineage” with “house.”

“Houses are corporate, long-lived units that are organized for specific ends. House members strategically utilize relationships of consanguinity and affinity, real and fictive, in order to legitimate expressions of unity and perpetuity.” (Gillespie 2000:468)

Suspecting that the segmentary-lineage model developed from the ethnographic study of the African Alur (Southall 1956) was applicable to other continents, Richard Fox (1977) applied the model to Indian polities (Rajput). Mesosamericanists have often based their segmentary-lineage interpretations on Fox’ application of the model to Indian caste societies. Likewise, Burton Stein (1977) applied the model to southern India – to the Pallavas, medieval Colas, and latter Vijayanaragara – indicating its widespread utility to various scales of demographic size, territorial size, and political power.

As Southall (1988) reconstructs, Alur society emerged as a distinct “entity” in the fifteenth or sixteenth century A.D., incorporating different ethnic groups that were previously organized as autonomous self-sufficient villages. The ethnic Alur probably commanded greater agriculture and pasture lands, not strategic resources or trade routes. Southall credits the foundation of the Alur polity to their ‘peaceful domination’ without the use of “coercive political force,” and the process of ruling almost as a professional occupation. Clear rank distinctions developed from this ideology over time, although not to the degree of caste or varna, constituting distinct hierarchically-organized segments of society minus the concept of polluting forces characteristic of Indian caste society (Southall 1988:57-59). Nonetheless, Alur society was characterized by producer households, although never fully self-sufficient.
“All Alur had free access to land and productive resources as members of localized kin groups. Households made their own housing, clothes, utensils, and food, but they were not self-sufficient. They depended on neighboring kinsfolk, mainly within the corporate lineage group, for fundamental tasks in agriculture, house building and moving, collective participation, support and mutual responsibility in all life cycle and crisis rituals, in local dispute settlement, collective action in relation to higher authority, and in initial defense against any external threat. The commensal unit was the minimal lineage, not the individual household. All lived at the same subsistence level, except that the ruling elite probably enjoyed a greater abundance of beer, meat, and milk” (Southall 1988:68)

Southall places the Alur at his stage III, where an incipient leader solidifies political authority out of ritual specialization and prestige. In this scenario, a lineage head was elevated to political office on the backs of his brethren or corporate group (Southall 1988:75). The Rajput and Colas polities were vastly larger demographically and territorially than the Alur (Southall 1988:65); nonetheless, similar structural principles facilitated the formation and maintenance of more complex societies. In these northern Indian polities, a higher degree of political complexity was attained than in the Alur case. The historical record of the Colas indicates economic growth through regionwide agricultural intensification. The integration of this developing agricultural system was paralleled by greater development of crafts and trade and of urban centers with greater centralization of military power, religious institutions, and government (Southall 1988:74). This description of the Rajput and Colas political systems of India is reminiscent of characterizations of the mature Aztec state, whereby local ‘city-states’ maintained much of their autonomy and self-sufficiency after incorporation into the overall state system, with the addition of the tax-rent tribute obligation. While one central king or suzerain theoretically held sway over the entire extended polity, power over local decisions remained with hereditary rulers.
“The monarch was in theory a despot, but mainly within the ruling class of the core domain, while in a mystical and ritual sense he was held to be the overall owner of the land and territory and responsible for its well-being: he possessed narrow political sovereignty within a broader ritual suzerainty. As the surplus increased, more entered the market through traders. Towns and cities developed, with a commodity economy mainly confined to merchants and the ruling class, while the masses of the population remained in their largely self-subsistent communities.” (Southall 1988:66)

Theoretically linking a lack of full-time specialization with the lack of productive resources, Southall (1988:61) emphasizes the development of the polity through segmentary principles as a weak state, controlling a large territory without direct control of strategic resources or trade, more so through labor control and localized agriculture and pastoral production. This reconstruction does certainly provide one analogy with the Classic lowland Maya, based primarily in similar ecological condition.

“The combination of foot transport, hilly terrain, a highly localized economy, no markets, and quite limited exchange meant minimal communication between the different component units of the segmentary polity, apart from those quite close to one another, so that a centralized, unitary political organization was out of the question. There as a definite recognition of the greatness and seniority of the rulers of the core domain, except that a few of the larger offshoots tended to claim equality and autonomy.” (Southall 1988:63)

For the Classic Maya, we might question the notion of a core area at all. Although it was popular to conceive of the Classic Maya Lowlands as a unified empire in the 1950s and 1960s (with Tikal as the obvious choice for supreme capital), this landscape was inhabited by numerous autonomous polities. Recent advances in epigraphic decipherment have brought the notion of a number of autonomous centers united under one overlord back to the forefront of the discussion. Did larger territorial states develop here? That is, were all centers politically independent as well as basically autonomous in their local government, production, and consumption? Even more confounding, did Classic Maya centers form larger economic networks, including integrated market systems?
Southall (1988:81) also points out the ability of demographically and spatially smaller polities to develop more centralized government systems, including the Ile-Ife and Ijebu-Ode (Yoruba) polities of the West African rainforest. It should not be forgotten that size and political control are not necessarily positively correlated. Greater centralized control is to be expected at smaller centers more often than within larger territorial polities. This very notion is at odds with the centralist position on the Classic Maya, where the largest centers of the southern lowlands, Tikal and Calakmul, are assumed to have wielded greater centralized control primarily because of their large sizes.

The segmentary state is seen as the ubiquitous organizational mode across all of Mayaland by some researchers (Ball 1993, 1994; Ball and Taschek 1991; Houston 1993; Dunning and Kowalski 1994), and rejected for only some centers by other researchers (A. Chase and D. Chase 1996; D. Chase, A. Chase, and Haviland 1990; Folan 1992; Folan, Marcus, and Miller 1995; Folan et al. 2008; Haviland 1992, 1997). Diane Z. Chase and Arlen F. Chase (1996) point out that different models of social organization have been associated with one another in theoretical arguments; that certain concepts are commonly “bundled together” in the formulation of anthropological arguments. Fox (1977) directly associates the regal-ritual city with the segmentary state model, and Maya researchers proposing “galactic polities” have also directly associated this form of socio-political organization with the segmentary state (Demarest 1992; Houston 1993). However, the Classic Maya are not the only Mesoamerican society for whom this form of social organization has been proposed. Hayden (1994:199) equates Aztec socio-political organization with the segmentary state; Eric Wolf also associated Aztec calpuli with conical clans.

“[C]onical clans’ [are] kinship units which bind their members with common familial ties but which distribute wealth, social standing, and power most unequally among the members of the pseudo-family. Such kin units trace their descent back to an original ancestor, real or fictitious; but, at the same time, they regularly favor his lineal descendants over the junior or ‘cadet’ lines in regulating access to social, economic, or political prerogatives.” (Wolf 1959:136 quoted in R. M. Adams 1966:88)
**Political Organization of Copán**

Copán has been the focus of targeted investigation for decades (see Webster 2008:233 for a listing of published survey and excavation data for Copán). The urban core of Copán has the highest recorded population density of any Classic Maya center (on par with Chunchucmil or Palenque), approximating the density of Postclassic Mayapan. The Copán urban core covers an area of about 1 – 1.5 km², with an estimated maximum population of about 12,000 persons during the apex of settlement density between A.D. 750 and 799; a total maximum population of the polity is estimated at approximately 28,000 (Webster 2008). Based on the concurrence of population estimates derived from settlement studies (Webster 2005; Webster and Freter 1990; Webster, Freter, and Gonlin 2000; Webster, Sanders, and van Rossum 1992) and agricultural sustainability models (Wingard 1992, 1996; see Webster 2005) Webster strongly adheres to a peak population estimate of approximately 22,000 persons at ca. A.D. 850 – 900. This was not a sustainable population and a steady, but not rapid, decline followed the demographic plateau between A.D. 750 and 900 (see Webster 2005:Figure 2.2). At the peak of population the inhabitants of the polity of Copán lived in three areas of decreasing population density, the urban core [1-1.5 km²], the Copán pocket [23 km²], and a more sparsely inhabited hinterland beyond this. The urban designation of the Copán core is based primarily on population density, not other factors associated with urban life.

“Our use of the term ‘urban’ for this part of Copan is thus a qualified one – it refers to the unusually high density of population, not to the more qualitative aspects of urban life, such as the presence of markets or well-developed occupational specialization, neither of which are evident.” (Webster 2008:241)

Based on survey, archaeology, and agricultural production simulations of the Copán region, Webster (2008; Webster, Freter, and Gonlin 2000) favors a model emphasizing a fundamental symbiotic relation between Copán’s urban core and the surrounding sustaining area of agricultural production in the Copán pocket and hinterland; a model not unlike that proposed for Tikal (Haviland 1965; Puleston 1973).
This symbiotic relationship is viewed as fundamental to the development of all Mesoamerican urban centers. Sanders initial formulation of the symbiotic model was based in the logic of the limiting factors of primary production and primitive transportation.

“I doubt that the Neolithic farmer with hand tools can produce more than a 20 percent surplus. A city of 100,000 population would require a rural population of 500,000 to support it.” (Sanders 1962:39)

In the Maya lowland regal-ritual city model the Copán core is viewed as a consumption center, although the craft (and to a lesser degree, agricultural) production and distribution systems are not entirely clear. The population of the urban core is much greater than the 20% figure assumed by Sanders (1962), and Sanders and Webster (1988) suspect that the agricultural production system involved a degree of outfield production, possibly on a seasonal rotational basis (Webster et al. 2000:186-187).

It is known that “preciosities” were manufactured within one of the larger “maximal lineage” compounds [9N-8] (Webster et al. 1998; Widmer 1997, 2009), but these appear to have been consumed within the compound as well, not necessarily exchanged outside the compound or outside the polity of Copán. The production of elite craft items or “preciosities” within the elite residential zone or epicenter of the Classic Maya center of Aguateca has been thoroughly documented (Aoyama 2007, 2009; Emory and Aoyama 2007; Inomata 2007; Inomata and Triaden 2010; Inomata et al. 2001, 2002). Aoyama (1995, 2009:82) analyzed a marine shell ornament debitage dump within the west court of the core architectural group at Copán, located in front of Structure 10L-16, which contained debitage from four marine species associated with 281 obsidian and 32 chert artifacts; his analysis confirms low volume production here, not a commercial or mass production context. Mallory (1984) excavated a workshop at Copán where obsidian tools were likely used in the processing of other goods.
Both Mallory (1984, 1986) and Aoyama (1999) discount any market system at Copán based in their respective lithic analyses; Aoyama favors a model of centralized control of obsidian production, while Mallory (and Webster) do not. Webster’s overall reconstruction of socio-political organization places Copán in the general category of the regal-ritual city (e.g., Fox 1977) organized through segmentary lineage principles while some larger Maya polities (i.e., Tikal) were probably more politically stratified and centralized (Webster, personal communication 2011; see also Sanders and Webster 2001). Smaller Maya polities (i.e., Copán or Piedras Negras) might have retained more ranking, although probably still through segmentary lineage principles. At Copán, ranking is evident among kinship groups as well as within them, but these should probably not be interpreted as “class” distinctions (Sanders 1989; Webster 2008:245).

“[Copán] was primarily a place of consumption rather than production, and the population size was at the upper range of this urban type. In our reconstruction the Copán political regime as a whole approximates what we would call a segmentary state, or in Fox’s terms the kin-based rather than feudal variant of the segmentary state.” (Sanders and Webster 1988:534)

Julia Hendon (1991) interpreted the archaeological evidence from Copán as supporting a segmentary lineage social organization model. William A. Haviland (1992; D. Chase et al. 1990) suspects differences in the social organization of Maya centers, especially between larger centers (Tikal, Caracol, Calakmul) and the smaller center of Copán. With respect to applying the segmentary state label to Classic Maya centers, he rejects this for Tikal; remaining unconvinced that ranking within lineages was as significant a feature of society as were distinctions in rank between classes. He viewed the simple residences situated within Tikal Group 7F-1 as servants, not as lower ranked members of the same lineage. Although accepting that Copán may have been organized as a segmentary state, he does not believe that all Maya centers must have been organized along these lines. Furthermore, Haviland rejects the notion that the mere presence of lineages or clans necessarily guarantees “the kind of segmentary opposition required by the segmentary-state model;” nor does he view urban life as incompatible with lineage organization (Haviland 1997:444).
“Given a lesser degree of centralization at Copan and an increasing prominence of lineages there, did it constitute a segmentary state in the strict sense? If it did, I think this remains to be demonstrated.” (Haviland 1997:443)

Elites, Regal-Ritual Cities, and Royal Courts of the Classic Maya

Webster interprets the central ruling apparatus of Copán as the royal court of a regal-ritual city (Webster 2008), a model which he has also applied to the Classic Maya centers of Piedras Negras (Webster and Houston 2003) and Tikal (Webster et al. 2004:32; Webster et al. 2008:369). Certainly courts can be found in societies characterized by abundant ranking as well as in more stratified ones; the court apparatus may vary considerably in structure from one society to another. Also, the court is somewhat like a household writ large, characterized by both human actors and the physical structures they used. Hence, larger royal courts should be archaeologically recognizable by larger architectural complexes characterized by facilities for a multitude of activities (e.g., the Palace at Palenque [see G. Andrews 1980] or the Central Acropolis at Tikal [see Harrison 1986]). The royal court is also a dynamic social institution, longer lived than any single individual, even the king.

While roughly the same size as the urban core of Copán, the 96 hectare urban core of Piedras Negras has an estimated population of around 2500-3000 people, three or four times less dense than the Copán core (Webster and Houston 2003:433). Nonetheless, Piedras Negras is viewed as the primate center within its settlement system, just as Copán is viewed as the primate center for its settlement system (Webster and Houston 2003). The light hinterland residential population of Piedras Negras evidently did not have any substantial access to non-perishable exotic or imported goods, despite its location on the Usumacinta River; household excavations document an impoverished artifact assemblage. Likewise, excavations at Copán revealed a rather simple artifact assemblage, devoid of abundant exotic or imported goods, except for obsidian (Webster et al. 2000:192). Except for some elite tomb assemblages, the importation of ceramic
vessels was also uncommon at Copán and became increasingly less frequent as the Late Classic wound down (Bill 1997). With a considerably smaller total population than Copán, Piedras Negras also displays a divergent settlement pattern possibly indicating some differences between the socio-political organizations of the two centers.

“Although some of these residences [at Piedras Negras] are quite impressive, none yet tested appears comparable in scale or elaboration with those found at some other Maya centers, most notably Copan, where a few great nobles sported their own thrones, inscribed monuments, and vaulted buildings. Households of Copan’s elite seem to have duplicated some of the functions of the royal establishment [of the urban core], and were mini-courts in their own right.” (Webster and Houston 2003:435, 437)

In archaeological contexts, elites are defined based on archaeological indicators of wealth – elaborate architecture and space afforded them both in life and death, that is, palaces and tombs which represent access to the labor of others in the form of construction costs as well as luxury goods manufacturing. At Copán, below the royal level, architectural investments (i.e., scale, quality, sculpture) are more reliable indicators of elite status than burials, artifacts, or even diet. Elites also have access to ‘esoteric’ knowledge of astronomy and calendrics physically manifested in “observatories,” iconographic programs in stone and stucco, and glyphic monuments. Location is also important, where one lived (and was buried) within the layout of a Maya center also attests to elite status. From an anthropological viewpoint, elites are not just wealthy persons of high rank or status, they can be functionally assessed as the members of society that control institutions, difficult as this may be to demonstrate archaeologically (D. Chase and A. Chase 1992:3).

Related to the concept of the elite control of political, religious, and economic institutions, Inomata and Houston lament the fact that “highly abstract issues such as political organization and social stratification” have received the lion’s share of academic interest when the actual ruling apparatus of Maya centers (i.e., the royal court) can be directly investigated archaeologically (2001:5-6). Applying the royal court model to Classic Maya polities, the issues of vested interest and personal contact loom large.
Within the court setting, more powerful elites may encourage and take advantage of the competition between lesser ranked courtiers; promoting discontent and perpetual stalemate among aspiring upstart elites. The court is also a social arena where lesser ranked individuals may have direct access to the king’s ear, and personal charisma and idiosyncratic behavior are channeled through an institutionalized context. The dynamic interplay of court officials may also become embedded in a considerable degree of theatrical presentation (Geertz 1980; Tambiah 1976) and religious symbolism and practice (Schele and Miller 1986). However, the ritualistic or theatrical dimension of primitive government should not distract attention from the material base of power manipulated by the ancient ruling class.

“It cannot be too strongly emphasized that despite Fox’s [1977] occasional overstatement of the ritual/ideological determinants of the regal-ritual city…he is not reviving the old ‘theocratic/ceremonial’ perspective…He clearly believes that centralized power and authority derive mainly from control of important resources (especially proprietorial domination of capital resources), not from manipulation of ritual and ideology disembodied from their material and political underpinnings.” (Sanders and Webster 1988:527-528)

Viewing social organization at Copán in terms of internally ranked maximal lineages with access to and control over their own resources and productive means, Sanders and Webster (1988; Webster 1992, 2001, 2008) envision a socio-political system with ranked elites vying for power and control. A materialist basis for this supposition rests in the duplication of productive assets outside the direct control of the ruling dynasty.

“The most important feature of this model is that the polity was characterized by what E. Durkheim called ‘mechanical solidarity’ in economic and hence political terms. In such a society the effective power of rulers is to a high degree circumscribed by the presence of lesser magnates with their own power bases.” (Webster 1992:154)

Palenque also became the dominant “primate” center within its region in the Late Classic period and a nucleated settlement or urban core developed with a population
density comparable to that documented at Copán (Barnhart 2001, 2008). Palenque’s settlement pattern shows a distinct similarity with that of Copán, sub-dynastic elite residences clearly distinguished from other ‘commoner’ residences. Excavations in Group IV at Palenque establish this household as the residence of Chak Zutz, an individual closely associated with the royal court of the Late Classic ruler Ahkal Mo’ Naab III. A series of superimposed graves (R. Rands and B. Rands 1957), small ‘temples,’ and a spacious vaulted residential structure attest to the temporal longevity and elite status of this household.

The recovery of a carved limestone panel from the main structure of Group IV, the Tablet of the Slaves, further establishes this residence’s elite status and political connection to the royal dynasty. The Tablet of the Slaves mentions Chak Zutz within the text while the central carved image depicts the current Palenque ruler, Ahkal Mo’ Naab III, receiving the symbols of divine rulership from his own parents (Wald 1997). It appears that Chak Zutz was a “war chief” or political office holder within the royal court of Palenque who held the rank or title of Yajaw K’ak’ and of Sajal. Palenque certainly had persons of elite rank closely associated with the central authority of the polity. “Titled elites” with access to the trappings of wealth and power have been documented for other Classic Maya centers and are viewed in terms of decentralized power at Copán (Webster 1992:136).

Access to elite goods which mark status has been documented at many Maya centers. At Caracol, access to carved monuments has been viewed as a sign of sub-elites gaining access to goods once restricted to dynastic elites only. Caracol Altar 22 is a smaller version of epicentral Altar 23; both depict two bound captives (A. Chase et al. 1991; Grube 1994). The monument was set in front of two stelae at a residential group connected to the Caracol epicenter by a short causeway. Noting that the individual named as the protagonist was not the current ruler of Caracol, Nikolai Grube (1994:86-87) suggested that this indicated a sub-elite residence by way of analogy with evidence from Copán. At Copán, Cassandra Bill (1997) has hypothesized that a greater demand
market for elite ceramics was created through the proliferation of sub-elites; these were mainly locally produced wares and not imported ceramics. This situation of increased access to elite goods has been described as a cross-cultural phenomenon by Arjun Appadurai.

“In a surprisingly wide range of societies, it is possible to witness the following common paradox. It is in the interests of those in power to completely freeze the flow of commodities, by creating a closed universe of commodities and a rigid set of regulations about how they are to move. Yet the very nature of contests between those in power (or those who aspire to greater power) tends to invite a loosening of these rules and an expansion of the pool of commodities.” (Appadurai 1986:57)

In the case of Chak Zutz from Palenque, this individual’s elite rank is clearly attested in the greater size and elaboration of his residence. The centrally mounted carved wall panel is certainly of the same quality and elaboration as examples displayed by the kings of Palenque and suggests that his rank was not considerably lower than the king himself; his residence probably served as a political meeting house as well.

The exceptionally well preserved epigraphic record of Late Classic Palenque documents the complex hierarchically-ordered royal court structure and the various interactions involving the elites within that court. Inscribed monuments recovered from Palenque Temple XIX (Straight 2007; Stuart 2005, 2007), Temple XXI (Bernal Romero 2002; González Cruz 2003; González Cruz and Bernal Romero 2003) and Group XVI (Bernal Romero 1999; González Cruz and Bernal Romero 2000) have provided an insightful, and complex, example of the workings of a Classic Maya court. Temple XIX and XXI were both equipped with “thrones” or platforms adorned with inscribed panels.

I have previously described Temple XIX as a civic building or meeting house dedicated to matters of a political nature (Straight 2007); the structure was built as a single construction episode without a prior antecedent and then ‘terminated’ after a short use-life (Straight 2007; Straight and Marken 2006). Temple XXI is a ‘sister’ to Temple XIX, built at the same time as a smaller version of the same ‘meeting house’-type
structure with a complementary iconographic and epigraphic program (Straight 1999, 2007). Neither Temple XIX nor XXI are “temples,” these are convenient labels that do not accurately describe the buildings. Group XVI (also called Temple XVI) is a range-type structure with multiple rooms, or ‘palace’ which produced various stone and stucco monuments recording historical persons and events.

The monuments from these three structures reference events from Palenque’s Late Classic history as well as mythological events from a distant past; although the monuments were all produced during the Reign of Ahkal Mo’ Naab III (r. A.D. 721 – ca. 740). The monuments from Temple XIX document a political relationship among the dynastic elites of Palenque and a place called Ux Te’ K’uh, presumed to be a center in the region, although this could also have been a part of Palenque itself. The dedication of Temple XIX is recorded at 9.15.2.7.16 (A.D. 734), an event overseen by an individual named Yok-?-Tal. This individual’s portrait appears on two other monuments recovered from Temple XIX, positioned to the left-hand side of the ruling king, Ahkal Mo’ Naab III16, and accompanied by a glyphic caption including his name and the title Yajaw K’ak’; the same title held by Chak Zutz on the Group IV monument. As the dates for these two individuals do not overlap, I suspect that a sixty-two year old Chak Zutz died and the office of Yajaw K’ak’ was filled by this Yok-?-Tal individual, who seems to be directly associated with Temple XIX itself in some capacity as a ritual specialist or caretaker (Straight 2007:188; Stuart 2005:123).

Other highly distinctive individuals portrayed on the carved scene from the Temple XIX platform panels are designated by personal names and titles. Cross-referencing the kinship relations stated on various monuments, it appears that this royal court was at least partially formed through actual blood ties, not fictive or non-existent ones. On the Temple XIX platform panel, the figure portrayed to the right-hand side of Ahkal Mo’ Naab III is the king’s biological cousin; both are grandsons of Janab Pakal the

16 This same individual may also be pictured standing to the left of Ahkal Mo’ Naab III on the miniature ‘bundler’ panel from Group XVI (Stuart 2005:125).
Great. Furthermore, this individual, Janab Ajaw, was elevated to the rank or office represented by the “banded bird” title during the reign of the previous king, Kan Hoy’ Chitam II, Ahkal Mo’ Naab III’s paternal uncle (Bernal Romero 1999; Stuart 2005:119). Another individual from the Temple XIX platform scene, Chan Ajaw, is also mentioned within the text of the Group IV monument, associated with warfare events conducted against foreign polities. It is clear that various ranks or positions within the royal court were filled by blood relatives of the king and that the same office was sometimes retained by a single individual through the reigns of two separate kings, or occasionally replaced during the reign of a single king. Familial ties are also suggested by portraits of individuals showing distinct deformities associated with acromegaly, a rare disease suspected to have afflicted the Late Classic royal decent line (Robertson, Scandizzo, and Scandizzo 1976; Stuart 2005:127), although this has been challenged in recent years. Re-analysis of the bones of K’inich Janaab Pakal I definitively show that he did not suffer from polydactalism or have a club foot (Romano 2006).

For Palenque, the royal court model appears fully justified. The evidence from Copán tends to support the combined model of a regal-ritual city ruled by a royal dynasty residing in the monumental “urban” core of the center; outlying elites occupying positions of authority themselves within second-tier elite compounds co-residing with their own lineage members of lesser rank. The question remains, how alike were all Maya centers? Copán and Palenque appear to have been founded later than Tikal and Calakmul, and this may account for some of the size discrepancy. However, Piedras Negras was founded on a similar temporal horizon as Copán or Palenque and never reached the urban population level of these two centers. West coast Portland, OR and San Francisco, CA are both smaller than east coast Chicago, IL and New York, NY, yet all four are recognizable as urban cities, and are socio-politically organized in an identical fashion, despite each center’s distinctive character or “ethos.” Did the Classic Maya centers all share a common socio-political structure on some level? Did similar institutional arrangements develop at geographically (or politically) distant Classic Maya centers? How can this be clearly demonstrated archaeologically?
The Centralist Position

“The operation of the court depends heavily on face-to-face contacts among courtiers. For many small- to medium-sized Maya centers, such face-to-face contacts may have been possible between the central authorities and the rest of the population at important political and ceremonial occasions. At large centers such as Tikal, Calakmul, and Caracol, interaction may have been quite different, of an austere remoteness that accentuated differences between ruler and ruled.” (Inomata and Houston 2001:13)

Calakmul has impressive monumental architecture, public works, elite tombs with elaborate grave furniture, more carved stelae than any other Maya center expressing political alliance and ‘overlordship’ of many other Maya centers, public works, a large population, a possible central marketplace, and a ring of secondary centers approximating a central place configuration (Carrasco Vargas, Vázquez López, and Martin 2009; Carrasco Vargas et al. 1999; Delvindahl 2008; Fletcher and Gann 1992; Folan 1992; Folan, Marcus, and Miller 1995; Folan et al. 2008; Marcus 1973, 1974, 1976, 1983, 1993; Martin and Grube 1995, 2000:100-115; Pincemin et al. 1998).

“I do not consider the large public structures, 108 stelae and two royal tombs already located in a place such as Calakmul, as representing a decentralized or weak authority; to the contrary, power is also indicated by the large structures, stelae, sacbes and altars apparent in a place such as Coba…” (Folan 1992:163)

Constantly evaluated within the cardinal direction/political capital model developed by Marcus (1973, 1974, 1976, 1983, 1993), Folan and colleagues propose that Calakmul was one of at least four major centers in the Maya lowlands (along with El Mirador, Nakbe, and Tikal) during the Late Preclassic [350 B.C. – A.D. 250], before dated stelae were being erected anywhere with any frequency (Pincemin et al. 1998:312). The transition from chiefdom to state level society, between A.D. 230 and 430, has been proposed for Calakmul and other Early Classic Maya centers in the south Campeche/northern Peten region (Pincemin et al. 1998:310). Folan and colleagues see the Early Classic landscape around the large center of Calakmul as a regional state, with a complex settlement pattern reflecting a centralized political organization more than “lots
of tiny polities” (Folan, Marcus, and Miller 1995:330). The Late Classic population estimate for the Calakmul polity covering 13,000 km² comes to 1,750,000 people, or an average population density of 1.32 persons per hectare, or 134 persons per km² (Folan et al. 2008:323).

“It would seem to me that Calakmul’s size and high population (with impressive examples of public architecture including a 6 meter high wall within what we have considered to be a regional state) existed as a highly centralized administrative center with a frequently-mentioned and widely-distributed emblem glyph instead of one organized in a regal-ritual manner around a decentralized authority.” (Folan 1992:165)

D. Chase and A. Chase (1996:805) cite published estimates of absolute population and size of the center (hence, population density) and the territorial extent of the polity for several lowland Maya capitals of the Classic period – Dzibilchaltun, Coba, Calakmul, Tikal, and Caracol. They have reached a similar conclusion: such enormous polities are definitely typical of the Late Classic Maya lowlands, and these polities would have been characterized by complex administrative systems.

“Given these large population figures for the Classic-period urban centers, substantial administrative effort would have to have been expended not only within them but also within their larger polities...Thus, populous Maya sites cannot be viewed as either spatial or temporal aberrations. They are key elements in a hierarchy of settlements within the Lowland Maya political landscape that was characterized by substantial scale, complexity, and integration by the Classic period.” (D. Chase and A. Chase 1996:805)

Survey reconnaissance found no appreciable drop-off in population density for a minimal radius of 7 km around Caracol’s epicenter (D. Chase and A. Chase 1995). Multiple causeways connect Caracol’s epicenter with architectural complexes or minor centers between 3.5 and 8 km from the epicenter (A. Chase and D. Chase 1994, D. Chase and A. Chase 1995); other minor centers are even farther away – Hatzcab Ceel is 10 km out and La Rejolla is 12 km out, both connected by causeways to Caracol’s epicenter.
La Rejolla, a predominantly Late Classic center 12 km to the northwest of Caracol, is physically connected to Caracol by causeways, and politically, through monumental inscriptions. A causeway was mapped from La Rejolla (Barrios and Palomo 2008) up to the Guatemala-Belize border where it continues into the nodal center of Ceiba, itself connected to the Caracol epicenter by a 5 km causeway (A. Chase and D. Chase 1994, 1996:807, 2001:275; D. Chase and A. Chase 1995). La Rejolla Stela 1 portrays a local lord as the main protagonist, while La Rejolla Stela 3 portrays Ruler VI of Caracol. This stela, dating to 9.12.0.0.0 (A.D. 672), is one of only two monuments erected during Caracol’s ‘hiatus’ in monument erection (the second is slate Stela 21, located in the B Plaza of Caracol’s epicenter and dated to 9.13.10.0.0 or A.D. 702) (A. Chase and D. Chase 1987:61). In conjunction with the connecting causeway feature, these monuments suggest that Caracol politically dominated this smaller center.

“From La Rejolla’s perspective this relationship apparently progressed from subordinancy to complete dependency during the end of [Caracol] Ruler V’s life and the beginning of Ruler VI’s tenure.” (Houston 1987:91)

But do these political landscapes reflect unified economies? At what level of the landscape should one expect economic integration, and why? Are polities coterminous with marketing systems? How does one interpret the political landscape in terms of economic modes of integration (e.g., Polanyi 1968)? If one accepts this scale of political integration, does this imply a market economy, or a redistributive one?

Political Integration and Economic Organization

Following the work of Ross Hassig (1982), William T. Sanders described mature Aztec political organization as a hegemonic empire, whereby light tribute demands were made of a number of previously autonomous polities. Tribute was exacted with limited administrative costs (Sanders 2000:353). Comparisons of the Valley of Mexico-centered Aztec empire and the Lowland Maya polities are often bipolar in reaction. Some stress
the likeness, stating that the Maya were well on their way to achieving the level of specialization known from the Valley of Mexico (Becker 1973b:404), others point out the differences, downplaying the Maya civilization as a constellation of glorified chiefdoms (see D. Chase, A. Chase, and Haviland 1990). Analogies between the Classic Maya and West African or Southeast Asian polities have not produced the same level of reaction. A group of “centralists” argue for certain Maya centers as large, politically centralized capitals. These centralist researchers have interpreted the archaeological and epigraphic record of Maya centers from the southern lowlands in terms of powerful political control and integration.

“Centralists currently see the major Classic Maya centers as the urban loci for administered economies integrated by organic solidarity.” (Fox, Cook, A. Chase, and D. Chase 1996:797)

Arlen and Diane Chase contest the labels regal-ritual city and segmentary state being associated together as an idealized theoretical construct and question the utility of this procedure. Joe Ball rejects the centralist argument based on economic patterns; his evaluation of the ceramic production-distribution system for the Classic Maya lowlands is based on the two major ceramic distribution studies cited by most authors, Rands’ and colleagues’ work at Palenque and Fry’s work at Tikal. He argues that the circulation of goods in the Classic Maya lowlands would not have required centralized institutions, that centralized control of production and distribution were not regulated by the central political authority. The Chases interpret the distribution patterns at Caracol to indicate a much stronger centralized control of the distribution of goods. Combined with the causeway system linking outlying “minor centers” with special function architecture to Caracol’s epicenter, the Chases envision centralized control over distribution, but not of production.

The splitting criterion Ball suggests seems to be the dichotomous distribution of elite wealth or status items, combined with dispersed production and unrestricted distribution of utilitarian items. He also suspects a greater emphasis on kinship relations
and gift-giving influencing exchange in Classic Maya society more so than institutional redistribution or marketplace exchange.

“[T]he reported patterns would fit equally well were the Late Classic Maya centers functionally regal-ritual centers, administrative centers, or regal-ritual cities in the urban typology proposed by Richard G. Fox (1977)…In each of these cases, concentrations of wealth and sumptuary materials are expected to occur with major central places conjointly with a broader dispersal of productive and distributive activities involving nonsumptuary, utilitarian commodities (see Fox 1977:24-38, 39-57). Centralized marketing, exchange, or redistribution may or may not be present, but emphatically need not be.” (Ball 1993:247)

Neither the production pattern nor the distribution pattern of utilitarian ceramics is actually very well known for Tikal. While production and distribution are certainly correlated to an extent, the production system in operation at Tikal has not been investigated through a targeted archaeological program; only one household [Group 4H-1] has ever been suspected as a production unit (see Becker 1973b, 2003), and only one other geographic location [the Palmar ridge] has been singled out as a probable ceramic production locus (Fry 1980, 2003a). While the analysis of ceramic vessel distributions at Tikal supported a market system model (Fry 1979, 1980, 2003, Fry and Cox 1974), distribution patterns cannot be immediately and unambiguously correlated with specific distribution institutions or with a specific mode of production (Bey 1992). Dispersed production, as in a cottage industry, characterized late seventeenth and early eighteenth century France, neither a complex chiefdom nor a segmentary state, but definitely market oriented.

“Spinners and weavers worked on their own, applying their traditional skills to the making of legally defined varieties of cloth. Merchants put out fiber or yarn to them through commissioners, never laying eyes on the people who worked for them, buying the finished product back from the commissioner only after careful scrutiny to determine its value. Control of production by owners of capital was nonexistent. Except for certain finishing processes, the choice of production method was the guilds’ or the rural weavers’ to make.” (Reddy 1986:269)
The categorization of the Classic Maya as urban or non-urban or their status as segmentary states certainly helps situate their culture within a cross-cultural comparative framework. However, I argue for direct investigation of production and distribution before joining theoretical constructs together in order to assert the most parsimonious answers. If any Maya polity can be classified as a segmentary state, then its production and distribution systems can be investigated in their own right, without closing off any avenues prematurely. It would seem to be advantageous to investigate the production of ceramics through survey and excavation, identifying actual production units and documenting their size and distribution range of products produced. It is only with a firmer grasp of the details of the production and distribution systems that a more accurate classification of the overall socio-political system will attain meaning.

“The organization of the ancient Maya economy tends to be a highly charged subject, due to the fact that archaeologists tend to associate different systems of exchange with stages of political organization that are perceived as progressing along a linear evolutionary spectrum (Yoffee 1977; Chase and Chase 1996)… Yoffee points out that the purpose of such typing seems to be to extrapolate from a single characteristic entire clusters of sociocultural functions thought to characterize the type, whether or not these are indicated in the material record.” (West 2002:142, 143)

There is a considerable amount of speculation and distrust involved in these decades-long theoretical arguments. Some researchers wish to extrapolate economic organization from political organization, or limit the scale of political organization based on alleged economic organization. One researcher’s ‘findings’ are quickly dismissed by another researcher’s ‘model.’ However, there is a growing concern for a greater degree of specificity when discussion theoretical models and their ‘logical’ or ‘necessary’ concomitants.

“A new generation of Mayanists argues for close scrutiny of analogical approaches and of the imposition of typological models in general. The divergent views on whether the aboriginal Maya had a unitary or a segmentary state are now leading all parties to be more explicit about their theoretical and methodological perspectives.” (Fox, Cook, A. Chase, and D. Chase 1996:801)
Chapter 4 began with a review of early theories of Classic Maya socio-political organization. Population densities sustainable under swidden agriculture in the Classic Maya heartland of the Peten region emerged as a major topic of discussion. Settlement studies in the Peten began documenting greater densities of residential buildings than had previously been encountered or thought possible. As researchers began acknowledging these higher population estimates, revised models of Classic Maya socio-political organization were contemplated. As excavations produced more foreign objects and imported materials at Classic centers, researchers began pondering economic organization and the division of labor achieved. Specialized production for exchange was contemplated as a means of societal integration. The settlement pattern documented through an innovative mapping project and the archaeologically recovered data from The University of Pennsylvania Tikal project were influential in either substantiating or calling into question various models of social, political, and economic organization.

The priest/peasant model of a strictly two-class society was challenged by archaeological indications of ranking or wealth differentials and occupational specialization, especially those from Tikal. Ethnographic and ethnohistoric documentation were used to support various models of socio-political and economic organization. Marketplace exchange emerged as a serious possibility, offering an answer to the mode of societal integration and cohesion as well as explaining the occurrence and distribution of imported materials and goods at Classic Maya centers. This era saw Tikal theoretically shift from a ritual center inhabited only by priests or rotating lineage heads to a more complex ‘city’ with a high population density, nucleated habitation, a sustaining area of agriculturalists, and a ‘class’ of artisans and merchants between the elites and commoners.

At least one ‘economist’ (Mann 1973) accepted some specialized production for the Classic Maya, but asked the all-important question: how specialized was production,
did specialization exist at the household level or were larger commercial ventures apparent? Mann noted that Postclassic Maya trade was an almost exclusively elite phenomenon, in the hands of dynastic royalty with the fruits of this trade remaining within elite circles. Postclassic trade was not organized toward the importation of utilitarian goods destined for the majority of society. The elite luxury goods that formed the bulk of this trade did not eventually trickling down to the commoner class, or folk segment of society; they remained in the hands of the elite. Grain importation did not form the basis of an exchange economy either. Stressing the lack of transportation improvements, the basically Neolithic technology, the absence of large-scale export agriculture, and underdeveloped manufacturing industries, Mann suspected that Classic centers were highly self-sufficient, closed economic units supported by household production and taxation or tribute, not commercially integrated nodes within a hierarchically ordered exchange economy. Nonetheless, he did question just how vast the social gulf between elites and commoners was, citing both archaeological and ethnohistoric data suggestive of a shared cultural pattern between these two segments. In his final assessment, Mann correctly emphasized the lack of highly advanced economic institutions for savings and investment.

Following hypothetical reconstructions of Classic Maya society in the 1950s and 1960s, the 1970s saw an increasing emphasis on the formal modeling of settlement pattern and artifact distributions. Advancements in epigraphic decipherment were accompanied by an enthusiastic thrust to reconstruct larger political constellations involving multiple centers, ushering in a short-lived era of abstract central place modeling largely based on epigraphic breakthroughs. The study of emblem glyphs suggested to some that a political hierarchy of centers had existed in Classic times (e.g., Marcus 1973), others interpreted the emblem glyph distributions to indicate a sea of independent polities (e.g., Mathews 1991). Carol Smith’s (1976b) ethnographic study of market structure in highland Guatemala emerged as the dominantly cited central place study. The regular spacing of centers suggested that the efficient circulation of goods had influenced the development of Classic Maya regional settlement patterns. In later
decades the more complete mapping of Classic centers led to a renewed interest in locational analysis with researchers seeking confirmation of the structure of regional market systems in the newly revealed settlement patterns at Tikal, Calakmul, and Caracol. It was argued that the settlement patterns at these centers conformed to Christaller’s K=7 administrative pattern within a solar or dendritic market system.

The 1970s also witnessed an emphasis on graphing artifact distributions as fall-off curves in an attempt to correlate specific curve shapes with specific modes of exchange. Critical review of this procedure effectively killed the short-lived enthusiasm that this method could effectively isolate distinct modes of circulation. The process was found to be overly simplistic and that a good deal of equifinality existed between perfected models, artifact distributions, and the social mechanisms responsible for such patterns. Particularly discouraging was the revelation that a complex redistribution economy could not easily be distinguished from a market system solely on the basis of fall-off curves; reality was much more complex than reductionist models anticipated. In spite of the difficulties in interpreting central place arrangements or fall-off curves, these formal modeling techniques are still invoked today, most often as theoretical support for the economic efficiency of the Classic Maya, rarely to question this assumption.

Chapter 4 concluded with a rather long discussion of more recent theories of Classic Maya socio-political and economic organization. The Classic Maya still defy classification to some degree; opinions differ as to the most appropriate terms and labels applicable to them. During this era terms developed to describe or classify non-Maya communities have been applied to the Classic Maya centers. Critical reviews of terms such as “peer-polity” and “city-state” have encouraged researchers to be more specific about what they mean when they employ such terms. In general, a group of “centralists” have argued that the largest Classic Maya polities (i.e., Tikal) had more centralized, bureaucratic political organization than smaller ones. This discussion of the degree of centralized political authority achieved has sparked new interest in economic organization, especially the degree of centralized control over production and/or
distribution. Advances in epigraphic decipherment have supported a flexible model of political leadership centered on the dynastic court; this model has found considerable acceptance.

Classic Maya polities are currently viewed as ranging along multiple interconnected continuums of overall size, population density, and degree of centralized political control. Documenting and explaining this variation consumes much of researchers’ time. Similarities among Maya polities certainly exist, and some paradoxical associations have also emerged. For instance, more formalized political control is proposed for the largest Classic Maya centers (i.e., Tikal, Calakmul, and Caracol) at the same time that research has documented a greater degree of nucleation and higher population densities in the more “urban” cores of smaller centers (i.e., Copán and Palenque). All in all, a greater proliferation of organizational models has called for greater scrutiny of evidence as well as terminology.

In the next chapter I will venture into detailed accounts of the specific artifact analyses and how these have influenced the theoretical reconstruction of production and exchange systems at Tikal. This discussion will contemplate only documented evidence from Tikal (and the theories it has spurred). The archaeological evidence of production from Tikal is not as robust as one might think, given the grand reputation of the Classic center as the largest and most important of them all. The evidence is not trivial either. A well-defined ceramic study, conducted by Robert Fry, remains a pivotal and essential jumping-off point for diving into the exchange economy of Tikal, and, by extension, the entire Classic Maya Lowlands. Likewise, the decades of artifact studies published by Hattula Moholy-Nagy lay a considerable groundwork for the interpretation of production and exchange within the Tikal kingdom. Finally, Marshall Becker has continued to bring to light an impressive array of theoretical considerations concerning the one residential group (4H-1) from Tikal that was certainly home to pottery producers. His tenacious reviews of, and thoughtful speculations on, this early excavation at Tikal are a constant reminder of the potential to investigate production directly at Tikal and, regrettably, the
absence to follow through with such excavations by subsequent generations of archaeologist.
Chapter 5 – Models of Economic Structure Proposed by Tikal Researchers from the University of Pennsylvania Project

5.1 – Moholy-Nagy Models

Based on extensive work with the Tikal artifact catalog, Moholy-Nagy suggests that by early Late Preclassic times (ca. 300 B.C.) production by craft specialists was accompanied by “some kind of market system” (2003a:88). She has interpreted the lithic production waste associated with elite contexts as evidence for the centralized production of both domestic and status artifacts. Moholy-Nagy does state that non-marketplace modes of redistribution are concurrently present, including attached specialists (2003a:108), but concludes that a well-ordered market system had developed at Tikal by Early Classic times.

“During the Early Classic period, Tikal became the most important administrative, economic, and ritual settlement of the northeastern Peten. It was the apical central place in a regional settlement hierarchy that probably conformed to Christaller’s K=7 or administrative pattern and the center of a marketing system resembling Carol Smith’s solar system type (C. A. Smith 1976:317).” (Moholy-Nagy 2003a:108)

Beyond the possible correlation of settlement with a perfected central place arrangement, Moholy-Nagy has mostly inferred Tikal’s alleged marketing system by the general character of production, distribution, and consumption patterns; it is the most parsimonious explanation for the recovered artifact distributions and settlement pattern. Tikal lacks a radial causeways system such as those described for Coba (Folan et al. 1983) or Caracol (A. Chase and D. Chase 1987; D. Chase and A. Chase 1994, 1996), although so-called minor centers are situated throughout the peripheral areas. D. Chase and A. Chase (1996) interpret the radial causeway system at Caracol as a reflection of both the administrative and economic organization of this center. Causeways connecting peripheral nodes of architecture directly to Caracol’s epicenter indicate the centralized control of marketplace exchange. Moholy-Nagy (2003a:109) proposed that minor centers were second-tier central places and the physical locations for marketplaces, even
though they are not physically connected to the epicenter by causeways. She also observes, however, that minor centers encircling Tikal have artifact inventories that are “poor in specialist-produced goods compared with those structure groups in the epicenter and center” (Moholy-Nagy 2003a:107).

Hattula Moholy-Nagy cites very short distribution radii for imported goods, and I will later suggest that these goods were likely circulated through non-market mechanisms. Ceramic distributions and widespread (but low volume) consumption of obsidian blades also suggest that marketing practices may have been important at Tikal for the circulation of utilitarian goods. The general model of a well integrated marketing system at Tikal is based in the interrelated phenomena of specialized production, a dense population, and the distribution of recovered durable artifacts.

“Specialization is indicated by standardization of form, a high degree of technical competence, large quantities of production debitage, and special site-maintenance practices for coping with the waste.” (Moholy-Nagy 2003a:108)

The term “specialization” is used in a general manner when describing durable goods from Tikal, whether these are ceramic vessels, chert bifaces, or obsidian blades. I assert that standardization is a relative term, and that artifacts themselves should not be described as “standardized” unless these are contrasted against spatially or temporally distinct artifact assemblages that are less standardized or more standardized. Alternately, the uniformity of artifacts may be compared against ethnographically studied artifact assemblages (as has been done with pottery) in order to assess the relative intensity of production inferred through specific uniformity or standardization measures (i.e., CV scores, f-tests). Many of the Tikal artifacts were time-consuming to produce and display a high degree of craftsmanship and skill in their production, but this does not necessarily imply “specialized production.” The organization of production has also been used to argue for standardized production at Tikal, as well as centralized control over specific artifact classes (i.e., obsidian blades).
Artifact Distribution Patterns

A basic dichotomy between exotic goods and utilitarian goods characterizes the Tikal artifact catalog; different distribution patterns characterize these two broad classes of artifacts, although some overlap exists. Exotic or status goods, consisting of or made from imported raw materials, were predominantly recovered from epicentral and central excavations. Imported marine shell and stingray spines, jade, and obsidian eccentrics were mainly recovered from the epicenter of Tikal. The majority of the 763 recorded stingray spines from the University of Pennsylvania excavations at Tikal were recovered from caches, burials, and problematic deposits, mostly from the epicenter. This distribution pattern demonstrates the restricted circulation of these items, and their specific ritual or non-utilitarian functions.

Two thousand five hundred and fifty complete and 1381 partial marine shells were recorded as unworked specimens and another 4497 pieces of marine shell labeled as debitage. Ninety-three percent of the shell debitage was identified as *spondylus* shell, and 95% of the shell debitage was recovered within Zone 1, a .25 km radius centered on map square 5D, the heart of the civic-ceremonial core of Tikal. Over half of the unworked shells were recovered from temple and range structure caches from the epicenter, and only 1% [n=46] of the shell debitage was recovered from beyond a 2 km radius from the great plaza (Moholy-Nagy 2008:31-34).

The distribution of jade or greenstone debitage is nearly identical to that noted for marine shell. Of the over 6000 pieces of jade debitage recorded, 96% was recovered from Zone 1. A single boulder of unworked jade was recovered from Early Classic Cache 65, deposited within a cylindrical ceramic vessel. Two “glyph-like elements” were painted in black on one facet of the approximately 8 pound [3.65 kg.] boulder, and obscured by subsequent burning (Moholy-Nagy 2008:31).
The distribution pattern of recovered obsidian eccentrics \([n=868]\), mostly manufactured from exhausted grey blade cores, also conforms to the general distribution pattern for exotic goods. They were most numerous in Zone 1, and consistently encountered within the 2 km radius from the great plaza; only a couple of these were recovered from beyond 2 km (Moholy-Nagy 2008:23-24). Six grey obsidian eccentrics made from exhausted cores were sourced to the highland Guatemalan El Chayal source, the major source for Tikal’s obsidian blade industry (Moholy-Nagy 2003b; 2008:23; Moholy-Nagy and Nelson 1990).

A second type of obsidian eccentric \([n=443]\) was manufactured by incising large macroblades or macroflakes. These also conform to a highly restricted distribution pattern, 75% recovered from Zone 1 and the other 25% recovered from within a 2 km radius of the great plaza (Zone 2). This specific artifact type was dominantly recovered from structure and monument caches (Moholy-Nagy 2008:25-26). These incised obsidians were manufactured from large flakes removed during the very early stages of polyhedral core reduction; their restricted distribution, like that of eccentrics manufactured from exhausted cores, is interpreted as indicating centralized production, and possibly centralized control of the obsidian blade industry at Tikal. Only two incised obsidians from Tikal have ever been subjected to instrumental sourcing and these both were made on El Chayal obsidian (Moholy-Nagy 2003b; 2008:24; Moholy-Nagy and Nelson 1990).

Lithic eccentrics were also made from locally available chert. Of the 1393 chert eccentrics recovered, 86% \([n=1193]\) come from Zone 1 and none were recovered beyond the 2 km radius from the great plaza (Zone 2). Again, examples of this artifact class are consistently recovered from structure and monument caches within the epicenter, paralleling the recovery context and distribution for the other exotic goods made from imported materials. The restricted distribution for eccentrics manufactured from local chert suggest that the labor involved in their production made these items elite status goods, not the raw material. The absence of eccentric cherts in peripheral excavations
would seem to indicate that these were not commonly used everyday items, but necessary elements in elite ritual practice. Even more mundane artifacts made from shell or bone were also heavily concentrated in the central precinct of Tikal.

“The consumption of specialist-produced durable artifacts during the Classic period was higher in the residential structure groups of the city’s epicenter and center than on the peripheries. Beyond a radius of approximately 2 km from Gr. 5D-2 [the “marketplace”], such artifacts show a steep drop in density, approximated by count per defined excavation lot, although expedient artifacts do not show such a drop. Several likely reasons for this disparity come to mind, such as more limited excavation in the peripheries, shorter spans of occupation, or poorer preservation of shell and bone. However, this kind of distribution may also indicate that the residents of outlying areas did not have the means to acquire much in the way of specialist-produced goods distributed through the market.” (Moholy-Nagy 2003a:109)

The highly restricted distribution pattern for exotic artifacts is interpreted by Moholy-Nagy as an indication of urban production and consumption, much like the market system proposed for the Aztec capital. But evaluating the distribution patterns of craft goods at Tikal is hindered by the lack of excavation data from beyond a 2 km radius from the epicenter and new excavation data are desperately needed. Full excavation of residential groups from all social ranks and in all parts of the settlement could substantiate or refute the models developed from the existing excavation data corpus. Both penetration excavations aimed at recovering caches, burials, and household refuse (middens and refuse incorporated as fill) and horizontal stripping to search for evidence of production within individual structures as well as work areas outside structures are warranted. In the absence of an intensive excavation programs to acquire new data, the organization of production and distribution at Tikal will remain obscure.

The Organization of Production

Moholy-Nagy interprets the “hundreds of pounds” of chert debitage recovered from a chultun deposit in the periphery of Tikal (Fry 1969:144) as indicative of dispersed household production from at least Cauac [A.D. 1-150] times on. She also mentions
chultun deposits of obsidian blade production debitage from the peripheries dating to the use of the Cimi ceramic complex [A.D. 150-250]. After the decline of Cimi ceramic complex pottery, deposition events of “less than 1000 pieces” of lithic debitage appear in construction fill or monument cache contexts, but no chultun deposits were recorded which postdate the Cimi ceramic complex (Moholy-Nagy 2003:91). Again, centralized use (and presumably production) of exotic goods is contrasted against the peripheral production of utilitarian goods. All of Tikal’s residents, however, consumed some goods manufactured from local and imported stone, as well as pottery. A demand market for goods produced by local artisans was certainly present but the question remains, how were production and distribution organized?

“Craft specialists probably worked independently at their residences, producing for the market and their own needs. Nevertheless, the presence of chert, obsidian, jade, and Spondylus debitage in elite contexts may be evidence that the same artisans occasionally worked in the attached mode upon elite demand.” (Moholy-Nagy 2003a:108)


Moholy-Nagy originally misinterpreted five obsidian concentrations encountered during the University of Pennsylvania excavations at Tikal as workshops (1976:100-102;
1990; 1992). No workshops, as in the physical locations of obsidian knapping, have been positively identified at Tikal, although large-volume debitage dumps have, as well as smaller dumps at groups outside the epicenter. Even more distressing to the researcher attempting to reconstruct the obsidian industry at Tikal, debitage from production was moved to specific locations to be redeposited for unknown reasons and these deposits were not systematically recorded by the excavators or during laboratory analysis. Even the very large deposits of obsidian or chert deliberately interred above eleven burial chambers in Structure 5D-2 (North Acropolis) were not systematically excavated or recorded (see Chart 9.2.2).

“The largest deposits of debitage encountered at Tikal came from above and around the chamber burials of its most important persons. In comparing laboratory records of these deposits to published descriptions (Coe 1990), it became clear that most deposits had only been sampled and none were completely recovered and documented. We probably recorded about one-tenth of the debitage encountered…The lack of information on excavated volume and the weights of recovered material culture precludes the presentation of data in a standardized format that would permit direct comparisons between different areas of Tikal and between Tikal and other sites.” (Moholy-Nagy 1997: 296).

The lack of quantitative data for these deposits renders many potentially profitable comparisons impossible. Nonetheless, many deposits were either counted or weighed and some diagnostic debitage categories were recognized. The counts of cores, blade fragments, eccentrics, and bifaces do help to put the Tikal obsidian industry in perspective, documenting considerable debitage dumping during epicentral construction episodes.

“[B]y far the largest deposits [of lithic debitage] are found exterior to the chamber burials of rulers and the most powerful elite. In all such deposits, the chert component consists overwhelmingly of biface thinning flakes and production failures. It is usually accompanied by a lesser amount of obsidian prismatic blade production debris, mostly small pressure blades, core fragments, exhausted cores, error-correction and core rejuvenation flakes, and occasional macroblade fragments.” (Moholy-Nagy 2003a:91)
Moholy-Nagy interprets the context of debitage exterior to burial chambers as an indication of attached or patronized production, where lithic specialists would have produced tools for the immediate construction of the actual chambers and/or lithic objects included as grave furnishings within (Moholy-Nagy 2003a:91). She has also hypothesized that these large deposits of debitage over chamber burials represent effective dumping for safety reasons (Moholy-Nagy 1990:274, 1997:307).

“I suggest that these exterior deposits were a way to get rid of very large quantities of chipping generated by craft specialists who were producing artifacts for the construction of the chamber burial, the funerary temple that covered it, and for inclusion in the accompanying caches.” (Moholy-Nagy 1997:307)

The dominantly epicentral recovery contexts of both obsidian blade and chert biface production debris, combined with the highly restricted circulation ranges of manufactured goods, suggest an emphasis on production within the epicenter of Tikal. Because no workshops have been located there it is still unknown where manufacturing took place, how this was organized for any artifact class, or if any elite control was exerted over this production.

“The long-delayed identification of the production waste associated with elite burials and caches has led to an underestimation of the importance of Tikal and other large cities as production centers of both domestic and status artifacts (Moholy-Nagy 1997). Regular cleanup of work areas and the absence of permanent facilities make it very difficult to identify the actual loci of craft production. Debitage and failed artifacts, unfortunately both highly portable, are the best evidence we have at present, since only special deposits were screened.” (Moholy-Nagy 2003a:108)

The term “workshop” has come to denote a specific mode of production or level of intensity: full-time (Clark 1986:45-46, 1990; Costin 1991:8-9; Mallory 1986; Moholy-Nagy 1990:269, 1997:294; Santley and Kneebone 1993:41; Shafer and Hester 1983, 1986). It has also been uncritically applied to a number of recovery situations, and the misidentification of workshops from surface survey has been noted by Clark (1986:29-31), Gallagher (1977:413), and Healan (1986:145-146).
“The term ‘workshop’ has been applied to varying site contexts ranging from lithic scatters to intensive quarrying and production residues.” (Hester and Shafer 1992: 243)

Moholy-Nagy has stressed that the in situ recovery of microdebitage from obsidian production is the only secure method of identifying the physical site of an obsidian workshop (Moholy-Nagy 1990:272, 1992:250), and that experimental archaeology is needed to understand the specific processes which shaped the formation of lithic workshops as they are recovered archaeologically (1992:249). Hester and Shafer (1992:243) find Moholy-Nagy’s (1990) assertion that microdebitage is the only sure means of identifying the physical locus of lithic production to be highly restrictive, noting that this would be nearly impossible to operationalize in most archaeological contexts.

The lithic debitage deposits recovered from epicentral Tikal are labeled based on their content; they are not assumed to be immediately attached to workshops. Without identifying the physical loci of workshops, Moholy-Nagy has emphasized the recovery loci of workshop dumps and their content. However, the debitage from these deposits has never been subjected to more rigorous quantitative or qualitative analytical analysis; deposits are described as production debris and the presence of some diagnostic flakes are noted. These deposits are viewed as secondary context dumps and their associating with workshops is problematic. Nonetheless, lithic debitage concentrations in the epicenter do suggest that lithic workshops were situated nearby.

“Once debitage is in secondary context, its connection to the workshop where it originated becomes problematic. In most cases, it will be impossible to ascertain how many production loci contributed to one dump or among how many dumps the debitage from a single workshop was distributed.” (Moholy-Nagy 1990:276)

Knappers may use cloths, hides, wooden bowls, ceramic pots, or fiber baskets to catch lithic debitage produced during the reduction of stone tools (Moholy-Nagy 1990:274). The workshop dumps certainly suggest that lithic reduction was practiced nearby although it is unknown whether or not they represent single knapping events or if
they were produced over longer time periods. The dumps are reported as deposits of pure
debitage with no admixture of domestic refuse or non-lithic debitage. This does suggest
that the dumped debitage deposits represent consistent lithic reduction, not redepôted
middens from residential groups manufacturing on a part-time or low volume basis.

Moholy-Nagy claims that all durable artifact production was carried out by
specialists; “tools of local chert and bone” are the only exception to this rule noted.
“Expedient production is indicated by the simple character of the artifacts, as well as by
the lack of skill and standardization” (Moholy-Nagy 1997:308). Specialized production,
on a part-time basis, is documented alongside expedient production and constitutes a
consistent feature of residential household activities.

“Part-time specialization from at least the late Preclassic Period is indicated by the presence in
household middens, chultuns, and construction fill of debitage from the manufacture of common,
standardized artifact types such as chert bifaces, obsidian prismatic blades, and bone awls and needles, and
from the production of lower-status artifacts of bone, and shell other than spondylus.” (Moholy-Nagy
1997:308)

The differential characterization of some implements as expedient and others as
specialized rests on the inferred degree of skill and labor input. While obsidian blades
are a good example of formal tools requiring skill and knowledge to produce, chert biface
production runs the gamut from highly skilled to rudimentary. Thin bifacial points or
knives made from fine grained chert probably required more skill to manufacture than
cruder celtiform bifaces made from medium or course grained chert. Even a
multidirectional chert core from which expedient flakes were removed may approximate
a crude celtiform biface tool. The salient issue when discussing production within the
context of a complex sedentary community is to what degree was production geared
toward exchange? Are the products of part-time specialists working at the household
level destined for exchange, or are they produced for immediate consumption? Over
what distances were these implements exchanged? Within the immediate kinship or
lineage group? Within a maximal lineage of several hundred persons? Through a polity-
wide complex marketing system? Outside of the polity? Remember that Clovis points are not simple, yet they were produced by humans ca. 11,000 years ago and have a widespread distribution larger than the entire Maya lowlands (Snow 2010:46-47, 52-56, Figure 3.6; also see Stanford and Bradley 2012) – before complex society existed anywhere on the planet! It would be a logical leap to infer, from their “standardized” appearance, that Clovis points were manufactured by full-time specialists and intended for market exchange.

The assumption that artifacts recovered from households at Tikal were acquired through marketplace exchange remains largely untested. Only Fry’s (Fry 1979, 1980, 2003; Fry and Cox 1974) analysis of ceramic vessel circulations was specifically planned to evaluate competing hypotheses of mechanisms responsible for the circulation of material goods. Although Fry’s analysis implies the existence of a complex distribution system for Late Classic ceramic vessels, it does not clearly demonstrate that this system was primarily market-oriented. The decades-long debate over classifying the socio-political level of complexity achieved by the lowland Classic Maya has influenced the objective analysis of societal modes of economic integration. A default assumption of marketplace exchange has gained acceptance as archaeological investigations have demonstrated that Classic Tikal was a large and complex center with both basic goods and exotic or status items, often made from imported materials, circulating for centuries. Unfortunately, non-market mechanisms and institutions have received virtually no direct testing or theoretical consideration.

Applying criteria from Santley and Kneebone (1993:Figures 1-3), Moholy-Nagy (1997:309) postulates that two, and maybe three, modes of production were practiced concurrently at Tikal:

1. Unspecialized or expedient production by non-specialists for personal or household use;
2. Household industries, carried on by part-time specialists and directed toward supplementing household subsistence;
3. Workshop industries, carried on by full-time specialists working independently or under elite control.

Moholy-Nagy implies that the production of high-status goods was likely organized as a workshop industry. I see no reason to postulate larger, more complex production units for high-status goods. On the contrary, I suspect that many high-status goods were produced by small production units, possibly by single individuals working alone and completing nearly every step in the production sequence by themselves. I would expect obsidian blade or ceramic vessel production in workshop contexts based on a high consumer-to-producer ratio and unrestricted use of the finished products, as well as the advantages of segregating tasks in the production chain and producing at higher volume output.

The dichotomous characterization of status goods versus utilitarian goods is a long standing phenomenon, even if the implications of this dichotomy have not been fully appreciated at Tikal. While the distribution patterns are open to interpretation, some basic patterns do need to be accounted for in any hypothetical reconstruction of production, exchange, and consumption at Tikal. To begin with, the restricted consumption of stingray spines and marine shells, jade and greenstone, and lithic eccentricities do not fit a central market model. While Tikal may have had a central marketplace where the elite of the center purchased exotic craft items for their elaborate caching rituals, I find this the most unlikely scenario. This would certainly be a very strange marketplace, where only elites purchased high-order exotic goods which were never carried out into the peripheries of the center. Of course, sumptuary rules may have forbidden the purchase of such exotics by ordinary people, or they may have been viewed as unnecessary or too expensive for most ‘consumers.’ Perhaps the central marketplace was a lively arena for all kinds of exchanges, with elite exotics forming just one class of items exchanged there. This was the case in big Aztec markets.
The paucity of status goods recovered from minor centers also brings the complex market exchange model into question. If minor centers channeled goods into the center, then why would these not be distributed more equitably within the peripheries? Of course, the sampling skew between full excavation of central compounds and the limited test-pitting of peripheral residential groups may account for this apparent distribution discrepancy. Nevertheless, the truncated distribution pattern for status goods does suggest that these may not have been circulated through a marketplace or market system at all.

5.2 – An Evaluation of Robert Fry’s Pottery Exchange Model at Tikal

The most ambitious investigation of pottery circulation at Tikal has come from Robert Fry’s (Fry 1979, 1980, 2003a; Fry and Cox 1974) systematic and well-planned analysis of ceramics recovered from a variety of epicentral, central, peripheral, and hinterland excavations. As part of the Tikal Sustaining Area Project (Fry 1969, Haviland 1970; Puleston 1973, 1983), newly mapped households outside the central 16 km² map of Tikal (Carr and Hazzard 1961) were investigated with test-pit excavations within a stratified random sampling program. A manually operated posthole digging apparatus was used to determine greatest sherd density at each household (Fry 1972). Based on the resulting information some 97 test-pits, measuring either 1 x 1 m or 1.5 x 1.5 m, were excavated at household groups located throughout the 500 m-wide transects radiating 10 km south and north from the central 16 km² map of Tikal. Noting that most of his test units produced less than 50 sherds, Fry conflated each household sample into regional blocks every 2 km distance from epicentral Tikal along the northern transect, and approximately every 4 km along the southern transect (Figure 5.2.1). Additional ceramic collections derived from more intensively excavated groups as part of the Tikal Small Structure Program (Haviland 1963, 1965), excavations at the minor center of Navajuelal (Greene 1970), limited excavations at the secondary center of Jimbal, and excavations in the East Plaza (Jones 1996) (Table 5.2.1).
Figure 5.2.1 – Map of Tikal showing geographic areas discussed by Fry (after Fry 1979:Figure 2).

Table 5.2.1 – Fry’s test zones (after Fry 1979:Table 3).

<table>
<thead>
<tr>
<th>Geographic Area</th>
<th>Code</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jimbal area</td>
<td>JA</td>
<td>11-12 km north, north survey strip</td>
</tr>
<tr>
<td>far north survey strip</td>
<td>FN</td>
<td>6-9.5 km north, north survey strip</td>
</tr>
<tr>
<td>mid-north survey strip</td>
<td>MN</td>
<td>4.5-6 km north, north survey strip</td>
</tr>
<tr>
<td>near-north survey strip</td>
<td>NN</td>
<td>2-4.5 km, north survey strip</td>
</tr>
<tr>
<td>north Tikal</td>
<td>NT</td>
<td>NE quadrant of 16 km² Tikal map</td>
</tr>
<tr>
<td>central Tikal</td>
<td>CT</td>
<td>within 500 m main plaza of Tikal</td>
</tr>
<tr>
<td>mid-south survey strip</td>
<td>MS</td>
<td>3-6 km south, south survey strip</td>
</tr>
<tr>
<td>Navajuelal</td>
<td>NV</td>
<td>10.5 km south, south survey strip</td>
</tr>
</tbody>
</table>
Fry has published several articles utilizing manually coded data from macroscopic inspection of Tikal sherds recovered from these excavation programs detailing the results of multidimensional scaling analyses of different pottery classes (Fry 1979, 1980, 2003a, 2003b; Fry and Cox 1974). Several specific form classes of both utilitarian vessels and serving vessels have been subjected to similar analytical procedures. The first multidimensional scaling analysis of Tikal pottery (Fry and Cox 1974) examined the distribution of two classes of utilitarian vessels: monochrome slipped basins and unslipped jars. 2,493 rim sherds were manually coded for multiple technological and stylistic variables.

Table 5.2.2 – Fry’s coded variables (after Fry and Cox 1974:214).

<table>
<thead>
<tr>
<th>stylistic variables</th>
<th>technological variables</th>
</tr>
</thead>
<tbody>
<tr>
<td>wall orientation</td>
<td>completeness of firing</td>
</tr>
<tr>
<td>wall curvature</td>
<td>differential firing</td>
</tr>
<tr>
<td>wall thickness</td>
<td>fire clouding</td>
</tr>
<tr>
<td>lip shape</td>
<td>paste texture</td>
</tr>
<tr>
<td>lip orientation</td>
<td>temper frequency</td>
</tr>
<tr>
<td>lip thickness</td>
<td>type of inclusions</td>
</tr>
<tr>
<td>basin decoration</td>
<td>frequency of inclusions - manganese</td>
</tr>
<tr>
<td>basin decoration dimension – depth</td>
<td>frequency of inclusions - mica</td>
</tr>
<tr>
<td>basin decoration dimension – width</td>
<td></td>
</tr>
<tr>
<td>neck height</td>
<td></td>
</tr>
</tbody>
</table>

Analyses were conducted for 18 variables using the computer-based KYST (Kruskal, Young, and Seery 1973) multidimensional scaling technique, based on a dissimilarity measure described in Fry and Cox (1974:215). A measure of distance $D$ between two assemblages $x$ and $y$ was calculated as follows:
where \( f_i^x \) represents the relative frequency of the \( i^{th} \) variable value for assemblage \( x \), \( f_i^y \) represents the relative frequency of the \( i^{th} \) variable value for assemblage \( y \), with \( n \) being the total number of variable values. As already noted, because most test pits produced less than 50 rim sherds, collections were conflated into nine regional blocks running from the epicenter of Tikal north 10 km and south 10 km. All ceramics used in the analyses come from Late Classic contexts of the Imix ceramic complex (then dated to A.D. 650 – 830).

The analyses were conceived as tests of two opposing models: the inward-looking model and the outward-looking model (Rands 1967). Robert Rands had proposed these alternatives as testable hypotheses which could be differentiated through careful analysis of pottery.

“Using ceramics from Palenque, Chiapas and the surrounding region, Rands has tested two different models of community-ceremonial centre relationships. His outward-looking model sees Maya communities as having social, economic and religious ties with a number of ceremonial centres, some quite distant. In contrast, his inward-looking model sees major ceremonial centres as a focal point of social, economic and ritual relationships for a number of surrounding communities. In both models, relationships would be intensified on certain market and festival days, when large numbers of people from these communities would come to ceremonial centres to take part in religious ceremonies, and exchange local items in the major market.” (Fry and Cox 1974:210)

Fry eventually concluded that his own “studies of distributional patterns of locally produced ceramics strongly supported the inward-looking model for Tikal” (Fry 1969, 1979; Fry and Cox 1974) (2003a:144). A similar conclusion was not reached regarding ceramic circulation at Palenque (Rands and Bishop 1980, personal communications 2000-2010). These two studies (Tikal [Fry] and Palenque [Rands and colleagues]) are most often cited together in just about any discussion of pottery production and exchange in the Maya area (e.g., Ball 1993; Houston and Inomata 2009:284; Marcus 1983:477; Rice 1987a; West 2002). Therefore it should be noted that the two projects differed significantly in sampling procedure, geographic area covered, and analytical procedures.
The two kingdoms were also quite different in size, topography, access to water, architectural style, and initiation of dynastic rule; other organizational differences should be assumed as well. The Tikal ceramic exchange investigation is best viewed as an intraregional study, while the Palenque ceramic exchange program is definitively an interregional study. The actual analysis of Palenque pottery would follow a quite different path and focus than the analysis of Tikal pottery, although the impetus for Fry’s Tikal study is surely to be found in common theoretical ground as the analyses for the Palenque region.

“The principal marketplace, located at the ceremonial centre and attended most consistently by people having socio-economic and ceremonial allegiance to that centre, would apparently funnel the pottery primarily to the various satellite communities within the sustaining area. People from outside the district, who attended the market less frequently, would take home significantly smaller quantities of the pottery.” (Rands 1967:147-148 quoted in Fry and Cox 1974:210)

Independent analyses were conducted for technological attributes and then for stylistic attributes. The initial solution for technological attributes of Imix basins produced two groupings: a north transect group and a Central Tikal/south transect group. The loose Central Tikal/south transect group could be further subdivided into three more distinct groupings: Central Tikal, mid-south transect, and Navajuelal. The patterning in these data was interpreted as tentatively supporting the inward-looking model.

“The patterning displayed would tend to support the inward-looking model, as geographically proximate assemblages tend to be adjacent in the solution as well. The lack of tight clustering can be explained as due to widespread interchange of basins among the geographical areas sampled. However, it must also be considered that pottery was similar through the use of similar raw materials.” (Fry and Cox 1974:218)

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17 The Palenque study has always been referred to as a regional study, with dozens of sites tested up to 50 km from Palenque. The Tikal study sampled areas assumed to be within the polity of Tikal, with the exception of Jimbal.
The independent analysis of Imix basins\(^{18}\) based on stylistic variables produced two well-defined clusters with very low stress (.002), one consisting of basin sherds recovered from Jimbal (n=6) and the other cluster comprised of all other basins from the survey area (n=475). A second analysis of Imix basin sherds, again based solely on stylistic attributes, was conducted without the inclusion of the distinct cluster of six sherds from Jimbal. This second solution produced a more dispersed pattern of dissimilarity, with higher stress (.115). Fry interpreted this solution to indicate “a tendency for the Central Tikal and nearer north survey strip assemblages to cluster, with south survey strip and far north survey strip assemblages somewhat distant and distinct” (Fry and Cox 1974:220).

This tendency does not appear very strong in the graphic representation of the multidimensional scaling solution (Fry and Cox 1974:Figure 38) where ceramic assemblages from noncontiguous survey blocks cluster together. This graph, only representing stylistic variables of Imix basins, does place the minor center of Navajuelal along the same axis as central Tikal, though at some distance. Serving ware vessels recovered from Navajuelal would later be identified as nearly identical to types recovered from Central Tikal (Fry 2003a:165). Further multidimensional scaling solutions of various classes of pottery consistently placed collections from Navajuelal closer to Central Tikal than to other areas of the survey region (Fry 1980:7). Perhaps this was the first indication that non-market forces were partially (or completely) responsible for ceramic distributions in the Tikal region. Although Fry has doggedly interpreted these distribution patterns within a market framework, I and others (Rice 1987a; Stanton and Gallareta N. 2001) have detected indications of possible nonmarket factors at work.

Imix complex ceramics were in use at Tikal for around 150 years (A.D. 700 – 850, after Culbert 1993). The assumption that all households tested producing Imix complex ceramics were inhabited for the entire 150 year period may not be accurate.

\(^{18}\) It is difficult to distinguish Imix basins from Ik basins. The shape classes, types, and varieties for Late Classic basins (large capacity bowls) at Tikal are identical between the Ik and Imix ceramic complexes (Culbert 2003).
While Haviland (1970:191, 1985, 1992a, 1992b 2003; also see Puleston 1973:160-161) has convincingly argued that households within the 16 km² map of Tikal were likely occupied continuously, peripheral households have not been subjected to the same degree of extensive excavation. It is likely that some of these households were established well into Imix times while others were not occupied very long into this time period. I find it difficult to believe the alternative that no new households were established over a period of 150 years, and none were abandoned! The difficulty in subdividing the Imix period is another hindrance to evaluating the distribution patterns for ceramics of the Imix complex. Even more difficult to assign chronological placement are the large bowls, basins, and jars of the Late Classic period; these vessels appear in forms (i.e. both wide-mouthed and narrow-mouthed jars with tall necks and large bowls with restricted orifices, incurved rims or bump lips) and types (i.e., Cambio Unslipped: Cambio Variety, Encanto Striated: Encanto Variety, and all six Tinaja ceramic group varieties) commonly in use in both Ik (A.D. 550 – 700) and Imix (A.D. 700 – 850) times.

The second class of pottery analyzed by Fry and Cox (1974) consisted of unslipped wide-mouthed jars. Although the multidimensional scaling solutions were not as clear cut as those for Imix basins, a degree of clustering was encountered when analyzing technological traits and again when only stylistic traits were run as a separate analysis. While each run identified four cluster groups, membership in groups was not the same for separate analyses of technological attributes and stylistic attributes. On purely stylistic grounds, assemblages of unslipped wide-mouthed jars from the most northern transect block (11-12 km north of epicentral Tikal [n=35]) and from the minor center of Navajuelal (n=54) each plotted in relative isolation. These plots do support the idea of truncated distribution radii for heavy utilitarian jars around the centers of Tikal, Jimbal, and Navajuelal, although this distribution may reflect sampling procedures more than central production. Interestingly, the multidimensional scaling plots for technological attributes and for stylistic attributes both place Navajuelal on a cross-axis with the clustered Central Tikal/north Tikal assemblages. These plots hint at social
relations that might have been expressed and reinforced through gift giving or redistribution instead of representing transportation costs in a market system.

Fry’s 1979 article examined alternative models for the exchange of serving vessels, concluding that the multidimensional scaling solutions supported a model of distribution based on a fairly centralized marketing system. In this article, serving wares are emphasized instead of ‘utilitarian’ vessels because they constitute a high percentage of the collections. Serving wares make up 41% [range 26 – 64 %] of the total collections from the stratified random sample of structures from peripheral and intersite areas of Tikal (Fry 1969:259) and 46% [range 28 – 76%] of collections from Central Tikal (Culbert 1973:86; Fry 1979:496, Fry 1980:5). This class of pottery is more portable than heavy utilitarian basins or jars and would have been easier to transport, being smaller and easily stackable. Fry cited distribution studies from Palenque as well as Tikal indicating that large, heavy utilitarian pottery had highly localized distributions (Bishop 1975; Rands 1967; Fry and Cox 1974). Subsequent analysis of the Palenque region pottery collections (Rands and Bishop 1980) documented the circulation of utilitarian pottery at greater distances, although the Palenque data may not be representative of all Maya settlements and regions. Nonetheless, if any class of pottery was widely circulated through a market system, the serving vessel class was the prime candidate and an obvious focus for further evaluation.

“The reconstruction of pottery exchange systems involves discriminating between the products of various producing centers, whether they come from full-time workshops or represent the work of a number of part-time specialists or individual households. Alternative methods of exchange ranging from gift exchange through formalized marketing must be considered.” (Fry 1979:495)

The assumption that “finely decorated serving vessels were the product of full-time specialists” has wide acceptance (R. E. W. Adams 1970; Becker 1973a, 1973b, 2003a; Culbert 2003:63; Fry 1979, 2003), although some researchers question the

19 In particular, large diameter basins with everted rims falling into the “plains” compositional reference group make an abrupt appearance in the Balunte ceramic phase at Palenque. These must have been ‘imported’ from about 10 km away, according to petrographic analyses.
qualification that these must have been full-time (Costin 1991; 2007). A consistent paste variant could not typically be correlated with any specific Tikal serving vessel shape or type. Therefore, the location of a specific production center for any of these vessels could not usually be determined. Analysis was again conducted on the basis of dissimilarity values; a new dissimilarity measure was constructed for these analyses (Fry 1979:501). A measure of distance \( D \) between two assemblages \( x \) and \( y \) was calculated as follows:

\[
d = \sqrt{\sum_{j=1}^{n} \sum_{i=1}^{m} \left( \frac{f_{ij}^x}{n} - \frac{f_{ij}^y}{n} \right)^2}
\]

where \( f_{ij}^x \) is the relative frequency in area \( X \) for state \( j \) of attribute \( I \), \( f_{ij}^y \) is the relative frequency in area \( Y \) for the same attribute state, \( n \) is the total number of attributes, and \( m \) is the total number of attribute states for each attribute. A slightly different set of attributes was employed for these examinations.

Table 5.2.3 – Fry’s coded ceramic attributes (after Fry 1979:502).

<table>
<thead>
<tr>
<th>stylistic attributes</th>
<th>technological attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>wall orientation</td>
<td>completeness of firing</td>
</tr>
<tr>
<td>wall curvature</td>
<td>differential firing</td>
</tr>
<tr>
<td>wall thickness</td>
<td>fire clouding</td>
</tr>
<tr>
<td>lip shape</td>
<td>paste texture</td>
</tr>
<tr>
<td>lip orientation</td>
<td>temper frequency</td>
</tr>
<tr>
<td>lip thickness</td>
<td>type of inclusions</td>
</tr>
<tr>
<td></td>
<td>frequency of inclusions - manganese</td>
</tr>
<tr>
<td></td>
<td>frequency of inclusions - mica</td>
</tr>
</tbody>
</table>

The degree of dissimilarity was interpreted as a measure of the intensity of exchange between any two survey blocks, and between the two hypothesized marketing
ranges of Tikal and Jimbal. Fry (1979:495) was also keenly aware of the equifinality problem that curses attempts to correlate distribution patterns with circulation mechanisms or institutions (see Bey 1992:3; Blanton 1981; I. Hodder 1974; I. Hodder and Orton 1976; Renfrew 1977; P. Rice 1987a:198, 1987b:535).

A diachronic approach characterizes Fry’s 1979 study. Two classes of serving wares (vases and plates/dishes) from two consecutive ceramic complexes (Ik [A.D. 600 – 700 A.D.] and Imix [A.D. 700 – 830]) were examined. The samples derive from approximately the same excavations used in the previous study (Fry and Cox 1974); however, Fry makes clearer reference to the context of several of these ceramic collections (see Fry 1979:499-500). The test blocks and sample sizes are listed in Table 5.2.4.

The vessel forms used for this analysis are illustrated in Fry (1979: Figure 1). The Ik ceramic complex “barrel” vase and lateral-ridge tripod plate or dish\(^{20}\) are diagnostic temporal markers at Tikal and similar specimens were recovered during the PST Project test-pitting program (see Chapter 9.4 and 9.5). The Imix ceramic complex cylinders were not so abundant in PST Project excavations, although the flat-bottomed (tripod) dishes were. The multidimensional scaling solutions of the measure of dissimilarity among pooled collections of single vessel form-classes were then compared to the expectations proposed for different modes of exchange (Fry 1979:497, 503) (Table 5.2.5).

The graphic representations of the independent solutions for Ik ceramic complex vases and dishes produced by KYST multidimensional scaling analyses place ceramic collections from the far north survey block, near the minor center of Jimbal, at quite some distance from all other collections analyzed. The solutions for Imix ceramic complex vases and dishes display more scattered plots, although important patterns in

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\(^{20}\) Lateral-ridge tripod plates/dishes evidence a considerable range of variation in wall angle, depth, and ridge morphology. Although Fry (1979:498) states that most examples of this form are “flaring walled and round bottomed,” the illustrated example (Fry 1979:499) appears to be a round-sided variant. Culbert (1993:Figure 41b5) notes that the round-sided variant is “less common than other variants.” I have used the term “dish” for this form class, for convenience, although I do mean plates and/or dishes.
Table 5.2.4 – Numbers of vessels analyzed from each of Fry’s geographic zones (after Fry 1979:Table 3).

<table>
<thead>
<tr>
<th>Geographic Area</th>
<th>Code</th>
<th>Location</th>
<th>Vases [Ik] Barrel</th>
<th>Vases [Imix] Cylinder</th>
<th>Dishes [Ik] Lateral-ridge</th>
<th>Dishes [Imix] Flat-bottom</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jimbal area</td>
<td>JA</td>
<td>11-12 km north, north survey strip</td>
<td>9</td>
<td>19</td>
<td>23</td>
<td>15</td>
</tr>
<tr>
<td>far north survey strip</td>
<td>FN</td>
<td>6-9.5 km north, north survey strip</td>
<td>15</td>
<td>17</td>
<td>29</td>
<td>29</td>
</tr>
<tr>
<td>mid-north survey strip</td>
<td>MN</td>
<td>4.5-6 km north, north survey strip</td>
<td>26</td>
<td>21</td>
<td>21</td>
<td>24</td>
</tr>
<tr>
<td>near-north survey strip</td>
<td>NN</td>
<td>2-4.5 km, north survey strip</td>
<td>11</td>
<td>12</td>
<td>7</td>
<td>18</td>
</tr>
<tr>
<td>north Tikal</td>
<td>NT</td>
<td>NE quadrant of 16 km² Tikal map</td>
<td>61</td>
<td>35</td>
<td>35</td>
<td>31</td>
</tr>
<tr>
<td>central Tikal</td>
<td>CT</td>
<td>within 500 m main plaza of Tikal</td>
<td>61</td>
<td>92</td>
<td>10</td>
<td>105</td>
</tr>
<tr>
<td>mid-south survey strip</td>
<td>MS</td>
<td>3-6 km south, south survey strip</td>
<td>16</td>
<td>0</td>
<td>23</td>
<td>0</td>
</tr>
<tr>
<td>Navajuelal</td>
<td>NV</td>
<td>10.5 km south, south survey strip</td>
<td>22</td>
<td>25</td>
<td>18</td>
<td>25</td>
</tr>
</tbody>
</table>
Table 5.2.5 – Fry’s hypothesized modes of exchange (after Fry 1979:Table 1).

<table>
<thead>
<tr>
<th>Type of exchange</th>
<th>Definition</th>
<th>Expected pattern of distribution for items produced by one center</th>
</tr>
</thead>
<tbody>
<tr>
<td>I supply zone</td>
<td>single exchange between producer and consumer at place of production or use</td>
<td>highly localized distribution of items; dominates the collections close to production center</td>
</tr>
<tr>
<td>II gift exchange</td>
<td>simple dyadic exchange; often structured in a complex stranded network of exchange relationships</td>
<td>widespread distribution - limits coterminous with limits of exchange system; low correlation between frequency in collections and geographic distance</td>
</tr>
<tr>
<td>IIIA simple centralized redistribution</td>
<td>pooling and redistribution of items by a centralized authority</td>
<td>spread determined by desirability and portability of items; highest frequency often within distant systems; frequency within system appears random; no correlation with geographic distance</td>
</tr>
<tr>
<td>IIIB simple centralized marketing</td>
<td>exchange through a single centrally located market</td>
<td>widespread distribution - limits coterminous with marketing system; higher correlation between distance and frequency in collections; similar frequencies in all collections within market area</td>
</tr>
<tr>
<td>IV noncentralized marketing</td>
<td>exchange through a series of smaller scale local markets with no overall systematization of the market system in a region</td>
<td>high correlation between frequency and geographic distance; similar frequencies in all collections within each separate market area - a graded distribution</td>
</tr>
<tr>
<td>VA complex redistribution system</td>
<td>pooling and redistribution of items at various levels of a hierarchical redistributive system</td>
<td>overall randomness similar to IIIA but with greater similarity among collections from localized redistributive systems</td>
</tr>
<tr>
<td>VB complex market</td>
<td>exchange through a hierarchically organized series of local and regional markets of different scales</td>
<td>similar to IIIB but with greater similarities of collections from same localized marketing area; neighboring market areas also fairly similar in frequencies</td>
</tr>
</tbody>
</table>
both the Ik and Imix plots are discussed by Fry (1979:504-508). These plots do not display a “random” order as much as an evenly spaced distribution. The clearest indication of dissimilarity between any collections occurs in the solutions for Ik dishes, both on stylistic and technological grounds. However, the removal of the Jimbal area collection from consideration produced a similarly evenly spaced distribution.

Evaluating the fit between the proposed modes of exchange and the multidimensional scaling solutions, Fry concluded that neither ‘supply zone’ behavior nor simple dyadic exchange (i.e., gift giving) were supported; neither were models of simple centralized exchange, based on either redistribution or market principles.

“The view that exchange of serving vessels was predominantly through a complex regional network is supported, although the mechanisms used cannot be specified. Given the scale of exchange, a more formal marketing system is much more likely than a redistributive system, especially given the evidence for craft specialization.” (Fry 1979:508-509)

The conclusion that serving vessels were circulated through a complex regional system rests on evaluation of the plots of the dissimilarity solutions. In these solutions, greater similarity was usually detected among collections from adjacent survey blocks, especially those making up the north survey strip (NN, MN, FN) except for the farthest north survey block (JA). The plotted solutions do not present clearly defined clusters of survey blocks as much as they indicate general tendencies to fall along similar axis.

“The study of serving vessel exchange at Tikal supports the position that ceramic exchange was primarily channeled through a complex marketing system, with both a central market and regional market centers.” (Fry 1979:510)

Fry had come to a similar conclusion when analyzing utilitarian pottery.

“Such pottery was produced at specialized centres and distributed through markets, and possibly also through special clientage relations.” (Fry and Cox 1974:223)
Given Fry’s list of expected distribution patterns, it would seem that he favored complex marketing (VB) over complex redistribution (VA) based on the degree of “randomness” detected. I will make three remarks in regard to Fry’s final conclusion: 1) no ethnographic analogy or formal economic model is proposed to support the expectations against which the data were compared; 2) these expected patterns are proposed for items produced by one center; the data used to evaluate these models do not represent the products of one center, they represent similar products manufactured at an unknown number of centers; 3) it could certainly be argued that the plots display the overall randomness as well as a greater similarity among collections from localized redistributive systems indicative of Fry’s complex redistribution system (VA).

**Identification of a Production Center from Visual Inspection of Sherds**

After discounting manganese as a far too ubiquitous natural inclusion in Tikal pottery, Fry charted the distribution of ceramics with visible muscovite (mica) inclusions, which turned out to be concentrated geographically in areas closest to the El Palmar ridge northwest of Tikal. Viewing the ridge as a likely source of “less intensively weathered [clay] deposits” likely to contain muscovite, he concluded that he had isolated a production zone for a single ceramic ware.

“The degree of stylistic and technological uniformity within this class of muscovite inclusion pottery indicates that only one or several closely linked centers produced this ware. Thus the distribution of this class of pottery can serve as an indicator of the nature of ceramic exchange in the Tikal region.” (Fry 1980:6)

The degree of stylistic and technological uniformity of these pottery specimens was deduced from six stylistic variables and eight technological variables, all manually coded from macroscopic inspection of the sherds. The validity of manually coding ceramics has not been supported by ethnographic analogy or formal theory to my knowledge. I am unsure if manually coding ceramic vessels will distinguish discrete
production units. Paste color and slip characteristics are absent from the list of coded variables, and no standardization measures were employed. The designation of “ware” based on paste similarity seems warranted for the muscovite inclusion pottery production center, though not necessarily indicating a low number of production “centers.” Only one other distinctive paste class was isolated (Tinaja Pink).

“Obviously the products of this [muscovite inclusion pottery production] center were getting to central Tikal households through some mechanisms, either through producers taking their wares to a central market or markets, or possibly through middlemen based at Tikal.” (Fry 1980:7)

In addition to the serving wares evaluated from this muscovite inclusion pottery production center, Fry also classified some monochrome slipped bowls and jars as products from the same production unit. In fact, it appears that serving wares (i.e., plates, dishes, bowls, barrels and cylinders), jars, and large utilitarian bowls and basins were all produced in this specific muscovite paste.

“[T]he products of this [muscovite inclusion pottery production] center dominate the area close to the production center: over 50% of the bowls and basins used locally were of local manufacture. This compares favorably with the 25 – 35% frequency of micaceous pastes in the same area for serving vessels.” (Fry 1980:11)

Fry thus states that 75 – 85% of all pottery “in this area” was manufactured at a single center. Such a high percentage probably indicates a community specialization situation, or a number of production units in the area utilizing the same clay resource, not a single manufactory producing high volumes of pottery with a standardized paste recipe. Fry refers to the muscovite inclusion pottery production center, and initially stated that “only one or several closely linked centers produced this ware” (1980:6). Later comments suggest that he was uncertain about the number and organization of such production centers.
“Determining whether these were specialized communities heavily involved in production or simply individual households will require additional research,...Given the scale of production and the likely use of open and pit firing rather than formal kilns, it may be difficult to locate these centers.” (Fry 2003a:167, emphasis added)

Beyond Tikal, Fry equated ceramic types with the products of single ‘centers’ or production units, concluding that certain types “indicate fairly localized production with steep fall-off curves after about 35-50 km” (Fry 1980:11-12). He cites the distribution of other ceramic types, published in various cite reports, as evidence of distribution radii of over 100 km. I make a clear distinction between a type or ware designation and the product of a single center or production unit. It is my firm belief that the volume of ceramic production at Tikal, in conjunction with the lack of standardization of form and paste recipe, indicates a considerable redundancy of production units for any type, ware, or shape class. Fry himself pointed this out in 1980, when speaking of the widespread distribution of Chicanel sphere pottery across the lowlands.

“Although Late Preclassic pottery of the Chicanel sphere is remarkably uniform, this uniformity is generally attributed to extensive interregional contacts leading to sharing of widespread norms of pottery production rather than to widespread distribution of ceramics from relatively few centers (Ball 1977).” (Fry 1980:3)

Applying the same logic to Preclassic ceramic assemblages as is commonly applied to Late Classic ceramic assemblages, one might conclude that Chicanel pottery had a huge market-based distribution and was produced by a few specialized communities! This conclusion seems suspect based on other criteria, namely the lesser degree of sociopolitical development of Preclassic lowland Maya communities. This point is crucial to the interpretation and understanding of ceramic distribution data. Culbert (1993) classified nine ceramic groups and twenty-one ceramic types (with an additional three varieties) for the Ik ceramic complex. It is highly doubtful if these classifications represent 9, 21, or 24 distinct production units. More likely, a number of production units were involved in the production of any number of types and possibly of
pottery from more than one ceramic group. No one-to-one correlation between number of production units and number of classificatory units, such as ceramic group, type, or variety, should be assumed. As a crude double check on this hypothesis, we can divide the projected population of Tikal by the number of groups for the Ik ceramic complex. Using a figure of 45,000 inhabitants for Tikal, we can estimate one production unit producing the entire range of a ceramic group for every 5000 inhabitants. Alternately, we can estimate one production unit producing just one ceramic type for every 2143 inhabitants. These would have to be very large manufactories to continually produce the entire annually-consumed pottery for all of Tikal.

After examining the degree of standardization in paste recipe as a proxy for number of production units, I have concluded that multiple production units produced the same types of pottery, and that a single production unit probably did not specialize in just one or a very limited range of vessel forms at Tikal. At the ceramic group level, there are indications that production units might have manufactured the entire (or near entire) range of types (and forms) within a single ceramic group. Compositional analysis suggests that multiple production units were duplicating this pattern; it is unlikely that just one large manufactory produced all the vessels of a specific ceramic group for distribution throughout all of Tikal. It is more likely that archaeologists have identified similar products from multiple production units and assigned these an overarching ceramic group or type designation. Foias and Bishop (2007) began their analysis of pottery vessel circulation patterns in the Petexbatun region by assigning these to specific ceramic groups and types. Consequently, they showed that different production units at each center produced vessels that were conventionally placed within the same ceramic group. Not only did each center produce the same ceramic types, more than a few production units manufactured ceramics of the same types in the same form classes.
Delimiting Market Ranges

Returning to the tentatively identified disjuncture between the Tikal and Jimbal ceramic assemblages, Fry (1980, 2003a) again used coded data from the geographically dispersed ceramic collections from Tikal and the same KYST multidimensional scaling technique in order to confirm a boundary, detected as “a distinct break,” between Tikal and Jimbal. Using a “standard geographic formula” a market range boundary was predicted between 8 and 9 km north of Tikal (Fry 2003a:150, Figure 5.1). The existence of this boundary was tested by generating measures of dissimilarity between pooled ceramic collections from regional survey blocks. Only stylistic variables were employed this time.

“Technological characteristics were rejected for this analysis because clay and paste similarity might be related to localized clay sources, which – given the relative uniformity of the geological substrate at Tikal – might not show any discrete source patterning.” (Fry 2003a:151)

Based on the multidimensional scaling solutions for stylistic attributes (not pertaining to slipping – no coding for surface treatment was attempted because slip preservation was poor), the Jimbal separation was upheld. I assume that Fry omitted the technological variables in order to lessen the homogenizing effect of the abundant micaceous wares. Fry’s graphs indicate an overall dissimilarity between collections from Jimbal and all other portions of Tikal, which he interpreted to indicate that “the area near the site of Jimbal was not strongly participating in the Tikal-based pottery exchange system for serving vessels” (Fry 1979:504-507 quoted in Fry 1980:8). Nonetheless, Fry’s analysis suggests (to him) that both Jimbal and Tikal received pottery from the same muscovite (micaceous) inclusion pottery-production center near the El Palmar ridge, while otherwise maintaining distinctively separate market systems for pottery.
“Evaluation of inclusion classes for the very aberrant collection (Jimbal area) indicates a fairly high frequency of plates with muscovite inclusions. This would indicate that the northwest Tikal pottery center was exporting items to the two systems. Participation in both systems would make the Tikal-based and Jimbal-based systems closer to each other. The degree of disparity represented in the solutions shows a clear and marked boundary between the two marketing systems, overriding the joint consumption of serving potter from one center [of production].” (Fry 1980:8)

To paraphrase, despite receiving vessels from a single production center, Tikal and Jimbal are characterized by quite dissimilar ceramic assemblages, indicative of separate marketing systems. Unfortunately, Fry does not give more precise numbers indicating what percentage of these vessels from the alleged El Palmar production center was entering each system, so it is not clear what percentage of this single production center’s product is represented in the 41% of serving vessels which make up the collections of Tikal. I personally suspect that multiple production units may have exploited similar clay resources from the El Palmar ridge vicinity, and that more definitive characterization of the pastes of these vessels (through petrography or INAA) would help to sort out the distributions. The small size of the Jimbal sample might also have skewed the reported dissimilarities.

“The anomalous position of Jimbal may reflect the fact that this center was part of a different production-distribution system for basins, or may simply reflect sampling error in a very small sample.” (Fry 1980:11)

While Jimbal, 14 km to the north of the Tikal epicenter, registered as outside the Tikal-based pottery distribution system, the minor center of Navajuelal, 9.5 km south of the Tikal epicenter, showed consistent affinities with the hypothesized Central Tikal based pottery distribution system.

“[T]he greater dominance of the central Tikal-based market system over regional systems may be a powerful factor. The collections farthest to the south, from in and near the small nucleated site [i.e., minor center] of Navajuelal, are remarkably like the Tikal collections. As a smaller but subordinate central place, Navajuelal may have replicated in smaller fashion (fewer total specimens) the heterogeneity of its larger and more powerful neighbor.” (Fry 1980:7)
The multidimensional scaling solution graphs produced by Fry using the KYST program would seem to indicate the greatest degree of uniformity among pottery collections from Central Tikal, North Tikal, and Navajuelal. In general, the north transect diverges from Central Tikal and the NE quadrant, while Jimbal and the Jimbal area group with the north transect (Fry 2003a).

“People consumed local products for most of their needs, not seeking exotic higher-quality items on a regular basis. Serving forms, especially vases, are the only category that is somewhat of an exception. The only people who seem to have been concerned enough to choose high-quality, presumably imported, serving vessels in some number were the residents of Minor Centers such as Navajuelal. The few whole vessels we recovered at Navajuelal included a number of examples identical to types common in central Tikal.” (Fry 2003a:165)

The KYST solutions (Fry 2003a) indicate a greater homogeneity or uniformity between the pottery collections of Navajuelal and both Central Tikal and north Tikal, but not in the intervening areas. The homogenizing effect of the market evidently did not influence households between Central Tikal and Navajuelal. Fry’s preferred explanation of marketing for this distribution is not entirely convincing. It is never explained why these vessels are “presumably imported,” and the dissimilarities among collections, basically by geographic location, suggests to me that, if these were circulated through a system of markets, these markets were not hierarchically arranged to funnel products to a central market for distribution back to the populous. The homogenizing effect of a central market on the surrounding area would seem to be hindered by administrative or community centers, not advanced, as would be expected in a complex market system. In general, Fry’s studies attempt to determine market ranges from dissimilarity, not to demonstrate the homogenizing effect of the market system on household assemblages, as Hirth (1998) has argued at Xochicalco. The greater degree of similarity (lesser degree of dissimilarity) between the ceramic collections of Central Tikal and Navajuelal are interpreted as a result of preference (purchasing power?) by elites, but never as the prerogative of elite actors within a non-market based distribution system.
Interpretation of Fry’s Ceramic Study

Fry’s multidimensional scaling solutions can be interpreted in a variety of ways and the highly abstract measure of the total dissimilarity of assemblages is only one possible method of analyzing market ranges. Several publications (Fry 1979, 1980, 2003a, 2003b; Fry and Cox 1974) contain these plots and conclusions based upon them, but disagreement in interpretation remains. The plots do not immediately suggest market exchange as much as they imply differences in ceramic assemblages for which other reasonable explanations can be suggested. In respect to Fry’s conclusions, Prudence Rice notes,

“The multimodality of the Maya pottery distribution graphs – and particularly the differences in occurrence of micaceous wares in comparing North Tikal with Central Tikal (Fry 1979:509) – tend to suggest that ‘non-economic’ or non-centralized and unmeasured factors were operating to control the circulation of these wares.” (Rice 1987a:535)

Recently, Stanton and Gallareta N. (2001) have legitimately questioned the assumptions and conclusions of Fry’s data, positing an alternate exchange hypothesis based on the exact same data. These authors argue that the class of vessels referred to as “serving wares” (e.g., dish-plates, thin bowls and cylinder/cylindroids) did not fit the spatial patterning of Fry’s market model. This class of vessel represents 41% of the recovered peripheral ceramics, leading Fry to conclude that they must have been distributed through a central market; their high frequencies precluding their having been “gifted” vessels. Stanton and Gallareta N. observe that serving vessels “…are the only class of ceramics that Fry identified as having a pattern suggesting a more centralized distribution” (2001:232). The multitude of patterns produced by the KYST multidimensional scaling program suggests that the search for a single mode of distribution may be futile.
Stanton and Gallareta N. (2001) favor investigating Maya gift-giving practices and wonder if the high volume of exchange of such vessels precludes their having been distributed hand to hand as gifts, perhaps on numerous occasions throughout the year. They further suggest that centralized non-market pooling and redistribution could account for the spatial patterns uncovered by Fry, concluding that, “it is our contention that the dynamics of ceramic exchange in the Maya lowlands were likely to have been more complex than that for which Fry’s model accounts” (2001:232 Footnote #7).

Interestingly, Stanton and Gallareta N. view a mixed system of centralized redistribution, itinerant peddling, gift-giving and non-centralized redistribution as more complex than a centralized or decentralized market system. This point is often missed by authors who consider market exchange or hierarchical market systems the epitome of complexity. While Carol Smith’s (1976b) study of contemporary highland Guatemalan markets is often cited in discussions of distribution patterns of archaeologically recovered data, the implications of the K=7 administrative pattern within a solar marketing system have not been fully appreciated. West (2002) argues that the Tikal ceramic distribution data conform to Carol Smith’s characterization of just such a system.

“In such systems, the bulk of transactions between food producers take place through face-to-face exchange, due to the fact that they are not well integrated into the market system (Smith 1976). The localized distributions of utilitarian ceramics in the Tikal sustaining area suggests that many of these transactions may have taken place by means of direct exchange. On the other hand, the wider distributions of serving vessels suggest that these vessel classes may have been obtained by food producers at centralized markets. Again, this is the pattern noted by Smith in solar central place systems, where peasants obtain some goods locally and more specialized goods at markets (Smith 1976).” (West 2002:160)

This characterization of the solar central place system emphasizes important aspects of Maya communities and factors limiting exchange spheres. For instance, all materials are moved by human porters and exchange in a central marketplace must involve either a return trip with the products ‘bought’ or a complex ‘credit’ system (i.e., some kind of deferred reciprocity, balanced or otherwise). This latter point deserves more explanation. First, “credit” is a specific economic term which does not exactly
work for archaic states without currency. By credit, I simply mean deferred payment, as in the practice of sellers allowing buyers to leave with goods with the understanding that they will have to provide the negotiated payment for them at a later date. Therefore, if this type of ‘credit’ is extended to buyers from sellers in the central marketplace, then at some point the product equivalent of the credit debt must be paid. In other words, payment cannot be postponed indefinitely. Energetically, this kind of ‘credit’ only defers transportation costs; it does not alleviate them at all. I agree that ‘credit’ was probably extended (probably along kinship ties); however, this was not an effective way of ameliorating exchange equivalencies or transportation costs.

Without a highly effective marketplace system reaching the inhabitants of peripheral areas, highly localized procurement and distribution are to be expected. Alternately, itinerant peddlers or traveling traders may have moved ceramic vessels over long distances on their backs or heads without any complex integration of production with distribution. Ceramic distribution studies for the Kalinga of the Philippines (Stark 1994) or the Baringo of Kenya (I. Hodder 1980) demonstrate that very simple production and distribution systems are sufficient to move even heavy, bulky ceramic vessels considerable distances.

**Charting the Distribution of the Product of a Single Production Center**

While Fry (1979, 1980, 2003a, 2003b) has consistently run separate multidimensional scaling solutions for technological and stylistic attribute, a more convincing argument would entail the evaluation of constellations of both technological and stylistic attributes together. The Palenque region project (Bishop, Rands, and Harbottle 1982; Bishop, Rands, and Holley 1982; Rands 1967, 1974; Rands and Bishop 1980, 2003) had greater success in isolating the geographic areas that were home to potting communities producing definable wares by using a polythetic set of membership inclusion (i.e., stylistic, technological, and compositional data combined).
Fry’s relative frequency chart of micaceous pastes in collections of monochrome slipped wares (both bowls/basins and narrow-mouthed jars) which he believes come from a single production center indicates very high frequencies of these wares at the northern end of the north transect: over 50% for narrow-mouthed jars and over 60% for bowls and basins (Fry 1980: Figure 6). The steep fall-off curve can be interpreted as either an indication of supply-zone behavior (as I. Hodder [1980] suggested) or down-the-line exchange, but does not immediately suggest marketing through an epicentral Tikal marketplace. The downward slope of the relative frequency line for narrow-mouthed jars makes a sudden jump from 10% to 30% at the 12 km mark. Without this spike in the graph, the curve would follow a steady decay curve previously identified as a down-the-line exchange pattern (I. Hodder 1980; Renfrew 1975, 1977; Torrence 1986). The jump in relative frequency coincides with Fry’s analyzed assemblages, with a 10% frequency in the north Tikal block (northeast quadrant of the central 16 km² map) and a 30% frequency at Central Tikal (the East Plaza excavations). This spike in the frequency chart indicates that these jars are heavily represented in the collection from the alleged marketplace in the East Plaza – that a single production center provided 30% of the narrow-mouthed jars to this one location. The question remains, then, why would the relative frequency of narrow-mouthed jars fall to 10-12% in the collections from excavations to the south (3-10 km)? The graph records a relative frequency of bowls/basins of 38% for the near north survey block (2-4.5 km north of Central Tikal), falling to just 10% at the north Tikal block (1-1.5 km northeast of Central Tikal), before spiking to 30% in the East Plaza (i.e., the marketplace) of Tikal.

If pottery manufactured on the El Palmar ridge entered a Central Tikal marketplace, then we would expect to see a higher relative frequency both north and south (as well as east and west) from the central marketplace. No homogenizing market-effect is evident in this graph; either the “marketplace” collection represents elevated consumption or it is an anomalous collection indicating only sampling error from using a

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21 Note that down-the-line exchange curves are usually charted at a much greater scale. For instance, Renfrew (1977) includes such curves charting distributions over 600 km. The 12 km curve for the Tikal pottery would only overlap with the first 2% of Renfrew’s chart.
non-random collection. Likewise, the bowl/basin relative frequency line should mirror that for the jars, if they are the product of a single production center; there is little explanation for two form classes of pottery from a single production center taking such divergent paths. Without the single anomalous assemblage from central Tikal and just for narrow-mouthed jars, the relative frequency graphs show a predictable fall-off curve with no indication of being distributed from a central market at all, unless that market was located at the end of the north transect. Fry interpreted his findings to indicate that,

“About 30% of the narrow mouth jars from Central Tikal collections were produced by this one center [at the El Palmar ridge]…The relatively steep fall-off curve indicates that there were a number of producing centers in the Tikal zone making this shape class, with most of them being regarded as equivalent.” (Fry 1980:13)

Fry (1980:16) concludes from this relative frequency graph that about five production centers were supplying central Tikal with monochrome bowls and three production centers supplied narrow-mouthed jars, based on simple percentage calculations. By the same reasoning and mathematical calculations, households in the NE quadrant of the 16 km² Tikal map (just 1.25 km away from central Tikal) were receiving monochrome bowls from about ten production centers and narrow mouth jars from about five production centers. There are several questionable logical assumptions in this reasoning. First, production centers should not be assumed to be of equal size; this very idea is at odds with Fry’s data, which indicate shorter distribution radii for utilitarian wares and larger distribution radii for serving wares. Second, a central market does not consume pottery, it is a distribution point. Fry’s (1980:Figures 7 and 8) multidimensional scaling plots, based on technological attributes, for both Late Classic monochrome slipped narrow-mouthed jars and wide-mouthed jars show clear clustering of the entire north transect assemblages distinctly apart from assemblages within the 16 km² central Tikal Map, or the south transect (including Navajuelal). Taken at face value, these plots indicate a severely circumscribed distribution radius for these goods from a central marketplace.
“The presence of a number of distinctive pastes and inclusion types demonstrates that there were a number of centers producing monochrome bowls in the region around Tikal. Although it was not possible to confirm the exact mechanism of exchange, the volume of items produced and the heterogeneity of most collections tend to favor a marketing over a redistribution system, perhaps with a major central market and a system of regional markets (Fry and Cox 1974).” (Fry 1979:496)

The fundamental error in Fry’s reasoning is to be found in this two-pronged analysis. Dissimilarity measures register different market ranges, while a separate evaluation of pastes indicates the number of production units or “centers” in Fry’s vocabulary. I suggest that paste classes may well indicate different production units, but the dissimilarity measures are a poor discriminator of market ranges. Without isolating the products of a number of different production units, an accurate analysis of market ranges appears beyond the limits of the data and analytical techniques employed. Fry’s list of discreet types of exchange are arranged as singular modes, never does he postulate what a mixed system using multiple modes simultaneously would look like.

Nonetheless, classes of pottery were analyzed and their distribution patterns compared against the expected distribution patterns for the products of discreet “production centers.” The precise meaning of the term “center” is never specified although I believe that Fry meant to suggest a production locus of some sort. The classes of pottery analyzed most certainly do not represent the products of single production units; they most likely represent an assortment of vessels produced by a multitude of production units. Under a highly complex marketing system, as Fry has suggested for Tikal, it seems unlikely that any class of pottery (i.e., vases or dishes) would be produced by a single production center, or production unit. Associating the highly abstract patterns of dissimilarity with any specific mode of exchange is equivocal. In order to evaluate the distribution pattern of the products of a production center, the products of that center must be isolated. Fry isolated only the Palmar ridge production center, which may actually be the source of clay used by multiple production units, and this “center” did not specialize in one specific shape class of pottery. Only one other specific ceramic paste, Tinaja Pink, has received serious attention as indicative of a unique production unit (see
The individual analyses of shape classes used to justify the conclusions of the study are treated as if these were run on the products of single production centers, which they were not.

5.3 – The Ceramic Production Location, Group 4H-1

“A vast array of ceramics found in middens and surface deposits around Gr. 4H-1 suggests that this group was the residence of a potter’s family. Gr. 4H-1 produced vast quantities of sherds from all associated trenches, greater in number than recovered from other comparable groups throughout the site [of Tikal]. A large midden was located against the steep north wall of Str. 4H-2. This midden alone (Op. 33F) produced 8 whistle fragments and two whole examples, 39 fragments and 1 whole figurine, 2 figurine molds fragments and 2 intact, and 40 pieces of censers, in addition to scores of reconstructable bowls, wall insert fragments, candlesticks, and decorated vessels, including 3 with miscellaneous texts.” (Becker 1973b:399)

The identification of Tikal Group 4H-1 as the locus of specialized pottery production was initially proposed by Becker in light of the quantity and depositional character of discarded ceramics recovered from excavations at the group. He also found evidence of figurine production. The published Tikal Report #21 (Becker 1999:17-39, Figures 12-25) provides a detailed excavation description of Group 4H-1 (Figure 5.3.1). Excavations on this “peninsula” in 1962 extensively tested six of the nine residential groups present, all of which conform to a Plaza Plan 2 (Becker 1999:2; 2003a). Becker estimates that 1500 labor-days were involved in these excavations over a six month period. Group 4H-1, at the northern tip of the peninsula overlooking the Bajo de Santa Fe, was the last to be tested; further investigations of this group were undertaken in 1963.

Five of the seven structures comprising Group 4H-1 were axially trenched, augmented by clearing and trenching excavations of their underlying basal platforms. Excavations revealed an occupation sequence from at least Manik times through Imix times. The plaza was raised and resurfaced several times and a number of burials, ranging from
Figure 5.3.1 – Plan diagram of Tikal Group 4H-1 with excavation limits shown (After Becker 1999:Figure 12).
formal chambers to simple cysts, were deposited over time. Earlier burials were often disturbed by subsequent interments. A total of twenty-six burials (labeled sequentially as Burials 88-113) were excavated. Most burials were associated with one of the eastern structures, either within, below, or within the plaza in front of Structure 4H-7. Abundant sherds of the Cauac/Cimi ceramic complex (A.D. 1 – 250) were recovered from construction fill below and within Structure 4H-7, mixed with sherds of the Manik ceramic complex (A.D. 250 – 550). Two Manik burials (Burials 95 and 107) were found below Structure 4H-4, the eastern shrine building. Burial 95 was a chamber cut into bedrock and contained the skeletal remains of a middle-aged male accompanied by stingray spines, bone implements, marine shell and coral, and Manik ceramic complex pottery. A single jade bead was likely placed in the mouth of the individual. Burial 107 was also discovered below Structure 4H-4 and contained the remains of fourteen individuals and a few Manik ceramic complex vessels placed in a chultun chamber.

Of the twenty-six burials recovered from Group 4H-1, over half (n=14) contained Imix ceramic complex pottery, five contained Manik complex pottery, and only one could be securely dated by Ik complex pottery; six burials had no pottery whatsoever. Two burials (102, 112) were encountered while trenching the low mound Structure 4H-2, as well as “an enormous quantity of sherds evaluated as ‘midden’ context” dating from the late Ik to Imix ceramic complexes (Becker 1999:16). This would appear to be the ceramic deposit which Becker (2003a) would later reference when describing Group 4H-1 as a ceramic production locus.

Following the publication of an edited volume of papers (Sabloff 2003) resulting from the 1999 School of American Research advanced seminar “Changing Perspectives on Tikal and the Development of Maya Civilization,” Marshall Becker, a participant and author in this seminar, revisited the indirect evidence supporting the conclusion that Group 4H-1 was, in fact, the residence of potters producing a variety of ceramics, most notably, Late Classic polychrome vessels (Becker 2003a). In this publication Becker expands upon his contextual argument, originally proposed in the early 1970s, for the
identification of this group as a potters’ residence while making suggestions concerning ceramic firing technology and the organization of production at Tikal.

“The nine architectural groups at Tikal that are on a peninsula jutting out into the bajo Santa Fe (Becker 1999) form a naturally defined barrio within which the occupants produced and distributed finely painted ceramics. Group 4H-1, at the far tip of the peninsula, served as the residence and production center for the actual potters involved in the working of clay and the firing process.” (Becker 2003a:97)

Becker lists seven kinds of evidence of ceramic production present at group 4H-1 (Table 5.3.1). Although he suspected it to be a production unit for polychrome pottery of the Imix ceramic complex, Becker notes that equipment for processing, storing, or applying pigments was not recovered from excavations at Group 4H-1. He also references the pigment processing tools recovered from excavations at Aguateca (see Aoyama 2009) as examples of artifacts which would provide clear evidence of polychrome production at Group 4H-1, but that were not recovered there. Of course, valuable portable objects such as mortars and pestles would likely have been carried away by the occupant artisans when Group 4H-1 was abandoned and without examples for reference, the identification of broken fragments of such implements by archaeologists is also less likely.

“Polychrome production must have involved considerable use of pigments, which are primarily derived from inorganic sources and therefore are likely to survive in archaeological contexts. No evidence for pigments or for grinding or storing equipment was recovered from the limited excavation within and around the various structures of Group 4H-1.” (Becker 2003a:103)

Clemency C. Coggins (1975:211, 429-430) had suggested that the inhabitants of this group were attached specialists involved in decorating polychrome pottery. Marshall Becker views the ceramic sherd dump underlying Structure 4H-2 as clear evidence of sustained production over time that did not make use of simple open-pit firing (Becker 2003a:102). Although Becker suggests that these fine polychrome vessels were produced with the use of “saggers,” the possibility still exists that one or more updraft kilns might
Table 5.3.1 – Becker’s List of Ceramic Production Evidence (after Becker 2003:98-99).

1. Recovery of a huge volume (ca. 25 of an estimated 75 m³) of extremely high-quality sherds (fine or “elite” ceramics) from a vast [de facto] waster pile, much of which had been incorporated into the basal platform of Structure 4H-2 (Becker 1999:15-16). Study of these ceramics, mostly dated to around A.D. 550-700 [Ik ceramic group] (Culbert 1993), suggest that they were not fired in a true kiln, as they show no warping, cracking, or other indications of firing errors.

2. The presence of fragments from a unique pair of decorative ceramics “masks” representing the face of the “Long-nosed” god. These ceramic masks appear to have been mounted on the façade of Structure 4H-4. These ceramic features are comparable in form, but not size, to stucco masks commonly adorning the façades of major temples at Tikal.

3. Fragments of five Classic-period molds for forming ceramic objects (1 censer and 4 figurine) were found in Group 4H-1, or 46% of the total of 11 found by the Tikal Project in excavations throughout the site (Greene 2000; McClung and Aguilar 2001). The Proyecto Nacional Tikal (PNT) has identified only three “figurine” fragments, all of Imix date and all at Group 7C-IX (María Josefa Iglesias and Juan Pedro Laporte, personal communication 1999).

4. Elevated numbers of what had been identified as censer fragments, relative to any other residential area of Tikal. H. Moholy-Nagy (personal communication 1999) thinks of these as “remnants of ceremonial behavior.” In the case of Group 4H-1 a “ritual” explanation for their presence seems less likely, given this location on the margins of the site as well as the other information suggesting these are part of ceramic production. Whether some of these fragments represent saggers or are another type of ceramic product made at or near Group 4H-1 has not been explored.

5. Winged candeleros (formerly called “candlesticks”) are items identified as incense burners by Ferree (H. Moholy-Nagy, personal communication 1999). The number of these, plus the large numbers of wall inserts or objects that look like flaring jar necks specially made and painted to be plastered to the insides of doorways where they were used to tie door hangings, suggest the range of painted wares made here. The numbers appear in very large quantities, far beyond any numbers that would be used “in a small structure group” (T. Patrick Culbert, personal communication 2000).

6. Inferred presence of clay sources in the adjacent Bajo Santa Fe.

Not evident among the artifact assemblage at this locus, but that would be expected in the household of potters producing fine quality wares, are the following:

7. Polishing or burnishing tools in the form of smooth stones or sherds, or even reused cents (Foster 1967; Stark 1985:179). Foster also notes that many of these tools also can be used in making baskets.

8. Evidence for pigment processing or production (Inomata 2001:326-329; Inomata and Stiver 1998). Although these may have been found associated with other groups on this peninsula, none has been specifically identified.

9. Tools that can be used in the application of paints.

10. Concentrations of fragments of burned daub, believed to represent clay used to seal a firing container or “kiln.” Examples have been noted by Christopher Pool (1997) in association with what I call the sagger kilns from Middle Classic-period Matacapan (Arnold 1989).
be recovered from other houselots or open space on this peninsula. Only one possible firing location has been identified within Tikal, a ‘firing channel’ associated with the northern ‘defensive earthwork’ (Culbert 2003:64; Fry 2003a:146). Consensus about this identification could not be reached among the Tikal archaeologists (see Haviland 2003:138). In general, one is left with the impression that not only are certain types of workshops difficult to distinguish (i.e., absence of kilns for pottery production and the possibility of open firing) but the term “specialist” has been used to denote different scales of production intensity.

“These specialists at Tikal may have shared their residences with kinsmen who were primarily agriculturalists. However, a trend toward the specialization known from the Valley of Mexico was probably well under way in the Maya lowlands by the beginning of the Classic period.” (1973b:404)

I would characterize such ‘specialists’ living with their agriculturalist kinsmen as probable part-time agriculturalists themselves, practicing a less intense form of production (concurrent with keeping milpas) compared with the hypothesized urban full-time specialists in the Valley of Mexico at Teotihuacán or Tenochtitlan during Aztec period times. The distinction between producers living in apartment compounds at Teotihuacán and workshops in the Aztec capital is not trivial either. Nor is the distinction between specialists dedicating all of their time to the production of a single class of good and those that engaging in a number of different artistic endeavors (see Inomata 2001).

Most recently, Becker has referred to this habitation cluster of nine plazuela groups as a barrio, explaining that these households were advantageously situated on a peninsula overlooking a bajo. Part of Becker’s overall inferential argument for the ceramic workshop designation is that these groups were settled in a particularly favorable location in regard to ceramic production resources (clay and fuel) as well as agricultural lands. In general, Becker stresses that the adjacent bajo provided not only prime agricultural lands, but also suitable ceramic clays and fuel wood for firing pots, in addition to being a favorable location for firing downwind of the habitation groups, on the bajo margin. As the only possible ceramic production household ever located at
Tikal, it is unfortunate that follow-up investigations to confirm this designation have still not been initiated. It would be very interesting to compare the composition of the nearby clays of the adjacent bajo to the paste of the recovered sherds, which formed a tight cluster based on compositional analysis, although few elemental concentrations were analyzed [Fe, Rb, Sr, Zr] (Culbert and Schwalbe 1987:649, Figure 12).

Given the large deposit of sherds suspected to have been ceramic production byproducts purposefully incorporated into the construction of the house platform of Structure 4H-2 of Group 4H-1, a restudy of this material with an eye toward documenting their standardization would provide an extremely rare insight into the level of production and degree of standardization we should expect from workshop dumps. Petrographic analysis and/or INAA of the same sherds would only increase our knowledge of standardized paste recipes and metric attributes would permit the calculation of the coefficient of variation, or CV value, for any number of metric attributes. In the meantime, we have some tantalizing hints at the organization of ceramic production in the periphery of Tikal at this household cluster. Reexamination of the recovered material, or even better, more excavations in the barrio might produce even stronger evidence.

Contemplating P. Rice’s (1987a) review of evidence for ceramic production in the Maya lowlands, Barbara Stark (1992) reiterates that specific physical production loci have not been discriminated and that the three case studies of ceramic distributions reviewed by P. Rice (Palenque, Tikal, Lubantuun) suggest that centers were consumers more than producers of ceramics. Prudence Rice had earlier stated a version of this opinion in regard to R. Rands and R. Bishop’s work with the ceramics of Palenque,

“They conclude that the pottery produced at the center itself does not ‘enter a regional exchange system; sharp decrement occurs at a short distance from the site, a pattern which fails to conform well to either of the models [inward or outward looking] unless the ‘sustaining area’ is defined in severely circumscribed terms (Rands and Bishop 1980:43). The same is true at Tikal, where not only the presence of markets but the operation of a money economy has been claimed (Becker 1983:42). Despite advocating a
complex market system at Maya centers, Fry (1980:16) concluded from his examination of ceramic data at Tikal, that ‘even the largest Classic Maya sites, such as Tikal, were apparently not the major nodes of redistribution of craft items as many had anticipated’.” (P. Rice 1981:79)

Concerning physical production loci, Stark remarks that P. Rice omitted Group 4H-1 at Tikal as a production loci, stating that,

“A particularly striking datum in Rice’s review is that no specific location of production had yet been identified. In this respect, she may have regarded as too equivocal a residential group at Tikal (Gr. 4H), interpreted by Becker (1973:399-400) as a location where pottery was made. Although four figurine molds were found at this residential group, along with ‘vast quantities’ of pottery, published data are insufficient to reach a firm conclusion.” (Stark 1992:186)

The lack of sufficient data to reach a firm conclusion is a constant problem with much of the reported archaeological work of the University of Pennsylvania Tikal project. Unfortunately, most significant deposits of ceramics or lithics interpreted as evidence of production during this large-scale project (1956-1969) were never adequately described, analyzed, or quantified. While I am struck with the sense that many important deposits uncovered by this project do bear on the question of the organization of production, most likely we will always have to rely on the impressions of the excavators, without recourse to specifics. This is true of the lithic deposits recovered from trenching excavations in the epicentral structures surrounding the Great Plaza (W. Coe 1990), the ceramic deposit from the northern earthwork (Fry 1979, 2003a), and Group 4H-1 (Becker 1973, 1999, 2003a).

I have reviewed all three of these situations using available published accounts. Published photographs and drawings of obsidian artifacts (Moholy-Nagy 2008) have been helpful in identifying specific forms present in some deposits, but photos and drawings of ceramics from important deposits are suspiciously absent. I attempted to locate the ‘firing channel’ ceramic deposit found within the northern earthwork during our Penn State fieldwork in 2005 and was unsuccessful. Perhaps the entire deposit was
recovered by the Penn excavation team working in 1968. After reviewing the evidence in support of the identification of Group 4H-1 as the locus of pottery production (Becker 1973, 2003a), I must agree that it is circumstantial and equivocal. I do agree with Becker and with Culbert (2003:63; Culbert and Schwalbe 1987:648-650) that Group 4H-1 shows probable signs of pottery production, but it is still not demonstrated that this group was definitely the focus of pottery manufacture. Reviewing the published data from the 1962 excavations will probably not clarify this matter any further, but a targeted excavation program at 4H-1, and the other eight peninsula groups, is in order.

“Group 4H-1 at Tikal merits excavation to bedrock to pursue the archaeological evidence indicating the production of polychrome pottery by its residents.” (Becker 2003a:99)

Six of the peninsular groups were investigated with trench excavations, but large-scale horizontal exposure beyond the limits of structure platforms would aid in delimiting activity spaces on the houselots, possibly recovering production areas. A restudy of the ceramics recovered would definitely provide a unique view into pottery production at Tikal. Given Becker’s (1999, 2003a) characterization of the nine peninsular groups as forming a “barrio,” it would be valuable to determine if groups other than 4H-1 were involved in craft activity as opposed to or in addition to agricultural work. Haviland also suspects that kinship organization was probably characteristic of production organization at Tikal.

“Craft specialists were organized in corporate groups, probably lineages, and lived in household compounds clustered together into mutilhousehold units...with populations on the order of 50 to 65 people (e.g.; Haviland 2003: 133; Haviland et al. 1985: 184-185).” (Haviland 2008:269)

More intensive excavations at all nine peninsular groups might clarify economic organization. This would be a rare opportunity to investigate craft production within an extended kinship group. Perhaps residents from multiple groups participated in ceramic manufacture and shared a kiln facility or firing area near the bajo. Perhaps pottery
manufacture was conducted in one area, by one group, and painting was done by other relatives in a different area. Perhaps a dedicated workshop facility was shared by multiple artisans or tasks within the chain of production might have been physically segregated at different work stations. Further excavation of all groups of the peninsula would certainly advance our knowledge of the organization of production within an extended compound, if this is, in fact, the case represented by these groups.

I also suggest analysis of the polychrome sherds to determine uniformity in metric attributes as well as elemental composition. Beyond verifying 4H-1 as a production locus, data collected from the analysis of the sherds would be invaluable for comparative purposes. Unfortunately, only one compositional study of the ceramics from Group 4H-1 has ever been published (Culbert and Schwalbe 1987; Schwalbe and Culbert 1988), and the results were not conclusive.

“T. Patrick Culbert and Larry Schwalbe (1987) tried to study intrasite production with XRF. Results were not very conclusive, and the authors pointed out the difficulties (at least with this method) of detecting chemical differences. Nevertheless, they stated that ‘XRF studies of variability in ceramic composition have been a profitable exercise that indicates considerable potential for further development’ (Culbert and Schwalbe 1987:654). The results as given do not seem to support this optimistic assessment, however.” (Beaudry 1991:253)

I suggest that the limited utility of this study stems from the limitation of the technique (energy-dispersive X-ray fluorescence, or EDXRF) used to determine elemental concentrations. I imagine that the authors were expecting stronger results from this relatively inexpensive technique in the hopes of applying it to a larger sample size. Some of the results were viewed as verification of the utility of compositional studies in sorting out production loci and product circulation within the site of Tikal, that is, at the level of intraregional exchange.

“There is a considerable potential for future studies of Tikal ceramics that might clarify questions of production and distribution. The study of considerably larger samples of sherds by x-ray fluorescence or neutron activation might define additional production centers.” (Culbert 2003:66)
Other production centers (or, at least, their products) have been proposed based on this compositional analysis and the pottery produced (or at least abundant) at Group 4H-1 was intermingled with pottery from different production units within consumer locations (Culbert 2003:65-67). Based on 170 ceramic samples analyzed through INAA, I have attempted to address some of the fundamental questions of ceramic production organization and consumption. Did ceramic production units specialize in one or a narrow range of form classes or types? Did households routinely consume pottery from multiple production units, or just one or two? How many production units manufactured a certain ceramic type or form class? I attempt to answer these questions with Tikal ceramics recovered by the PST Project in Chapter 9.

5.4 – Concluding Remarks to Chapter 5

Although Marshall Becker has proposed that Group 4H-1 was the residence of potters, secure data on the organization and scale of production for most artifacts classes remain scant for Tikal. Production debris, or debitage, from a number of artifact classes was encountered during excavations by the University of Pennsylvania project, most predominantly in epicentral excavations but also at households within the central 16 km² map of Tikal as well as some peripheral residential groups. None of these debitage deposits have been firmly associated with workshops or production areas and are best viewed as evidence of production at an unspecified scale and intensity. The epicentral lithic debitage dumps appear to indicate a greater intensity of production than central or peripheral debitage dumps. The occasional recovery of large chultun deposits of debitage hints at the unknown quantities of production debris which may have been deposited in the peripheries. Household level production appears to be indicated, but it is difficult to tell whether this reached household industry levels, or if larger specialized workshops produced quantities of lithic tools for greater distribution. The household crafting of multiple classes of artifacts has been documented repeatedly. In the absence of securely identified production units or ‘workshops,’ artifact distributions have provided the data for evaluating models of the circulation of goods. The recovered distribution of durable
artifacts has led both Hattula Moholy-Nagy and Robert Fry to conclude that a complex market system was the dominant institution responsible for the circulation of goods at Classic Tikal.

Hattula Moholy-Nagy (1997:309) sees two different patterns suggestive of “some full-time craft specialization at Tikal in the Classic period.” The first pattern consists of elite-associated recovery contexts: obsidian and chert deposited to the exterior of burial chambers in the epicenter and similar, yet smaller scale, lithic deposits in caches and problematic deposits and ‘waste’ of highly valued materials in caches and in burials. The second pattern consists of debitage from two or more craft industries recovered from a single midden at residential groups, especially within the Central Tikal area (i.e., the 16 km² Tikal map). While she views the first pattern in terms of attached specialists or independent specialists producing within an elite-patronized context during major epicentral construction projects, the second pattern is interpreted as specialists supporting, not supported by, families or lineages.

“Co-occurance [of debitage from two craft industries] suggests the possibility that several specialists making different goods, or perhaps a single artisan with more than one specialty, could have supported a family or larger kin group entirely through the production of artifacts of various kinds of raw material.” (Moholy-Nagy 1997:309)

Given the relatively small amounts of debitage in these household middens, I find it unlikely that this represents either full-time specialization, or that an entire family or larger kin group could have been supported by one or a few artisans crafting on this modest scale. I find it much more likely that a family or lineage engaged in agriculture could have supported one full-time specialist, or even more likely, that slack times in the agricultural cycle would have been used for one or more household member to engage in part-time crafting. The modest scale of production and debitage disposal in household middens also suggests to me that strictly household level production is evidenced, not a household industry. The products of these household “specialists” likely circulated among households in the near vicinity through reciprocity or redistribution. Evoking an
exchange model in which an entire household was supported by one or a few members seems unwarranted. Nonetheless, in addition to or in lieu of reciprocity and redistribution, products may also have entered a market system, likely through a peripheral market node. Haviland remains unconvinced of the importance of outside trade [long-distance trade] in the rise of Maya civilization and Tikal in particular.

“At Tikal, there was some trade, at least for obsidian, jade, and quartzite right from the start (Moholy-Nagy 2003: 85). I think, however, it would be easy to overestimate the extent of this trade (see also Sanders 1973:354). Given small populations and a tendency to hoard items made of foreign substances, people’s needs for exotic materials could probably be satisfied by trading arrangements no more complex than those which obtained, for example, among the Indians of North America.” (Haviland 2008:277)

I do not wish to suggest that Classic Maya centers were in any way politically equivalent to Adena or Hopewell centers, but I do agree with Haviland that it is easy to overestimate the volume of trade, as well as the social and economic importance of this trade, at Classic Maya centers. I am also concerned that native North American centers will be compared to the Classic Maya in order to prove that marketplace exchange must have been important at mound centers in the United States.22

The distribution of exotic goods within 2 km of the great plaza of Tikal suggests a rather truncated range of circulation for the majority of craft items made from imported material although it does support the conclusion that these items were manufactured within the center of the site. However, Fry’s study of the circulation of ceramics suggests that this class of goods may well have been exchanged over the entire kingdom of Tikal. The greatest drawback to Fry’s study is that ceramic vessels were not sufficiently discriminated by production unit; a difficult and dubious task to be sure. The one paste class which Fry equates with a production center was a micaceous paste assumed to have been produced near the El Palmar ridge, north of Central Tikal in the periphery of the

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22 When reviewing this dissertation, and in subsequent discussions, George R. Milner explained that he shares my skepticism concerning the existence of marketplace exchange at Cahokia and, like Haviland, believes that non-market mechanisms are still the most viable explanation for the artifact distributions at North American mound centers.
site. The high frequency occurrence of this paste in vessels recovered from the far north end of the north transect does indeed support the supposition that this is the locus of production. The fall-off curve produced by graphing the frequency distribution of this paste class with distance from the assumed production center does not support the market model, the fall-off curve conforms to a down-the-line exchange pattern.

The correlation of minor centers with marketplaces is inferential, not based on quantitative artifact distributions, specific architecture configurations, specialized facilities, or formal central place analysis. The actual activities performed at these minor centers have not been systematically investigated. Ian Hodder (1972) has expressed his concern that any settlement pattern characterized by a hierarchy of centers, indicated by size and architectural configuration, will be assumed to reflect the influence of unspecified economic forces. At Tikal, the presence of minor centers, a prominent feature of the settlement pattern, has not been sufficiently explained. After intensive excavation of the “minor center” labeled Group 7F-1, Haviland (1981, 1992) concluded that this was not a minor center at all, identifying this group as an elite residential compound. Of course, elite residential compounds might also be the focus of dispersed administration functions, but this must be investigated in its own right and not assumed based on a general model of dispersed administration in a largely kinship based socio-political system (i.e., a segmentary state) or a hierarchically structured bureaucratic organizational model.

The minor centers around Tikal may have served a number of functions and different functional complexes may have been subsumed under the general heading of “minor center.” In respect to economic models meant to explain the distribution patterns for goods, minor centers are evoked as market centers; their distribution parsimonious with evenly spaced second tier central places for the effective distribution of goods. When I was working at Caracol in the 1990s helicopters routinely landed in the ‘ample plazas’ of the center, but I would not conclude that this was the intended purpose for these plazas, although they are certainly big enough. If the minor centers or termini were,
in fact, ‘entrepôts’ for imported goods then we would expect to see these goods in circulation around these minor markets as well as entering the central market – that is if a market model is followed. Viewing minor centers as way stations in the importation route of goods headed for the central ‘market’ where they are not distributed any further than 2 km does not indicate a well integrated market system. The lack of data on the specific goods circulated through market centers and the hierarchical integration of these marketplaces have not been investigated in their own right.

Perhaps the characterization of the alleged Tikal market system as a K=7 solar system is warranted, given the highly truncated circulation radius for exotic goods around the epicenter, combined with the lack of durable goods at residential groups in the periphery. However, it is just as likely that all stingray spines, marine shell, jade and greenstone, and obsidian and chert eccentrics did not move through a market system – in fact I doubt that they did. The more widespread circulation of low quantities of obsidian blades and large quantities of pottery vessels throughout the center and periphery suggest that these goods were much more likely to have been circulated through a market system. Nonetheless, Fry’s ceramic distribution study does suggest that ceramic assemblages were not uniform across the entire kingdom; that one efficient, integrated market system was not facilitating the circulation of pottery in sufficient quantities to promote a general homogeneity of ceramic collections from different sectors of Tikal. It is therefore probable that either the market system was not entirely effective or that the market system was not the only mechanism facilitating exchange.
Chapter 6 – Craft Production

6.1 – Archaeological Investigations of Craft Production and Specialization

The theoretical considerations surrounding the anthropological subject of craft production/specialization have been published, evaluated, criticized, and revised (Costin 2007). Newer considerations have been proposed. Costin notes that some concepts and terms arising from the theoretical consideration of specialization may be “difficult if not impossible to operationalize in archaeological terms” (2007:148). John Clark once defined craft specialization in a straight-forward manner, as the production of alienable goods for non-dependent consumption (Clark and Perry 1990:297; see also Clark 1995). After critical review of the subject of specialization (Clark 2005), he has most recently come close to advocating the abandonment of the subject altogether (Clark 2007, see Costin 2007:145-146). Going back to the theoretical concerns of Binford (1968, also see 1981, 1982), the greatest setback to testing competing social and economic models is not the archaeological data themselves but the manner in which these data are used to answer questions through the prism of theoretical models and templates we use to make sense of archaeological data. The way in which data are collected and analyzed is probably the limiting factor in evaluating alternative explanations; the actual archaeological record is often quite robust. Certainly ceramics and lithics are widely distributed across Tikal, yet researchers dispute what these distribution patterns indicate, and if they can be used to substantiate specific social or economic models.

In her concluding chapter from a recent edited volume on craft production and specialization published by the AAA (Archaeological Papers of the American Anthropological Association, Vol. 17, Issue 1 2009), Cathy Costin summarizes this latest effort to bring scholars together with the expressed concern of defining, disentangling, and utilizing anthropological concepts relating to the topic of craft production/specialization.
“Although the charge to “rethink” production given to the participants in the American Anthropological Association symposium from which this volume derives was open ended, the resulting volume and its critique are far from all encompassing. Virtually all the goods reported on are elite or ritual goods; there is little attention to the clearly mundane. None of these essays is rethinking methodology – how we collect, analyze, and interpret our data – in a fundamental way.” (Costin 2007:141)

From this rather bleak assessment, Costin continues to evaluate various authors’ perspectives on craft production and specialization, taking a critical stance in evaluating “phenomenological classifications and lexical semantics,” or, simply put, the categories and terms used to describe different aspects of craft production and specialization. Identifying kinds of specialization in the archaeological record is a consistent theme of this paper. Costin accepts that evaluating or rethinking the classificatory schemes used to describe and evaluate archaeological data is important. However, she does suggest that definitions have not always been explicit or unambiguous, or that they can even be applied to the archaeological record.

In a recent synthesis paper published in *The Journal of Archaeological Method and Theory* entitled “Late Classic Maya Pottery Production: Review and Synthesis,” Prudence Rice (2009) largely restricts her discussion to figural polychrome vessels. She devotes only three out of thirty-two pages to “monochrome serving wares and ‘utilitarian’ pottery.” The figural polychrome vessels discussed have long been viewed as sumptuary goods whose distribution were restricted to elite gift-giving circumstances, and Rice herself advocates analysis of their production and distribution in terms of “inalienable” wealth goods. The production of utilitarian pottery is discussed only through short synopses of site specific or regional ceramic studies before returning to the main thrust of the paper, the production of figural polychrome vessels.

The specialized production of things was initially a fairly simple and straightforward matter (see Clark 1995:290–291; Costin 1991:3, 2001b:276; Cross 1993:65; R. Evans 1978:114–115; P. Rice 1981:220, 1991:263; also Flad and Hruby 2007; cited in Costin 2007:148). With time, fundamental categories and concepts have been found to be overly simplistic and the usefulness of these has been challenged, leading to debate
and refinement. Even “things” can be difficult to classify and may not remain forever in one category; things can become different kinds of things through time and context (e.g., Apadurrai 1986; Weimer 1992). Though various definitions exist for the term “specialization,” many are consistent with that put forth by Costin, who identifies it as "the regular, repeated provision of some commodity or service in exchange for some other" (1986:328, cited in Costin 1991:3). Barbara Stark similarly defines specialization as "production for distribution to other households on more than a sporadic basis, such as might be involved in reciprocal gift-giving" (1995:233). Cathy Costin (1991:4) notes that Clark and Perry’s definition of specialization as the production of alienable goods for non-dependent consumption (Clark and Perry 1990:297) is too broad, and includes ad hoc manufacture and modification of goods included in prestation or gift-exchange systems. At the heart of this basic archaeological definition of specialization is the concept of exchange; things are made in quantities beyond immediate consumption needs to be exchanged for other things not made, or in short supply, in the specialist’s household.

“[A]n over-riding concern among archaeologists studying production is whether all households made a particular item for their own use, or whether a subset of producers manufactured a particular category of goods for transfer to and use by a larger group of nonproducers.” (Costin 2000:378)

“Indeed, ‘exchange’ (or transfer) is an implicit part of all ‘specialization’ because in ‘specialized’ systems producer and consumer are not the same individual.” (Costin 2000:397)

Adhering to this fundamental definition of specialization, there were almost certainly specialist producers within Classic Maya communities, especially at large centers such as Tikal. Accepting what I refer to as the minimal specialization definition, production for any exchange outside the immediate household is referred to as specialization and documenting exchange beyond the immediate household is proof of specialized production. But the investigation of specialization has moved beyond a simple ubiquity measure. Researchers are concerned more than ever with degrees of, and organizational modes of, specialized production. The typologies derived from Peacock
(1982) and van der Leeuw (1976) have long constituted the basic theoretical paradigm for the archaeological investigation of the scale and organization of production. Recently the limited utility of employing these typologies has come to the surface of discussions of specialized production (especially of pottery) and researchers are seeking finer distinctions. 

For example, the “household mode of production” has been used to denote a range of phenomena, from low intensity “ad hoc” forms of production to fairly intensive production carried out in a household setting (Feinman and Nicholas 1993; Trubitt 1996). 

Fairly intensive production at the household level has been documented archaeologically throughout Mesoamerica and is now widely accepted as the most pervasive form of pre-Columbian production over this broad region (e.g., Aoyama 2001; Healan et al. 1998; Hirth 2006, 2009a; Mallory 1984, 1996; Martínez 2009a; White et al. 2004; 193-195; Widmer and Storey 1993). Household production of wealth or status items has also been documented, especially in the Classic Maya lowlands (e.g., Inomata et al. 2002; Inomata 2001, 2007; Widmer 1997, 2009). Once a very useful organizational distinction, the “household mode of production” (e.g., Hagstrum 2001; Santley and Kneebone 1995) is now deemed too simplistic and a monolithic category conflating multiple distinct or related phenomena. But the deconstruction of the issue of specialization has moved beyond the subdivision of accepted categories and into the new theoretical realms herefore unrecognized or unappreciated. I will not delve into the more abstract issues of specialized production, although it is important to be aware that the subject is complex and can be attacked from a variety of angles. I will keep this overview simple and focused on concepts immediately applicable to archaeological contexts.
Why Specialize?

Self-sufficiency and interdependency are two of the more salient points to emerge from continued rethinking of craft specialization. Although very difficult to identify archaeologically, researchers are now considering degrees of specialization. Are specialist producers self-sufficient in terms of producing or receiving the necessities of daily life within their immediate household? That is, do specialist producers craft part-time when they are not producing their own food, clothing, and shelter at the household level? Is it enough to investigate only material needs when humans also have social obligations, rights, and wants? The development of specialized production for exchange has been linked to social complexity at least since Durkheim’s (1933[1893]) writings, and has continued to be invoked as a defining characterization of urban and/or state level societies, causally linked to the rise of societal complexity (R. M. Adams 1966; Boas 1940; Childe 1936, 1950; Redman 1978; P. Rice 1981).

Cathy Costin (2007:148) has noted that considerations of inter-dependency as a defining criterion of specialization can be viewed from two different “agentive perspectives.” The producer-oriented approach contemplates or defines specialization in terms of the amount of time the specialist spends on their crafting, or the degree to which the specialist is economically reliant upon their crafting. In contrast, a product-oriented approach, from the perspective of the consumer, contemplates or defines the economic interdependence between producer and consumer in terms of the consumers’ reliance on specialist producers. This latter perspective arises from the development of exchange values and maximization. The consumer’s reliance can be viewed in terms of the energy and time saved by not producing the specialist produced product. The network of relationships and dependencies resulting from these continued exchange relationships can reinforce and advance societal cohesion and solidarity, or they may encourage the development of asymmetrical relationships and more sinister and hierarchically ordered forms of abuse and exploitation.
By “exchange” I do not mean to imply barter, marketplace exchange, market economy exchange, or any other specific (or exclusive) mode of the transference of goods. I certainly acknowledge the array of social arrangements in which producers may be compensated, remunerated, or supported through their own crafting without directly exchanging (as in barter or sale) their goods. Likewise, goods may be circulated through gift-exchange or pooled and redistributed without each individual item necessarily ‘exchanged’ for another. The minimal definition of specialization (i.e., those quoted from Costin [1986, 1991], Stark [1995], and Clark and Perry [1990] above) implies that specialization is an adaptation to efficient provisioning. This is only one aspect of specialization, of course, and production need not be entirely voluntary.

“Production in the context of slavery, mandatory tribute, or obligatory production for use within the extended kin group might not result in an observable flow of material or monetary compensation for the producer.” (Costin 2007: 149)

While it may be easy to conceptualize specialization for exchange within a market model with production for sale and the proceeds used to buy all other necessities of life, the anthropologist must face the varied circumstances under which specialization emerges and both the informal and institutional arrangements through which different forms of specialization can exist and flourish. Prudence Rice (1996:179) notes that specialization may occur at varying levels of sociopolitical complexity, whereas intensification is “an economic process involving increasing investment of labor and resources, and ratio effects of scale, efficiency, and mass production.” The related subjects of specialization, standardization, and intensification have received considerable attention over the last several decades. In general, archaeologists are interested in how to recognize specialized production, and how to quantitatively and qualitatively distinguish different organizational forms and levels of intensity of specialized production. The definitions proposed for various kinds of specialization are often beyond recognition from an archaeological viewpoint. Particularly frustrating is the concept of specializing in one activity to the exclusion of all or most other subsistence activities, leading to partial or complete dependence on the specialization.
“This reliance on ‘dependence’ as a defining criterion for specialization can also be challenged on an empirical level. Ethnographic studies of small-scale societies suggest that many artisans produce craft goods for others while remaining basically self-sufficient in terms of primary subsistence needs. Finally, dependence or intensity of production as a criterion for defining specialization is methodologically problematic. How does one identify archaeologically this economic ‘dependence’ on crafting, however we define it?” (Costin 2007:149)

The concept of dependence is directly related to exchange or other forms of reimbursement, remuneration, or support through patronage. Anthropologists want to know to what extent did specialist producers devoted their time to one or a limited range of production activities and how were they able to survive and prosper through this arrangement. Archaeologists are grappling with the methodological problems in achieving these goals from archaeological investigation.

*Part-time vs. full-time specialization*

The search for full-time specialist craftspeople has not been entirely fruitful. The expectation of recovering archaeological evidence of full-time craft specialization in Mesoamerica has influenced decades of scholarly work. Researchers are beginning to accept that part-time production was widespread throughout pre-Columbian Mesoamerica and constitutes the normative practice accounting for the majority of craft items produced. New World peoples tended to work part-time at crafts, and often worked several different materials to produce several different end products. Hirth (2009a:57) has pointed out that even in the hyper-commercial Late Aztec empire, specialists tended to multicraft. This is a consistent finding from archaeological investigation of pre-Columbian societies, even when production occurred in urban environments (e.g., Hirth 2006, 2009a; Manzanilla 2009b).

Part-time pottery production is congruent with agricultural production (Costin 1991:16-17). While full-time specialization is a logical response to maximizing production output, pottery production is often a logical response to juggling domestic
chores with craft production. The multiple tasks or stages involved in pottery production (clay preparation, vessel forming, vessel drying, vessel firing) can be done at different times, utilizing the labor of multiple individuals (including children) within the potting household. Furthermore, part-time household production is an effective means of diffusing the economic dependence on a single productive activity.

“Independent producers can be characterized as risk minimizers who will, if possible, combine economic strategies to remain somewhat generalized.” (Costin 1991:17)

Pottery producers in agrarian societies will often directly barter their vessels for agricultural products. Full-time potters in the Philippines are careful to schedule production based on the timing of harvest in order to have pots ready for barter for rice when prices in the markets are at their highest just prior to harvest time (P. Rice 1987b:196). Among the Raqch’i of Peru ceramic vessels are exchanged through barter for amounts of agricultural products equal to the capacity of the vessel bartered (Chávez 1992:77). This practice is not restricted to irregular commerce either. Workshop potters in Vounaria, Greece, exchange their vessels for wheat brought in by agriculturalists, who thus directly procure pottery from the source (P. Rice 1987b:197).

Full-time specialization generally requires extensive exchange opportunities (i.e., market exchange) or elite patronage, although other social arrangements are possible, such as estate production within self-sufficient corporate groups (e.g., Janusek 1999) or oikos (e.g., Finley 1967[1954]:407-408; 1973) or mandatory exchange through the jajmani village-level caste production/exchange system of northern India (e.g., Beidelman 1959; Epstein 1967; Kolenda 1967[1963]). Proposed full-time specialist production units in Mesoamerican contexts are most often associated with attached specialization controlled and/or sponsored by the central authorities of urban capitals in central Mexico. The standardization of archaeologically recovered pottery collections is sometimes compared against ethnographically derived collections from known full-time specialized producers, but I cannot think of any study of Mesoamerican ceramic
production that has conclusively determined that any ceramic ware or type was certainly produced at high-output volumes by full-time specialists.

**Attached Versus Independent Specialization**

One of the most basic distinctions made about specialized production concerns the control exerted by elites. The attached versus independent specialization dichotomy first proposed by Earle (1981; see also Brumfiel and Earle 1987, Costin 1991) was originally conceived to differentiate production for exchange from the elite sponsorship of production in order to control the circulation of the product and to obtain the restricted product on demand at the elites’ discretion.

“Earle made the fundamental distinction between production of special, high-value goods for elite consumption and production of utilitarian goods for broad distribution.” (Costin 1991:5)

The term “attached” specialist is used by Earle (1981), Brumfiel and Earle (1987) Costin (1986, 1991, 2009), Gero (1983) and Hagstrum (1985, 1989). Santley et al. (1989) used the term “tethered” specialist and Sinopoli (1988) used the term “administered” specialist for basically the same phenomenon (Costin 1991:6). Clark and Perry (1990) extend the use of the term “attached” production to any context of sponsorship by any person or institution. Costin notes that the parameter of “context” assesses the degree of independence as opposed to attached-ness (elite control) and thus the term attached should only be used in contexts in which political elites are controlling production (1991:7-9). Costin’s perspective follows from the distinction, originally proposed by Earle (1981), between elite sumptuary goods produced by attached specialists for restricted exchange and utilitarian goods produced by independent specialists for broader, unrestricted exchange.

“[B]y definition, the products of attached specialists serve to uphold institutionalized sociopolitical differentiation, but the products of independent specialists do not.” (Costin 2005:1072–1073, originally in *italics*)
I think a problem here is the issue of the kind of attachment and the process by which attachment develops and endures (or not). For example, the slave women attached to Sumerian temple-workshops were not attached by choice and they presumably could not detach themselves. They made products (e.g., cloth) that certainly helped uphold differentiation, but the products were probably not themselves particularly special – what we would ordinarily call “status goods”. Much the same logic would apply to willingly endentured (attached) specialists in later times in Western Europe and the US.

Attached specialists have been associated with the control (by political elites) of status goods; this kind of system has also been discussed under the heading of “prestige economies” (Frankenstein and Rowlands 1978; Hayden 1995; Johnson and Earle 1987:322–325; Trubitt 2000) or “wealth finance” (D’Altroy and Earle 1985; Earle 2002). However, intensity of production (i.e., full-time/part-time), capital investment in production facilities, and rights over the distribution of cloth or pottery (utilitarian goods) may be controlled or sponsored for more pragmatic reasons. I suspect that attached production within state-sponsored workshops or even state sponsored “cottage industry” (see D’Altroy and Bishop 1990) are possible organizational modes, although a different term may be appropriate in order to distinguish elite control over the production of utilitarian goods from elite control over prestige or sumptuary goods. Even the strict dichotomy between purely utilitarian and purely sumptuary goods is probably too restrictive. As Costin (1991:27) has pointed out, we do have examples of large-scale workshops under state control – the weaving complex of the Inka administrative center of Huánuco Pampa (Morris 1974) and the palace industries of Mycenean worlds (Killen 1964; Shelmerdine and Palaima 1984). Janusek (1999:111) does warn that in the later Inka state, only the highest order sumptuary goods (i.e., royal cumpi tunics) were directly controlled by (attached to) the state, although D’Altroy and Bishop’s (1990) study of imperial ceramics suggests that Janusek’s position is overstated. Consideration of the archaeological context of production is important to differentiate between centrally
located and centralized control. Political, social, and economic functions are expected in central locations, but do not necessarily imply central control (Costin 1991:26).

Two Polar Opposite Perspectives on Goods Produced by Attached Specialists

Several models of ceramic production organization include specific assumptions concerning certain classes of pottery. Prudence Rice’s ‘trial model’ of ceramic production (1981) argues that specialized production resulting in more standardized ceramics will be seen in elite ceramics first (cf. D’Altroy and Bishop 1990). Other authors concur and have emphasized that relatively elaborate sumptuary goods with high labor intensive input for distribution to supporters should be standardized (Feinman et al. 1984; Janusek 1999:109; P. Rice 1987b:201-204). Costin and Hagstrum (1995:623) take the opposite stance and argue that ceramics produced by attached specialists producing strictly for elites will evidence greater labor investment, be more unique, and requiring more skill and greater elaboration. This uniqueness highlights the skill and perseverance of the craftsperson and, by extension, the prestige of the elite who commands this craftsperson. In general, we should expect to see greater elaboration and more individualized items under this specific mode of production organization. Opinions differ.

“The very definition of luxuries, as objects used in restricted contexts, made perhaps of exotic materials and with complex technologies, and above all, with a high investment of labour, is antithetical to the notion of standardization...Hence, one must make a distinction between objects produced for an ‘unspecified demand crowd’ and those produced for patrons or even as personal gifts or dowries. Simplification is more likely a feature of the former scenario.” (Menon 2008:147)

Clearly, we are dealing with two different phenomena here. Prudence Rice (1981), Janusek (1999), and D’altroy and Bishop (1990) see standardized sumptuary items for distribution by primary elites to subordinate elites. On the other hand, Earle (1981) and Costin and Hagstrum (1995) emphasize the individual or unique nature of elite goods for elite consumption. Inomata, Aoyama, and colleagues (see Aoyama 2007,
2009; Emory and Aoyama 2007; Inomata 2007; Inomata and Stiver 1998; Inomata et al. 2001) have documented the elite consumption of time-consuming, labor-intensive prestige or sumptuary items without extensive exchange beyond a single attached specialist producing status items for the king. This latter perspective characterizes much of the literature pertaining to Classic Maya sumptuary or status goods. Furthermore, these authors have documented sumptuary goods production for immediate consumption with no exchange; elites simply crafted their own sumptuary goods and badges of rank.

At Tikal and other Classic Maya lowland centers highly elaborate and individual status items are routinely recovered from elite archaeological contexts. These include personal adornments such as ear flares, bead necklaces, and headdress and belt ornaments, often made from imported jade, obsidian, or shell, as well as elite ‘grave goods’ such as composite lapidary vessels and masks, and ritual paraphernalia such as stingray spines, long bones, and skulls inscribed with glyphic passages. While physical remains of presumably fine fabrics and the items sown onto them have not been readily recovered, iconographic representations of elites on stone and stucco monuments, as well as painted murals and pottery vessels attest to their existence. The recovery of bone needles and adornment manufacturing debris (especially at Aguateca) suggest that such clothing was made by royal/elite women. Were these manufactured by attached specialists? If so, were these attached specialists of fairly high ‘elite’ rank or were they craftworkers of much lesser social standing? How many of these items were never exchanged at all; they were produced by the very individual who possessed them in life (and death)? Are attached specialists best viewed as craftpersons or servicepersons? Perhaps the archaeologist’s focus on material goods blinds them to the social relations which these sumptuary goods reinforce. Is the individual attached primarily because they are a person of extraordinary standing or because they are an individual with exceptional innate crafting ability?
Crafts and Commodities

“In our vernacular Western culture, ‘crafts’ are distinguished from two other categories of non-comestible things: fine art objects (the unique creations of known individuals) and industrial products (machine-made, mass-produced goods). Crafts fall into the interstices of these other categories. As such, crafts are usually considered to be handmade, utilitarian objects fashioned by anonymous individuals working within the confines of traditional techniques and culturally defined expectations for these objects’ form and style.” (Costin 2007:146)

For the archaeologist, the term “crafts” is most often used to refer to “a category of tangible, portable things such as pottery; metal tools, weapons, and jewelry; stone tools and ornaments; shell tools and decorative objects; basketry; and textiles” (Costin 2007:146). Cathy Costin also notes that the category of “crafts” could include other “transformed materials” such as architecture, carved monuments, and even prepared foods as well as creations such as written stories and poems or more intangible performances such as dances and songs (2007:146). Many of these ‘crafts’ do not leave abundant archaeological evidence behind. While song and dance might be attested in carved monuments or painted vessels, in the absence of written accounts documenting such production we will probably not be able to reconstruct systems of attached specialists crafting such intangibles. They almost certainly existed, but we are hard pressed to say more on the subject.

The circulation of ceramics and lithic tools is frequently used to hypothetically reconstruct economic organization around a center or within a region. The (intentional) uniformity of ceramic vessels or lithic tools has been argued to indicate standardized production aimed at economic maximization with the expressed intent to exchange the items on the market. Jacques Maquet (1971) calls such goods “commodities by destination,” that is, intended by their producers principally for exchange. Commodities may conform perfectly, such as a standardized iron bar, indistinguishable from any other, or they may be highly individual, such as an original painting (Appadurai 1986:16). The craft production of art works in Western society has certain parallels with attached
specialization in archaic cultures. In both systems a small group of ‘elites’ determines the value of the elite item produced, not general utility or use value, strictly speaking. The commodities that I have analyzed for this study are the most commonly recovered archaeologically in the Maya lowlands, ceramic vessels and lithic tools, that likely conform to the expectations of commodities by destination. Because of their ubiquity and durability their distributions are also the most often analyzed with an eye toward evaluating patterns of circulation of goods and inferring the organization of production and exchange. It would be premature to assume that all lithics and ceramics were produced for unrestricted exchange, however. These are all-inclusive categories, and different kinds of pottery and lithics certainly demand differential analytical treatment.

Embedded Specialization

John Wayne Janusek (1999) used the term “embedded” to refer to production within a corporate group context in Tiwanaku, and this term, as he uses it, would also apply to multicrafting production contexts within elite neighborhoods at Teotihuacán (see Cabrera Castro and Gómez Chávez 2008; Gómez Chávez et al. 2004; Manzanilla 2009b). The term has also been applied to the North American northwest coast to refer to specialists producing strictly for household consumption, some of them elites (Ames 1995). Janusek (1999:123) believes that a great deal of craft production within the Tiwanaku polity was conducted within extended residential compounds housing supra-household groups (i.e., lineages) outside of direct centralized control. Production in the Tiwanaku centers investigated was household based and the products, ceramic vessels and bone panpipes, were both consumed within the extended household and distributed to other households. The identified craft production households were situated in the urban peripheries of two centers, Tiwanaku and Lukurmata. Both craft production areas reported by Janusek were found inside the supra-household compounds, they were not segregated workshops separated from domestic living space (Janusek 1999:124-125).
“I argue that urban craft specialists in Tiwanaku and Lukurmata were corporate groups resembling segments of minimal *ayllus* or *estancias*, and that skilled production was coordinated by local authorities who ultimately answered to state rulers.” (Janusek 1999:125)

The organization of production described as “embedded specialization” does fall into the broad category of independent production. Nonetheless, the distinction Janusek makes is important, that specialized production need not be directly associated with widespread exchange outside the residential compound or strictly attached to elite consumers. Consideration of the embedded mode of production also raises the question of defining the household. Embedded production within large supra-household compounds, barrios or neighborhoods, or on large landholding estates blur the lines between independent households.

*The Ritual Mode of Production*

Katherine Spielmann (1998, 2002) discusses economic intensification and specialization in small-scale societies where the production of surplus food for feasts and “socially valued goods” for exchange was conditioned to meet social requirements, neither controlled by elites nor influenced by commercial demand. Spielmann’s bottom-up approach to investigating production focuses on the individual within society as the primary decision maker influenced dominantly by social norms and the cultural system. While still technically independent producers, these individuals are seen as socially obligated to produce for social reproduction and (mechanical) solidarity, not directly attached to elites or formal elite institutions, nor producing commodities for widespread impersonal exchange.

“In the ritual mode of production, the goal is not profits but, rather, acceptable, often superlative performance and participation. Thus, feasting and craft production in small-scale societies are supported not by elites but by numerous individuals as they fulfill ritual obligations and create and sustain social relations.” (Spielmann 2002:197)
Individual, Group, and Community Specialization

Some authors have concentrated on the producer-oriented view of specialization. Does the individual craft producer specialize in one or a narrow range of crafts which they then exchange for some or all of their daily subsistence needs? The term “producer specialization” is suggested by Flad and Hruby (2007) to denote a person who individually produces craft items, although a confusion of terms results with this (see Costin 2007). This is also extremely difficult to determine archaeologically, but it is the defining characteristic of either the full-time specialist producing for impersonal exchange or the full-time specialist completely supported by an elite institution. Further complicating this matter, specialists may be more efficient, and more efficiently produce for exchange, when they work together cooperatively. Prudence Rice (1987a:537) made the distinction between product specialization, where producers limit production to one or a few products, and producer specialization which relates to the intensification of labor (i.e., full-time) and capital input into the production enterprise (i.e., kilns, storage facilities).

Even if specialist producers work largely independently of one another, they may group together in communities or in wards or barrios of larger communities based on proximity to raw materials or for hazardous waste disposal (as in the case of lithic production) or because caustic fumes are produced when firing ceramics. Concentrations of independent crafting households may also result from transmission of craft production knowledge through kinship structures and continued community reputation for quality production as a historic contingency, through primacy and inertia. Entire communities may specialize in a small range of goods for exchange through market systems connecting other communities through complementary specializations. Community-based specialization can be defined as a system "in which individual specialists, aggregated in a limited number of communities, produce pottery [or another craft item] for regional distribution" (Hegmon et al. 1995:33). This type of interdependency is characteristic of highland Guatemala and sometimes considered when speaking of Classic
Maya production and exchange systems (see Reina and Hill 1978; C. Smith 1976b). In the Classic Maya area, only Colha, in Belize (Hester and Shafer 1983, 1986), has produced evidence of possible full-time specialization (in chert tools) and limited regional exchange is suspected. The basic point of all this analysis of terms is to specify what kind of specialization one is speaking of, not to assume any particular set of concomitant circumstances implied by the use of a specific term.

Dean Arnold uses the term “specialization” to refer to the division of labor in the stages of production or the separation of specific tasks within the production chain (D. Arnold 1987). This application of the term “specialization” implies a division or segregation of tasks by separate individuals working together to produce a craft item. A situation may also develop in which individuals specialize in just one activity, their specialization providing a time-saving or cost-cutting advantage to a number of other specialists. Pottery production in Ticul, Yucatan involves “specialists” who only specialize in mining clay or temper; these specialists do not actually make pottery themselves (D. Arnold 1987). Specialization may also involve separating the craft activity from the residence, as in constructing a dedicated workshop utilized exclusively for manufacture. Besides being segregated from domestic activities, production may be segregated among individuals and within spaces of the production unit “in response to increasing production scale and specialization” (Pool 1992:279). From the viewpoint of an archaeologist attempting to identify such segregation, the physical location of production provides the most direct evidence.

“Assessment of the degree of activity segregation therefore requires the identification of the location of the production entity with respect to houselots and the identification of activity loci within the production entity. The latter may be facilitated by the presence of permanent facilities.” (Pool 1992:279)

Favoring a configurational approach to the identification of industry complexity, Underhill notes that household-level production of ceramics should be recognizable by the physical remains of pottery manufacture at many households, whereas full-time specialization should leave archaeological evidence in a limited number of areas
(1991:15). Uncovering evidence for the segregation of activity areas requires extensive horizontal excavation of production units, a situation not common in the Maya lowlands.

“Ideally, household production should be recognized by material evidence for pottery-making in or near each house in a settlement. Specialized production should be recognizable by remains of production in a limited number of areas within a site (see Tosi 1984: 23-4). This pattern should characterize both simple and complex household industry. A change to workshop production should be recognizable by the appearance of workshops, permanent facilities for completing different steps in production such as preparing paste, shaping, decorating, and firing.” (Santley et al. 1989:109, quoted in Underhill 1991:15)

Following early theoretical work by Peacock (1981, 1982) and Van Der Leeuw (1976, 1984), an emphasis on the identification of the scale of production has remained of paramount concern. These authors, and others since, have considered ceramic production in terms of a progression in organizational complexity and efficiency from household production through factory production. However, interpreting archaeological evidence within the confines of such a scheme may lead to confusion; archaeological evidence can be interpreted in a number of ways and one must be careful not to overstate the degree of task segregation.

“For example, Deal (1988:117) notes that some Highland Mayan potters use task-specific grinding stones to process raw materials. The size and weight of these metates, in turn, encourages area-specific processing stations (Deal 1988:121). Both special-purpose tools and the creation of task-specific work areas are characteristics that conventionally are attributed to more intensive modes of ceramic production (Peacock 1982; Rice 1987:181; Van de Leeuw 1976).” (Arnold and Santley 1993:229)

The evidence for pottery production at Matacapan is an excellent case in point. The same physical evidence for pottery production beyond the household level has been alternately interpreted as indicating a nucleated industry, workshop production, or manufactory production (Feinman 1999; Pool 1990; Pool and Santley 1992; Santley et al. 1989; Stark 2007; Stark and Garretty 2004). In their discussion of the organization of ceramic production at Matacapan, Pool and Santley (1992) provide the following
summations of six different levels or types of manufacturing contexts, based on Van der Leeuw (1976) and Peacock (1982) [summaries are quoted directly from Pool and Santley (1992:213-214)]:

**Household Production** – *household production* refers to part-time production conducted annually or more sporadically with the purpose of replenishing the ceramic inventory of the household. Because pottery is produced in low volume and the ceramic assemblage is unspecialized, few production residues are produced, production facilities tend to be impermanent, and assemblages differ little from those of non-producers households.

**Household Industry** – The *household industry* denotes more intensive production that is conducted within a domestic context as a secondary source of income for the household. The increased scale of production relative to household production results from supplying ceramics to consumers beyond the potter’s own household. Some specialization in the manufacture of particular ceramic types may occur, and greater investment in manufacturing implements and facilities such as kilns may be expected.

**Workshop Industry** – At the level of the *workshop industry*, production becomes a full-time activity and the primary source of income for the producer. The higher volume of production requires greater efficiency in manufacture, which may be enhanced by investment in permanent facilities, segregation and routinization of activities, standardization of vessel forms, decorations and pastes, or specialization in particular wares or forms. Although workshop industry production still occurs within domestic contexts, it may be distinguished archaeologically from less intensive modes of production by greater densities of production residues, differences in assemblage composition, the presence of permanent firing, storage, or drying facilities, and special segregation of tasks.

**Nucleated Industry and the Manufactory** – In both cases, the high volume of production interferes with domestic activities, requiring the locus of production be removed from the domestic context to a special place. Remains of domestic activities are therefore rare or nonexistent in archaeological deposits…*Manufactories* are single, large production entities managed by one or a few proprietors. In contrast, *nucleated industries* comprise an aggregate of smaller, independent workshops.
A sixth organizational mode of pottery production is added to this list by Pool and Santley: the tethered or attached specialist. – The attached specialist is a producer who manufactures goods for elite or state use on commission or to fulfill obligations to specific high-ranking individuals.

It should be noted that Pool and Santley’s definition of attached or tethered specialization diverges from the distinction originally proposed by Earle (1981) between attached specialists connected to elites who do not have rights of alienation over their own products and are required to produce on demand and those with more voluntary associations with elites. I prefer to use the term patron-client relationship when discussing more voluntary associations where specialists produce for elites on a contractual basis or for some kind of remuneration and are free, to varying degrees, to detach themselves at will.

Pool and Santley’s definitions of modes of production encompass both evidence that can be readily recovered from archaeological programs of survey and excavation as well as organizational principles that are more difficult to ascertain from physical remains. For instance, the relative percentages of different ceramics that make up specific domestic inventories can be quantitatively evaluated in order to distinguish between household production (where pottery manufacture is one of many tasks performed) and special-purpose workshops (where emphasis is placed on the production of one or a few goods to the exclusion of domestic activities). Other organizational arrangements culled from ethnographic case studies are much more difficult to evaluate from archaeological materials alone. For instance, how would one determine that a manufactory was “managed by one or a few proprietors” and not a voluntary association of specialists, such as a guild or other kind of corporate group with democratic rights of membership? How does one discriminate between household industry and workshop industry when both are conducted within domestic contexts? The distinctions between household industry and workshop industry cited by Pool and Santley (1992) amount to differences in degree.
Other organizational arrangements involving multiple units from one of these categories have been identified ethnographically (i.e., cottage industry of household production; community specialization at the household industry level). Anne Underhill (1991) also proposed faceting household industry into simple household industry and complex household industry. Cathy Costin (1991) has provided an eight-part typology of organization as a baseline for describing and discussing specialized production archaeologically. The following short definitions are quoted directly from Costin (1991); see Costin (1986) for more detailed descriptions.

**Individual Specialization** – autonomous individuals or households producing for unrestricted local consumption.

**Dispersed Workshop** – larger workshops producing for unrestricted local consumption.

**Community Specialization** – autonomous individual or household-based production units, aggregated within a single community, producing for unrestricted regional consumption.

**Nucleated Workshops** – larger workshops aggregated within a single community, producing for unrestricted regional consumption.

**Dispersed Corvée** – part-time labor producing for elite or government institutions within a household or local community setting.

**Individual Retainers** – individual artisans, usually working full-time, producing for elite patrons or government institutions within an elite (e.g., a palace) or administered setting.

**Nucleated Corvée** – part-time labor recruited by a government institution, working in a special-purpose, elite, or administered setting or facility.

**Retainer Workshop** – large-scale operation with full-time artisans working for an elite patron or government institution within a segregated, highly specialized setting or facility.

Other typologies could be summarized, but most are fairly congruent. These idealized or ethnographically reported modes of production organization are based on constellations of factors which are often discussed separately within the same articles. Costin (1991) notes that specialization is not a ubiquity measure, nor a static phenomenon; specialization occurs in degrees, and does not necessarily follow an
evolutionary trajectory along a continuum of idealized typologies. She cites four general parameters which are encompassed by her eight part typology: context, concentration, scale, and intensity (Costin 1991).

“The first considers the nature of control over production and distribution. I call this context of production. The second parameter describes the relative regional concentration of production facilities. The third parameter focuses on the scale of the production units, taking into account both their size and their constitution. Finally, the fourth parameter measures the intensity of production, or the degree to which it is a part-time, as opposed to a full-time, activity for artisans.” (Costin 1991:8)

“While typologies are important for their organizational value, what is more basic for archaeological studies is our ability to distinguish among the factors – to describe and characterize production accurately – and to understand why different parameter values occur under different social, economic, political, and environmental conditions, so that we can explain why we have found the types of production we have carefully described.” (Costin 1991:9)

The measure of “intensity” as part-time versus full-time may be a gross simplification. Full-time specialists may only work part of the year, perhaps as corvée labor requirements in state sponsored workshops. Archaeologically, it would be difficult to identify this. Part-time independent specialists may also work at different levels of intensity, and it is important to think in terms of frequency of production events as well. Pottery production may be practiced seasonally, with a complete cessation of production during the rainy season, or merely a reduced schedule. The time scales archaeologists deal with typically preclude such fine-grained chronological assessments. The life-cycle of a potting household will also influence the timing and intensity of production at a level beyond the recognition of the archaeologist.
Specialization in Commercial-based Societies

“Standardization is usually assumed to be an integral part of specialization for two reasons. First, specialized systems have fewer producers; therefore, less individual variability (caused by unconscious motor habits and skills, consciously made decisions regarding form and decoration, and/or the use of a wider range of raw materials) will be manifest in the assemblage (Hill and Gunn 1979; Peacock 1970; Rice 1981; Torrence 1986). Second, standardization – a result of routinization of ‘industrialized’ production – is expected to reflect cost-cutting strategies (e.g., Rathje 1975; Torrence 1986). As archaeologists often incorrectly consider all specialized systems to be competitive and cost-conscious, standardization is viewed as a logical result of basic economic forces.” (Costin 1991:33)

Standardization, in western economic jargon, is a completely rational response to specialization for increased output in a commercial system. In this type of system, it makes perfect sense to produce uniform products for widespread distribution. Products of uniform size can be shipped more efficiently when placed in identical dimension boxes and this facilitates the calculation of profit; knowing the exact number of boxes that fit on a truck for distribution allows the manufacturer to respond to supply/demand issues swiftly and easily. Consumers in such a system also become accustomed to standard sized products, expecting and finding comfort in this predictability. Even non-manufactured goods such as cashew nuts or eggs are size graded in the modern market economy. However, uniformity of product does not necessarily imply large scale production or freely alienable goods

“Torrence (1986) repeatedly implies that large-scale facilities indicate profit-oriented (independent) production. This is not the case; both independent and attached facilities can be large or small.” (Costin 1991:15)

The size and output of any given production unit certainly helps to clarify the organization of production. But the size and production output are somewhat separate phenomenon. Neither definitively indicates the organization of production as attached or independent (context), part-time or full-time (intensity), or commercially based for unrestricted exchange as opposed to oriented toward redistribution. Identifying the
physical setting of production will not automatically determine the organization of distribution. The evaluation of production requires not only ascertaining the organization of producers, socially and in physical space, but also their relationships in respect to other producers and to consumers of their products. Therefore, characterizing the organization of production also requires knowledge of the circulation of the goods produced.

**Identifying Craft Specialization through Standardization Measures – The Standardization Hypothesis**

Prudence Rice (1981) attempted to use diversity measures derived from population ecology to investigate specialization through richness and evenness measures. Her “trial model” was conducted at the ceramic type level of analysis and only utilized pottery from a single center, Barton Ramie. The result received mixed reviews and the technique has been criticized for not resting on solid theoretical ground; the interpretation of diversity measures has been questioned (Rice 2009:177). Cathy Costin (1991:34; contra Rice 1981; Feinman et al. 1984) argues that “gross formal and stylistic diversity within an assemblage is not the best level of analysis for studies of standardization;” type-level diversity does not reflect specialized production for economic maximization as much as social norms and functional concerns. Diversity measures have not readily been applied to ceramic assemblages following several highly negative reviews (e.g., Cowgill 1989; Dunnell 1989), although C. Bill (1997) did resurrect these in her study of ceramics from Copán. Standardization measures, in contrast, have seen a proliferation of application to archaeological ceramic assemblages, although this analytical method may also be headed for a similar fate.

The assumption that as craft producers devote more time to the manufacture of goods they will produce more uniform products as a function of repetitive crafting has been dubbed the standardization hypothesis (see P. Arnold 1991; Arnold and Nieves 1992; Benco 1988; Blackman et al. 1993; Blinman 1988; Costin 1986, 1991, 2000; Costin and Hagstrum 1995; Hagstrum 1985, 1986; London 1991; Longacre et al. 1988; P.
Rice 1981, 1987b, 1996; Sinopoli 1988; Stark and Hepworth 1982). By this logic, standardized products are equated with greater output from more specialized production units. This is contrasted against less standardized products produced at lower volumes, at the household level for immediate consumption or limited exchange. Following this logic, the recovery of highly standardized products can be associated with greater intensity of production. This requires knowledge of the relative degree of standardization in products achieved in the different organizational modes of production; in practice this has necessitated comparing ethnographic knowns with archaeological unknowns.

Limitations of Ethnographic Analogies

A major concern with using models or theories developed from ethnographic research on the production and distribution of ceramics, and this extends to most entrepreneurial activity post-1900 A.D., is the influence of the tourist market. As Prudence Rice has warned,

“First, much of the information available on contemporary pottery economics concerns the relation between potters and modern nontraditional market economies, which are often tied into international tourism. Care must be taken in using these data as analogies to prehistoric situations, particularly in areas distant from urban centers.” (P. Rice1987b:204)

Although ethnographic studies of agrarian communities do provide crucial information on craft production and distribution which allows us to formulate and test models applicable to the archaeological past, several confounding variables are present in these communities which did not, or probably did not, influence archaeologically known cultures and communities (including the Classic Maya). Ethnographic investigations in Panajachel, Guatemala (Tax 1941, 1963[1953]), highland Guatemala (Reina and Hill 1978), Ticul, Yucatan, Mexico (Arnold 1985, 1987, 2007), San Isidrio, Veracruz, Mexico (P. J. Arnold 1991) Atzompa, Oaxaca, Mexico (Hendry 1992; Stolmaker 1976, 1996), Raqch’i, Peru (Chávez 1987, 1992), and many other communities have provided
invaluable information concerning production and distribution in still ‘primitive’ agrarian societies (e.g., the Kalinga of the Philippines [Aronson et al. 1991; Graves 1981, 1985, 1991; Longacre 1974, 1981, 1983, 1985, 1991; Longacre and Skibo 1994; Longacre and Stark 1992; Longacre et al. 1986, 1988, 1991; Skibo 1990; Stark 1991a, 1991b, 1991c; Stark and Longacre 1993]). One must be careful to acknowledge the ‘modern’ influences that affected these communities when they were studied. Even when Panajachel was studied by Sol Tax in the late 1930s to early 1940s, the majority of inhabitants were cash-croppers, embedded in a market economy tied to a World System economy. Over the forty years that Dean Arnold studied pottery economics in Ticul, the potters shifted from producing mostly traditional utilitarian pottery for local consumption to producing pottery mostly destined for, and influenced by, a tourist market. Even widely-held general assumptions, such as the belief that craft specialization is an economic reaction to a lack of agricultural lands (i.e., D. Arnold 1980:147; Foster 1965:46, 1967:37-38; Howard 1981:7; Papousek 1974:1013; see also D. Arnold 1985; David and Hennig 1972; Deal 1998; Hodder 1982; Kalentzidou 2000; Stark, Bishop, and Miksa 2000), which is supported by a preponderance of (but not all) ethnographic studies, may be a product of the ethnographic present and not applicable to the archaeological past.

“Importantly, some ethnographic studies suggest that the observed marginalization of peasant artisans is a result of their incorporation into the capitalist global economy (e.g., Byrne 1994; Cook and Binford 1991).” (Costin 2000:395)

On the other hand, Bey (1992) has suggested that some analogs between ethnographic studies and archaeologically known societies may be appropriate. Specifically, he compares the practice of selling undecorated vessels to middlemen who then paint them for resale in the tourist market, reported for the Peruvian Raqch’i (Chávez 1992) and Mexican Ticul potters (Arnold and Nieves 1992), to the archaeologically known Classic Maya and Inka.

“Perhaps similar arrangements existed for the Maya and Inkan artisans who created highly valued and decorated vessels in the past. Even if the parallel is not exact, the use of the tourist segment of the
production and distribution system may be a useful analog in developing hypotheses for the study of elite ceramic production and distribution and may be worth exploring further. The modern subsystem may not represent a new development but a new form of an old arrangement.” (Bey 1992:12)

P. Rice (2009) argues that Classic Maya figural polychrome vessels were painted by elite artisans using ‘blanks’ not produced by the painters themselves within centralized facilities. These vessels, once painted, were then circulated as inalienable objects through elite gift-giving. Viewing the production of some painted ceramics as highly skilled artistic expressions and not commercial commodities, Takeshi Inomata has suggested that master painters likely monitored, if not conducted, all stages of vessel production from clay selection through firing and painting.

“We should, however, remember that many of the master ceramic artists of historic and modern East Asia have been directly involved in the entire process of pottery production from the acquisition of clays to the firing of pots. In particular, some of them have considered the firing process, on which all effects of painting depend, too important to delegate to unskilled apprentices (Uchijima 1958). Although the relatively standardized production of Codex style vessels in a large number may have benefited from a division of labor, we still need to consider the possibility that master elite artists in Maya society participated at various stages in the production of some pictorial pots of more individualized styles. Even when multiple individuals were responsible for different stages of ceramic production, Maya ceramic painters must have maintained close interests in the entire manufacturing process. Reents-Budet (1994:218-222) suggests that potters and painters worked side-by-side in the same workshops because the production of high-quality vessels required close coordination and supervision. She goes on to argue that master painters began their careers as apprentices learning clay preparation, vessel forming, and firing.” (Inomata 2007:134)

Between these two viewpoints there is a good deal of room to question the validity of ethnographic analogy and the usefulness of it. Also, Bey and Inomata appear to be discussing two different crafts – one a commodity for ‘resale’ and the other an inalienable possession or elite status good. Here lies one of the problems with viewing pottery as a craft item in the context of Classic Maya society. While some authors have occasionally called a vessel a “masterwork” or have noted the high degree of craftsmanship reflected in certain ceramic pieces, there are few clear-cut distinctions
among classes of pottery indicative of the relative skill necessary to produce them, the status of the artist or craftsperson producing them, or the social value of owning them. Classic Maya figural polychromes are one of the few classes of pottery singled out as inalienable possessions. These vessels were almost certainly given as gifts to commemorate events or relationships; however, it is unlikely that they were ever exchanged beyond the initial gifting.

Recognizing which pottery vessels were produced for impersonal exchange and which were status items exclusively intended for elite consumption has important implications for the organization of production and exchange. These are not the only two classifications we might identify; vessels may also be produced for household consumption, for specific non-elite gifting circumstances, or for taxation/tribute.

“Not all the activities or modes of organization operating in the past are represented in the ethnographic present, and vice versa. Things change!!...Potters today do not characteristically produce the same range of wares for the same range of uses or users they did in the past...Thus, as anthropological archaeologists, it is imperative to use judgement of the context to know when our ethnographic analogies will be appropriate and applicable and recognize when a specific case in point is quite different from anything in the present.” (Costin 2000:399)

6.2 – Evaluating Standardized Production from Archaeologically Recovered Ceramic Assemblages

The homogeneity, or uniformity (see P. Rice 1996:179), of ceramic vessels, indicated by consistent metric attributes, (i.e., rim diameters and vessel heights), is often claimed to be the product of increased standardization resulting from increased intensity of production (i.e., more frequent production events). Uniformity is viewed as a purposeful attempt to increase production efficiency for greater output as well as an unanticipated and largely unconscious by-product of repetition (Costin and Hagstrum 1995:624). Ethnographic studies demonstrate that potters working at high production output tend to manufacture more uniform vessels with more highly consistent metric
attributes than potters working at lower intensity levels (e.g., Arnold and Nieves 1992; Kvamme et al. 1996; Longacre et al. 1988; Roux 2003). Hence, uniformity of product is interpreted as an indication of specialized production. Ethnographic case studies also document the very simple techniques employed by part-time ceramic producers in order to control (or standardize) these metric attributes from production event to production event – even when these are infrequent.

“How is such consistency possible among household producers? The Tuxtlas potters employ a number of scales to judge size, including pieces of wood of prescribed length and/or hand and finger spans. These measuring aids enable the potter to produce a formally standardized assemblage despite the infrequent nature of production activities. Consistency in vessel form may also result from the tools used during manufacture. A potter repeatedly using the same mold will obviously produce vessels of uniform size and shape. Standardization, therefore, may occur for reasons other than specialized manufacture and the need for greater production efficiency.” (Arnold and Santley 1993:232)

While it is tempting to see the reporting of standardization measurements from archaeologically recovered pottery assemblages as an objective indicator of greater production intensity, ethnographic case studies of potters indicate that standardization may occur at very low production intensity levels, even at the part-time household level. In reality, uniformity of product may only indicate that the potter kept a stick handy to measure their vessels periodically or that all vessels were produced using one master bowl as an impromptu mold. The standardization hypothesis (see P. Arnold 1991; Arnold and Nieves 1992; Benco 1988; Blackman et al. 1993; Blinman 1988; Costin 1986, 1991, 2000; Costin and Hagstrum 1995; Hagstrum 1985, 1986; London 1991; Longacre et al. 1988; Rice 1981, 1987b, 1996; Sinopoli 1988; Stark and Hepworth 1982) proposes that greater product uniformity is caused by higher rates of production (Roux 2003:768). Archaeologically recovered ceramics can be physically measured and the uniformity of these measurements compared with those of other archaeologically recovered assemblages, or with similar data recorded from ethnographic studies of potters producing at a known level. As with any statistical measurement, choosing the appropriate attribute to measure is key.
“Size is more amenable to interval scale measurements in such dimensions as diameter, height, and wall thickness. Ratios of height to diameter or of one vessel part to another (e.g. neck to body) may also be used to quantify vessel shapes, although some information is lost in the process (P. Rice 1987a:216-217; Shepard [1956] 1980:236-245).” (Pool 1992:299)

However, there is considerable concern that archaeologists are not recognizing important emic categories when evaluating archaeologically recovered ceramic assemblages. Despite removing outliers from their collection when detected through histograms, Costin and Hagstrum (1995:631) still felt that they may have conflated multiple emic categories in their analysis, just as Longacre et al. (1988) and Allen (1992) concluded in their respective analyses of archaeological ceramic assemblages.

Cathy Costin and Melissa Hagstrum (1995:622) distinguish between intentional attributes and mechanical attributes. Intentional attributes are those introduced into the product by choice. Mechanical attributes are those largely unintentional, idiosyncratic, and subconsciously introduced during manufacture resulting from repetitive hand motions and use of tools. Even this distinction reflects the etic perspective of the archaeologist who chooses to define a specific attribute as either intentional or mechanical. In general, greater standardization in mechanical attributes is expected within more specialized, greater output production contexts (Costin and Hagstrum 1995:624). When analyzing archaeological assemblages, measures of standardization are meant to gauge the relative number of hands responsible for the production of the given assemblage. This has been particularly useful in the Classic Maya lowlands and other areas where pottery is abundant, but where production loci have not been identified. Even without identifying the physical production loci it is still possible to use the objects themselves (i.e., pottery vessels or sherds) to delimit the organization of production (Arnold and Nieves 1992; Benco 1986; Costin and Hagstrum 1995; Foias and Bishop 2007; Hagstrum 1985, 1986; Hodge et al. 1993; Sinopoli 1988).

Standardization is not a ubiquity measure; it is a relative measure that requires comparison. The degree of standardization apparent in any ceramic assemblage must be
compared against other assemblages (Costin 1991:2; Costin and Hagstrum 1995:620, 622; Arnold and Nieves 1992:94). In practice, the high degree of uniformity interpreted as standardized production by specialists may be incorrect because the causes of standardization are not completely known. Standardization for greater output is just one possibility.

“I would simply like to note that although attempts to increase standardization are a logical response to the demands for more vessels, because it can increase output rates of distribution, care should be taken not to equate it with specialization. Producers can become more specialized without manufacturing more standardized vessels and vice versa.” (Pool 1990:249-305, quoted in Bey 1992:7)

To facilitate the comparison of ceramic assemblages, intra-group variability has been calculated with the Coefficient of Variation (CV). The CV is defined as the sample standard deviation divided by the sample mean, multiplied by 100 and expressed as a percentage. It may be considered as the standard statistic in studies of variation and therefore as an excellent measure of standardization (Eerkens and Bettinger 2001). Other statistical measures, such as $F$ tests (or analysis of variance [ANOVA]), may be more appropriate in determining the statistical significance of differences between assemblages (P. Rice 1996:178). Uniformity measures (i.e., CV values) have been developed from the analysis of ethnographic pottery production specifically as an objective, quantifiable measure of the uniformity of ceramics produced over a short period of time, by an individual or group of potters within the same workshop or community.

An appropriate and meaningful standardization comparison must involve two (or more) assemblages of relative comparability. This could be the comparison of the product produced by different individual potters, pottery workshops, or entire communities of potters. Ethnographic reports of metric attribute uniformity use data collected over very short time periods – pottery produced on a single day, or perhaps over the course of a year. Rarely are uniformity measures calculated for vessel assemblages produced over multiple years (see Longacre et al. 1988). Archaeologists (especially ceramic analysts) typically work with ceramic assemblages of a much different scale. In
fact, archaeologists have employed uniformity measures as an indirect means of investigating the relative number of hands involved in production and the amount of time spent annually on production, an unnecessary procedure for ethnographers studying living peoples.

“Ethnographically, defining or identifying specialist production has not been a consuming concern in pottery studies, and indeed the criteria used for recognizing economic specialists of any kind are very different from those used archaeologically. Among the significant elements are the proportion of time devoted to the specialty, the amount of subsistence (or income) gained from it, the existence of a native title or name for the occupation, and the receipt of some remuneration for the product (Tatje and Naroll 1973).”

(P. Rice 1987a:188)

Reports of comparative CV values have become more frequent over the last two decades, both of archaeological assemblages and of ethnographic data from living producers. Archaeologically recovered assemblages are usually compared and contrasted with ethnographically derived data sets. Such studies tend to sit one another, and the database of ceramic assemblages with calculated CV values has slowly grown. However, there may be an inherent flaw in the practice of comparing ethnographically obtained standardization results to archaeological assemblages. Prudence Rice (1996:180) notes that standardization is a process that develops over time and cannot be so easily dealt with through ethnographic studies which investigate or document uniformity or homogeneity of product in the ethnographic present (even longitudinal studies). However, the effects of the process of standardization (i.e., the uniformity of product attained) can certainly be investigated as the outcome or product of this process. The major obstacle to comparing ethnographic samples with archaeologically samples is the fundamental difference between the products of one or a few potters (ethnographically) and the products of generations of potters (archaeologically). It is difficult to extrapolate the uniformity of product attained by potters over a short period of time to archaeological assemblages made up of the products of numerous potters over much longer time periods.
“This phenomenon refers to the fact that measures of uniformity register increasing variability, or become ‘cumulatively blurred,’ when the scale of analysis is expanded beyond the products of a single manufacturing event (such as a fused stack of wheel-made wasters from a specialized workshop) to include the products of multiple production events representing several workshops, even when the producers are specialists.” (P. Rice 1996:181)

Case Studies Employing the Coefficient of Variation, or CV, Measure

Ceramic Production in Peru

“Many archaeologists treat measures of standardization or variability as though they were qualitative, testing for the presence or absence of specialization. In fact, what standardization really measures is the number of production groups in relative terms.” (Costin 1991:35)

Cathy Costin and Melissa Hagstrum (1995) analyzed a ceramic sherd collection from highland Peru for signs of standardization reflecting differences in the organization of production for different wares. In this manner, their analysis compared the relative standardization of each ware to first determine the relative number of producers and then evaluated the differential standardization to determine whether the organization of production for all three was equivalent. The sample was collected by the Upper Mantaro Archaeological Project (UMARP) (see D’Altroy and Hastorf 1996; Earle et al. 1987) and the samples come from domestic contexts characterized by variable rank or social status as reflected in residential size, masonry quality, and location within the settlements. Various utilitarian vessels used for storage, cooking, and transport in two ware groups, Wanka and Micaceous Self-slip were analyzed and compared with imperial Inka-style jars. The samples come from four post-Inka conquest sites of the Wanka Valley dating to post-A.D. 1460 (Wanka III).

After charting the distribution of attribute dimensions as histograms, outliers were removed from consideration; nonetheless, the authors still felt that emic categories may have been conflated (Costin and Hagstrum 1995:631). CV values were calculated for
individual morphological variables (i.e., attributes) and were quite high (29.46% to 49.09%). The high CV values are attributed to the length of the archaeological time period represented by the sherd collection; they probably represent multiple production groups over time and a substantial degree of cumulative blurring. Only slight differences among the CV values of the three different ware groups were detected (Costin and Hagstrum 1995:Table 4).

The authors interpret this pattern to indicate that most utilitarian pottery was manufactured within a household-level context by independent artisans. The low degree of standardization within the Inka-style jars suggests that these were not manufactured by full-time retainers in workshop contexts, rather by larger numbers of corvée laborers working part-time in service to the state. Costin and Hagstrum see only slightly more standardized Inka-style jars, and compared with the other two ware assemblages, none were very standardized in terms of mechanical attributes indicative of high-output workshop contexts.

“These data, then, suggest that the producers of all wares were nucleated to a similar degree, since they exhibit equivalent homogeneity (or heterogeneity)...Furthermore, the data suggest similar numbers of potters or workshops were at work producing each of the three wares.” (Costin and Hagstrum 1995:633).

A previous compositional study of Inka ceramics recovered archaeologically from Cuzco, Lake Titicaca, the upper Mantaro Valley, and adjacent Tarma concluded that the Inka state controlled the raw material (i.e., clay source) used in the production of Inka pottery (D’Altroy and Bishop 1990). Before completion of this study the standardized appearance and form of imperial Inka ceramics was already well attested, and local production varying by region anticipated.

“Standardization in vessel shape and decoration provided an unambiguous stamp of imperial manufacture and facilitated production by local potters. Second, despite the standardization, regional variants can be distinguished...This implies that, while the state’s pottery was made to its specifications, the execution varied regionally.” (D’Altroy and Bishop 1990:123)
D’Altroy and Bishop’s (1990) analysis confirmed that Inka imperial pottery was made from clay sources unavailable or previously unused by the Mantaro Valley population. Their analysis did suggest that true imperial Inka pottery could be separated from local Inka pottery, the latter either representing local imitations or poorer quality regional variants compositionally different from the core Inka imperial pottery group. They suggest that this may indicate either greater exchange in pottery or (more likely) a redundancy of production units producing similar pottery in the area. They conclude that their analysis supports a model of regionally focused production and distribution, even if “strong control was exerted over the style of the finished product” (D’Altroy and Bishop 1990:133).

“The evidence clearly shows that the Inkas restricted access to the raw materials used to make imperial pottery, thus controlling its circulation at the source...To obtain craft goods, the state supplied raw materials to its subjects for conversion into finished products. This point was especially important in state-subject relations, since it was a central tenet of imperial ideology that the taxpaying population owed only labor, not goods.” (D’Altroy and Bishop 1990:133)

From this compositional analysis and the standardization analysis of Costin and Hagstrum (1995) it appears that Inka ceramics were produced in much the same way as local utilitarian ceramics were in the Mantaro Valley, probably at the household level. The state did control the style of Inka ceramics, indirectly, and the raw material for their production directly. The transportation costs involved in moving heavy, bulky ceramics conditioned the organization of their production, resulting in a dispersed production pattern involving numerous producers. The calculation of CV values for different ceramic classes or wares does indicate that the production of Inka pottery was not appreciably more intensive or conducted by a considerably smaller number of production units.
Iroquoian Ceramic Production

Kathleen Allen (1992) employed the CV measure to infer household level production by non-specialists in six Iroquoian villages from western New York. These villages were all within one tribe and the sites were occupied between A.D. 1550 and 1630. Allen calculated CV values for the metric attributes of collar height and rim thickness, and also for primary design element width, angle and spacing. These coefficients were then compared to CV values calculated by Longacre et al. (1987, 1988) from ceramic inventories produced in one ethnographic setting and one archaeological setting. In other words, Allen compared an archaeological assemblage where the mode of production was unknown to one ethnographic ceramic assemblage for which the mode of production was known, and also one other archaeological assemblage for which the mode of production was assumed to have been household level production.

The coefficients calculated by Allen for Iroquoian ceramics were based on different attributes; the fragmented Iroquoian ceramics would not yield vessel height and width as Longacre et al. had been able to measure with their samples. Two populations of vessels produced by potters in the Philippines were analyzed by Longacre et al. (1988). The first set of vessels was produced by specialists in the Paradijon neighborhood of Gubat and the second set of vessels was produced by non-specialist Kalinga women in household settings in Northern Luzon. Coefficients were calculated for vessel height, vessel width, and aperture diameter. These categories were further subdivided based on emic categories of size and function: small-medium, medium, and medium-large for the Paradijon collection; medium vegetable cooking and medium rice cooking for the Kalinga collection. CV values were calculated for individual classes and then for pooled assemblages containing all vessels from an entire assemblage.

Ceramics made by the specialist producers of Paradijon yielded CV values of 3.4% to 6.8% for individual size classes, compared to 10.2% to 13.7% for individual size classes of household produced Kalinga pottery. When collections were analyzed without
regard for size or function, the pooled assemblage for Paradijon yielded CV values from 8.7% to 10.0% while the pooled Kalinga assemblage yielded slightly higher CV values of 11.3% to 14.5%. Comparing these ethnographically reported assemblages of ceramics to an archaeologically acquired collection of ceramics from the southwestern pueblo site of Grasshopper, Longacre et al. (1988) found CV values for single vessels classes in the 15.1% to 28.8% range. When all corrugated vessels (the entire pooled assemblage) from Grasshopper were analyzed, CV values jumped to 54.6% to 64%! Allen follows Longacre in prescribing caution when comparing archaeological assemblages with ethnographic ones.

“Longacre et al. (1988) hold little hope for the comparability of archaeological and ethnographic ceramic variation when the former consists of vessels from a variety of emic categories that can not be differentiated. Statistics that analyze group variation are heavily dependent on the categories used in the analysis and therefore they urge caution in the application of this statistic to archaeological material to infer mode of production.” (Allen 1992:148)

Allen calculated CV values from the Iroquoian pottery utilizing a ceramic collection produced within an eighty year maximal time span. This represents several generations of potters, and is about as fine-grained as any Classic Maya ceramic phase can be accurately defined at present. She was acutely aware of the problem of conflating multiple emic size and functional categories together but questioned her own ability to control for these variables. After calculating CV values for collar height [22.6% to 34.9%] and for rim thickness [13.7% to 30.9%], Allen combined these two metric attributes into a single ratio variable of collar height to rim thickness, calculating CV values from 23.4% to 30.1% for this ratio measurement. This ratio CV value was surprising; Allen had expected a lower CV value when the two variables were combined as a ratio. The primary design element width, spacing, and angle CV values were even higher [31.7% to 47.1%], not unexpectedly (Allen 1992:150).
“When these coefficients are compared to those from the Longacre et al. study, they are, for the most part, on the high side of those obtained for either the Kalinga or Grasshopper ceramics. They are below those obtained for all corrugated vessels from Grasshopper (coefficients of variation between 54.6% and 64%). Given that the coefficients obtained in the present study were from sherds and used more variables, it is reassuring that the coefficients are not more extreme.” (Allen 1992:150)

Although all the Iroquoian sherds utilized in this study represent collared vessels, and are probably best viewed as a single class of pottery, Allen still felt that she had probably conflated multiple emic categories of pots into her collection unintentionally and unwittingly.

“As is typical in the archaeological situation, the identification of ceramic categories that would have had meaning to the prehistoric populations proved problematic. However, this need not negate the value of this analysis.” (Allen 1992:149)

To assess the value of Allen’s study, I think that she has demonstrated a low level of vessel uniformity in one form class of pottery indicative of non-specialized production, that is, a low degree of standardization. While the organization of production (much less distribution) cannot be solidly inferred from the analysis, we can reasonably say that this study has provided a solid basis for classifying the Iroquoian pottery production system (of the single form class) as unspecialized in a general sense. The CV values for various attributes of the collared vessel sherds certainly do not indicate any standardization indicative of a high degree of specialization in their manufacture. On comparative grounds, one could argue that household-level production of this form class is most likely and that highly specialized, full-time potters did not likely produce these vessels in workshop or manufactory contexts. The high CV values also suggest that many potters produced similar vessels as opposed to a few specialists producing all the vessels consumed in all the communities.

In Allen’s (1992) study, the goal was obviously to measure an archaeological assemblage for which the mode of production is not known for comparison against ethnographic assemblages for which the mode or modes of production are known.
However, there are fundamental distinctions between archaeologically recovered assemblages and those analyzed in ethnographic contexts. Archaeological collections are limited by the time spans assigned them. A ceramic phase of 100 – 150 years length is simply not fine grained enough to allow for direct comparison with an ethnographic collection from a single production event or season. The differences between archaeologically recovered assemblages and those produced by modern potters has been a major concern with this kind of standardization or uniformity comparison.

**Alternatives to, and Evaluations of, CV Values**

Arnold and Nieves (1992:107, 112) have argued for the replacement of CV values with more standardized statistics in assessing variability in ceramic assemblages, including F tests (see Longacre et al. 1988) and Analysis of Variance [ANOVA] (see Sinopoli 1988). The interpretation of CV values themselves has also been addressed by Roux (2003) in a cross-cultural study of low- and high-intensity production contexts. In her study, CV values were calculated for various assemblages of vessels produced by modern potters, which were then compared with CV values obtained through other ethnographic studies and with CV values calculated by Blackman et al. (1993) for Mesopotamian ceramics recovered archaeologically. The results indicate that CV values are a meaningful indicator of the degree of standardization indicative of different levels of intensity or scale of production. Although “emic conceptions of standardization also play on metric variability,” high-rate production situations were characterized by low CV values indicating that the quantification of metric variables of pottery vessels can be used to qualify the scale of production, at least in high-rate production cases.

The article evaluates ceramic production from multiple geographic locations at both low- and high- intensity production contexts. Roux directly observed potters and measured their products for comparison with previously published ethnographic case studies. The newly reported analyses of ceramic assemblages come from households from several villages in southern Andhra Pradesh in India (low-rate production) and
households in North India from Uttam Nagar, a suburb of New Delhi (high-rate production). Published data (Arcellin-Pradelle and Laubenheimer 1982, 1985) on ceramics from a single workshop in Spain (high-rate production) were used for comparison, as were summary statistics on metric attributes from several ceramic production contexts in the Philippines [Kalinga] reported by Kvitme et al. (1996) and Longacre (1999; Longacre et al. 1988): Paradijion (high-rate production), Dalupa (low-rate production), Dangtalan (low-rate production), and San Nicholas (high-rate production).

The primary low-rate production context from Andrah Pradesh (India) was evaluated with pottery from six adult male potters from four villages located from 3 to 10 km apart from one another. Each village had a population of 1200-2000 persons and from two to ten resident potters. Each potter produced approximately 6000 vessels annually working “at different rhythms” throughout the year within domestic settings and without any segregation of production tasks; each potter personally completed all steps in the manufacturing process. The vessels were distributed by the potters’ wives through patron-client relationships (jajmani system) or through barter or trade within a 3 to 4 km radius of the home. Cooking vessels are produced with a combination of wheel throwing and paddle and anvil techniques, incised with simple horizontal lines, and slipped monochrome red. These vessels are a good proxy for lowland Maya monochrome bowls. Large dry storage jars are also produced by these village potters.

The primary high-rate production context from Uttam Nagar (India) was characterized by full-time potters working in household workshops and producing approximately 15,000 vessels annually per potter. The 200 potting households of this suburb of New Dehli typically each have one or two pottery wheels and a kiln within the courtyard of the compound. Each compound houses a nuclear or extended family. The second high-rate production context analyzed by Roux (2003) consisted of a single male potter from Vall de Uxo, a village in the Castellon province of Spain. The workshop had separate areas for manufacturing, drying, firing (kiln), and storing (warehouse). This
potter worked ten hours a day, eleven months out of the year producing various tableware and cooking vessels. Only pitchers were used for the study. Employing a kick-wheel, he manufactured about fifty pitchers per day and his annual output of pitchers was estimated at 14,000. All the ceramics produced by this full-time potter were sold through middlemen.

Analysis of inter-group variability was computed using Analysis of Variance (ANOVA), while intra-group variability was assessed through the calculation and comparison of the Coefficient of Variation (CV). A “group” was defined as a series of vessels made by a single potter as a single production event (a day’s work for one man). CV values were calculated for the single metric variables of height, maximum diameter, aperture (rim diameter), wall thickness, lip thickness, and lip width; ratio CV values were not reported.

“Inter-group variability has been computed using ANOVA (analysis of variance). As underlined by Kvamme et al. (1996), results obtained by an F-test are dependent on an assumption of normality that does not hold most of the time. For this reason we proceeded with a posteriori tests (LSD3 [Scheffe] and Games-Howell) that are very robust with populations that are not normally distributed and are useful for comparing heterogeneous variances on small samples.” (Roux 2003:772)

Within the low-rate production context, statistical differences were significant between the products of individual potters from Andra Pradesh (ANOVA, p<.001; LSD [Scheffé] and Games-Howell, p<.05). Likewise, inter-group variability was statistically significant in the analysis of New Delhi potters’ vessels (ANOVA, p<.001; LSD [Scheffé] and Games-Howell, p<.05). Variability in CV values for single metric attributes of the Andra Pradesh ceramics varied from potter to potter and within specific emic categories of vessels produced (Roux 2003:775, Table 1). CV values for height, maximum diameter, and aperture from individual potters fell between 1.43 and 9.71, CV values for lip thickness and width were variable, reaching 17 to 25, though clustering between 4 to 8 usually. CV values for thickness of wall reached 25.
When considering the standard deviations and CV values of each type of vessel [emic category], all potters pooled, it appears that, for height, maximum diameter and aperture, CV values range from 5 to 9 percent. There is a cumulative effect, also called ‘cumulative blurring’ (Blackman et al. 1993) that makes these pooled CV values higher than those for each potter.” (Roux 2003:775)

The Uttam Nagar (New Delhi) pottery CV values for height, maximum diameter, and aperture of vessels produced by each individual potter ranged from .87 to 3.19, while the pooled collection of all vessels produced by all potters still fell between 1 and 5 percent. The specialist potter working within the workshop context in Vall de Uxo, Spain produced vessels with CV values from 1.4 to 2.9 for the metric attributes of height, maximum diameter, and aperture; other attributes had slightly higher CV values and slight variation existed between the two series of jars produced on the two separate days that pottery was measured (see Roux 2003:Table 7).

These results do produce a distribution of decreasing CV values with increased production intensity, suggesting that low-rate production does permit the development of uniform motor movements which translate into homogenous ceramic products, although not to the same degree as high-rate production contexts. Valentine Roux does note that her results differ slightly from a similar ethnographic study of ceramic production conducted in the Philippines and published by Kvamme et al. (1996).

“In the Philippines, all potters pooled, the high-rate production (Paradijon, full-time potter specialists) presents CV values that range from 4.3 to 6.92 percent, whereas low-rate production (Dalupa, part-time potter specialists) presents CV values ranging from 4.06 to 5.56 percent. The least specialized potters (Dangtalan, household use, restricted exchange) produce ceramics whose CV values range from 6.27 to 8.34 percent.” (Roux 2003:778)

The data reported by Kvamme et al. (1996) from the Philippines are intriguing; CV values from low-rate production by part-time potters evidenced only slightly greater variability than CV values from high-rate production by full-time specialists. Even the least specialized potters, strictly producing at the household level, produced CV values below nine percent. This suggests that CV values do not reflect cross-cultural standards
of uniformity as much as they demonstrate the relative standardization of product among
groups in the same area whose intensity of production varies. Valentine Roux mentions
that metric data acquired by Longacre (1999) from four San Nicolas potters
manufacturing water jars at the rate of 20-65 per day maintained metric variability of
about three to four percent, and that “Kalinga pottery varies about 12 percent”

“To summarize, the ethnographic data presented here suggest that ceramic assembla-
ges presenting CV values from 3 to 6 percent are quite ambiguous. They may result from large-scale production. Ceramic assemblages presenting CV values from 6 to 9 percent may belong to small-scale as well as very small-scale production. Ceramics assemblages presenting at least two variables with CV values below 3 percent point to high-scale production.” (Roux 2003:779)

Roux’s article concludes by comparing the findings from these ethnographic
analyses to the analysis of twenty-seven “open simple-rim” fine ware bowls fused
together as a single waster stack archaeologically recovered from Tell Leilan, Syria. This
vessel type was popular by 2200 B.C. at Tell Leilan and numerous other sites in Northern Mesopotamia (Roux 2003:780). The homogenous paste recipe, single form-class, and
uniform monochrome slip of these vessels suggest that they are, in fact, the product of
“mass production.” The vessels were kilnfired as a group in a single event, and represent
a partial stack. The height of a full stack of these vessels is estimated at two meters,
giving us a rough idea of the kiln capacity. While Roux (2003) equates the relatively
high CV values from these vessels as an indication of low-rate production, it is much
more likely that these values should be viewed as objective measures of the products of a
high-rate production context.

Firing large stacks of highly similar vessels implies that either one potter was
producing at high output or that multiple potters manufactured similar vessels and fired
them together at a shared kiln (nucleated industry) or that multiple potters produced
vessels side by side in a workshop or manufactory context. In this case, the quantity of
vessels fired as a single event is consistent with “mass production,” not in the industrial
sense, but certainly above the level of assumed household industry, nucleated industry, or workshop industry contexts in pre-Columbian Mesoamerica. Perhaps this particular study calls into question the validity of the standardization hypothesis, as it is currently evaluated using CV values, more so than the actual organization of pottery production at Tell Leilan, ca. 2200 B.C. The production of large numbers of highly similar vessels of a single ‘type’ then fired in kilns, in conjunction with the “high” CV values, suggests that multiple potters worked side by side in a single workshop or manufactory context and pooled their pottery for group firings.

If the CV values from this high-rate production context seem high in comparison to the CV values from low-rate production contexts then perhaps we should question the applicability of this uniformity measure in assessing the scale or intensity of production. I tend to view the archaeological context of production in the Mesopotamian case to be more reliable than interpretations based solely on CV values. It seems reasonable to infer a high-rate of production from the archaeological evidence and then accept the CV values as an objective measure of the degree of uniformity obtained in this instance. I prefer the interpretation that the high CV values here likely indicate that multiple potters were producing relatively simple, unelaborated bowls very quickly in a workshop or manufactory and then firing them in large batches. The high CV values probably reflect the ‘cumulative blurring’ arising from pooling the metric measurements of the products from multiple producers’ hands.

Longitudinal studies of pottery production are desperately needed to address the issue of ‘cumulative blurring’ within assemblages. Additional ethnographic studies of high- and low-intensity ceramic production would only strengthen the comparative database already existing. Nonetheless, no matter how robust the ethnographic catalog becomes the temporal control over archaeological assemblages will never be equal. Hence, a certain degree of comparing apples with oranges will always exist. To extend the evaluation of the usefulness of this technique to the analysis of Classic Maya pottery, several concerns generated from standardization studies using CV values can be
addressed. As far as the deranging factors arising from confusion of emic categories, Classic Maya ceramics do separate out into distinct vessel form classes as well as specific types and varieties. Even without knowledge of the specific emically defined function of a narrowly defined form class, comparable vessels from an assemblage can certainly be selected out for analysis.

The two other variables of concern here are size classes, and temporal coexistence. Size classes can (and should) be controlled for, even with sherd collection, by first charting the metric data using histograms and then looking for bi- or tri-modal distributions indicative of size classes (see Sinopoli 1988:171-185). Choosing vessels (or sherds) which can be assigned to a short enough chronological period to be of value is a more difficult dilemma. Many types and varieties of Maya pottery were in circulation for long periods of time. While Preclassic ceramic phases might be too long to yield meaningful information, a specific type of pottery in a specific form class within a 100 year Late Classic ceramic phase should be defined narrowly enough to be highly comparable. Even if the CV values do not elucidate the exact mode of production for such a narrowly defined ceramic type, the degree of standardization does indicate the relative number of production units (see Foias and Bishop 2007). We can reasonably make the assumption that, in general, higher CV values equate with less standardization indicative of a greater redundancy of production units while lower CV values indicate a greater degree of standardization, probably indicating fewer production units.

6.3 – Standardization of Ceramic Paste Recipes

“Physicochemical characterization of paste compositions is the granddaddy of specialized ceramic analyses, having a long modern history that stretches back into the 1950s. One advantage conferred by this distinguished heritage is that researchers have had several decades to ponder and resolve the ‘glitches’ in the assumptions and methods of compositional analysis, a luxury not always possible in more recent approaches to pottery.” (P. Rice 1996:166)
Instrumental Neutron Activation Analysis (INAA, see Bishop 2003 for review; Blackman and Bishop 2007; Neff 1993, 2000 for procedures and methods) has proven to be a powerful tool in the analysis of ceramic production and trade or exchange in Mesoamerica (Bennyhoff and Heizer 1965; Bishop 1975, 1980; Bishop and Rands 1982; Bishop et al. 1982; Foias and Bishop 2007; Hodge et al. 1993; Neff et al. 1988; Rands 1967; Rands et al. 1974; Rands and Bargielski Weimer 1992; Rands and Bishop 2003; Reents-Budet and Bishop 2003) and elsewhere (Blackman et al 1993; Neff et al. 1997; Sayre and Dodson 1957; Steponaitis et al. 1996). The results obtained through INAA and the interpretations which they have supported or refuted have caused considerable uproar at times, although on weak or false grounds (see Neff et al. 2006), or apparently unwarranted suspicions of the inability of the technique to discriminate true human behavior (D. Arnold 2000, Rice 1996; see also Neff et al. 1987; Bishop et al. 1988).

Both Robert Fry and T. Patrick Culbert concluded that ceramics were produced at a number of specialized production centers at Tikal, based on the consistent correlation between paste groups and specific forms, types, and/or varieties (Fry 1979:150), although the homogenous character of clays in the Tikal vicinity confounds simple visual segregation of sherds into groups correlating with production units (Fry 2003a:151). Under the minimal definition of specialization, there were certainly ceramic production specialists at Tikal. Beyond production for exchange outside the producing household, evidence from Tikal suggests that ceramic production had become specialized to the degree that the products of at least some production units were circulated more widely, although the mechanisms of distribution are not entirely clear. I suspect that consistent paste recipes relate to geographic sectors of Tikal inhabited by multiple ceramic production units.

Prudence Rice (1996), somewhat skeptical of the degree of precision possible through compositional analysis, advocates the development of “middle range theory,” especially hierarchical organization of inclusive stages in the data analysis. As a rule of thumb, the greater the number of samples analyzed, the more fine-grained distinctions
and subgroups can be recognized. This relates to the geographic scale of analysis. A persistent question is at what scale can meaningful distinctions in pottery composition be related to human potters and exchange mechanisms? Can compositional analysis distinguish the product of different production units or workshops? The compositional analysis of pottery production is more effective at the gross scale of analysis (interregional) than at smaller geographic scales (intraregional and local).

**Ceramic Paste as the Analytical Unit**

“A distinctive paste composition may indicate exploitation of a particular clay resource by a single group of potters who use it in the manufacture of certain kinds of pottery.” (Rice 1976:539)

The Type-Variety system of pottery classification (Gifford 1960; Sabloff and Smith 1969; Smith 1955, 1971; Smith and Gifford 1964; Smith et al. 1960; Willey 1965; Willey et al. 1964, 1967) has been criticized (e.g., M. Smith 1979) and defended (e.g., Ball 1979; Adams 2007). Patrick Culbert has organized the Tikal ceramic sequence by type classification and also by form class (1993; see Culbert and Rands 2007). Prudence Rice (1976) objected to the use of the ware category as an analytic unit within the Type-Variety system and felt it more appropriate to separate, not conjoin, paste and surface treatment (a typical problem with Type-Variety analysis). She argued that ware as an analytical category of the Type-Variety system should be based on surface treatment and that “paste” or “fabric” be used as a “single modal or analytic unit” crosscutting the type and ware categories (Rice 1976:541).

“Paste composition could conceivably, though not necessarily, be considered a single attribute class, analogous to form. The difficulty is that the differences in vessel proportions (such as wall height, mouth diameter, etc.) which are visually distinguishable almost immediately and are the qualitative and quantitative basis for form categories, are not always so immediately apparent with paste variables.” (Rice 1976:540)
Joseph Ball (1993:245) has suggested that Fry’s work at Tikal and Rand’s and colleagues’ work at Palenque indicate ‘multiform assemblages’ corresponding closely to the ceramic group level of classification (P. Rice 2009:148). It should be noted at the onset that neither Fry nor Rands incorporated Type-Variety classification into their respective analyses. The ceramics of Tikal are classified by type (but usually not separated into varieties) by Culbert (1993) and the Palenque ceramic sequence was not formulated through Type-Variety characterization; very few vessels or sherds recovered from Palenque fall into established type categories. Both Culbert and Rands (2007) agree that shape or form class analysis should be incorporated into the Type-Variety system, or used alongside it.

Compositional analysis (INAA and petrography) of pastes has been consistently incorporated into the Palenque regional ceramic analysis (Bishop 1975; Bishop, Rands, and Harbottle 1982; Rands 1967, 1969, 1974, 1980, 1987; Rands and Bishop 1980, 2003; Rands, Bishop, and Harbottle 1978; Rands and Weimer 1992). The Tikal ceramics are well-preserved compared to samples recovered from the Palenque region. Sherds recovered from Tikal are hard-fired, often with intact slips and painting. Sherds recovered from the Palenque region were fired at low temperatures, they are soft and brittle; slip preservation is horrible. The Palenque regional ceramic analysis has been at the forefront of paste or compositional studies for five decades, and straight-forward answers to questions of production and circulation have largely still not emerged. The lack of compositional analysis of paste with Tikal ceramics has been a hindrance to answering basic questions concerning the number of production units and the circulation of pottery.

Attempts to Isolate the Product of a Single Production Unit at Tikal

At Tikal, ceramics recovered during the University of Pennsylvania project containing visible muscovite (mica) inclusions concentrated geographically around the El Palmar ridge to the northwest of Tikal. Viewing the ridge as a likely source of the
muscovite-inclusion clays from which the stylistically and technologically uniform pottery was made, Fry suggested that “only one or several closely linked centers produced this ware” (Fry 1980:6). Another class of pottery with a visually identifiable distinct ceramic paste, “Tinaja Pink,” was also isolated and considered the product of a single or a few closely related production units (see Culbert 2003:66; Culbert and Schwalbe 1987).

Pottery recovered from the large de facto waster dump incorporated into the basal platform of Structure 4H-15 of Group 4H-1 at Tikal formed a tight cluster when subjected to compositional analysis through energy-dispersive X-ray fluorescence (EDXRF), although few elemental concentrations were analyzed [Fe, Rb, Sr, Zr] (Culbert and Schwalbe 1987:649, Fig. 12). Culbert and Schwalbe’s (1987; Schwalbe and Culbert 1988) EDXRF compositional analysis of Tikal pottery did not produce clear or definitive results (Beaudry 1991:253). Nonetheless, the compositional variability detected through the short run analyses did demonstrate the potential for isolating the products of different production units even within a small geographic region (Culbert 2003:36; Culbert and Schwalbe 1987:654).

Prudence Rice objects to the term “workshop” in connection with lowland Maya pottery production on the grounds that one has not been found (2009:140). On the other hand, household-level pottery production evidence has not been found either and this (hypothetically) should be recognizable through archaeological evidence at the majority of households (Underhill 1991). As Rice has noted, Fry suggested the possibility of three to five ceramic production loci for each class of pottery at Tikal. Given the amount of pottery recovered at Tikal and the projected population of the center, these twelve to twenty production loci would have to include either large workshops or entire neighborhoods.
“Fall-off curves in the occurrence of various categories of pottery, principally four forms of monochrome serving vessels and utilitarian jars, suggested the possibility of three to five production loci for each class of pottery, including central Tikal, north Tikal, and two satellite sites: Navajuelal to the south and Jimbal to the north.” (Rice 2009:139).

As I read Fry’s work, pottery production at Jimbal did not enter the Tikal center to any great degree. I have also reviewed the method for calculating the number of production “centers” in chapter 4.2, concluding that these crude estimates should be considered highly speculative – the actual number of pottery production centers, groups, or units is currently unknown.

**Discriminating the Products of Different Production Units**

Similar to standardization measures indicating the relative number of production units regardless of their size (Costin 1991:36), the identification of many compositional reference groups reflect distinct ‘resource use’ groups within a region likely indicative of many production units (Costin 2000:387).

“However, a single resource use group might comprise one or many production units. In the latter case, other data would be necessary to test the internal homogeneity and structure of the group.” (Costin 2000:387)

Both D. Arnold (2000), working with living potters from Ticul, Mexico, and Stark, Bishop, and Miksa (2000), working with living potters from Dalupa and Dangtalan in the Philippines, found a positive correlation between the number of clay sources exploited and the number of production units for ceramics (Costin 2000:388).

Ceramic paste composition should not be the only variable used to distinguish different production units; additional lines of evidence will strengthen the conclusions of compositional studies and researchers do combine multiple lines of inquiry in practice (Costin 2000:389; e.g., Bishop and Foias 2007; Blackman et al. 1993; Hodge et al. 1993;
Rands 1967, 1969; Rands and Bishop 1980). It seems likely that, if anything, fewer units would be identified if separate production units or production groups shared resources to the extent that the composition ‘signatures’ of production units became blurred. Combining INAA with attribute standardization, typological, and modal analyses (including design elements) should facilitate reasonable inferences about the relative minimum number of distinct production units present. Stark, Bishop, and Miksa (2000) have demonstrated that INAA can be used to successfully distinguish among the products of communities in close geographic proximity and take the position that higher degrees of spatial resolution are possible with archaeological assemblages than have been typically attempted.

“The body of ethnoarchaeological work demonstrates that compositional groups may not always correlate with the ‘economic’ production units archaeologists variously refer to as workshops, production loci, production groups, or production centers. [Dean] Arnold (2000) asserts that the correlation is highly imperfect, and he counsels that compositional variability may reveal little about the organization of production beyond the general region. I suggest that if ethnoarchaeology were to demonstrate that there were rarely or [n]ever a correlation between ceramic compositional groups and human production units, archaeologists would be forced to abandon a key presumption and analytic tool, something Arnold comes close to advocating. However, several ethnoarchaeological studies…do show that compositional groups correspond to human groups, which interact economically, socially, or politically, although these groups may not be the ‘workshops’ (production groups) for which archaeologists are looking.” (Costin 2000:385-386)

Dean Arnold has argued that paste variability reflects various environmental, technological, and social factors (limiting factors) more than the organization of production (2000:336). Fair enough, but the scale of discrimination possible through compositional analysis certainly supports the method’s ability to clarify the organization of production across a region, or possibly throughout a single polity the size of Tikal.

“[T]he primary usefulness of paste compositional analyses lies in the identification, in geographic and geological spaces (‘community signature units’), of source communities that exploit raw materials within a limited range of probably no more than 3 to 4 km.” (D. Arnold 2000:333)
Prudence Rice (1996, 2009) also points out that compositional reference groups do not necessarily equate with workshops, and along with D. Arnold (2000) she is generally critical of the method. Neither has proposed a better idea, just warnings and caveats. Both prefer to investigate other aspects of pottery production. Rice warns that multiple production units may use the same clays and that a single production unit may use multiple clays. She also warns that the addition of temper may confound sourcing a paste to a geographic clay source (P. Rice 2009:128). D. Arnold and colleagues (see D. Arnold 2000; D. Arnold et al. 1991, 2000; Neff et al. 1988) have investigated the effects of tempering on paste composition, although more work is needed to strengthen the conclusions of such studies. In their study of Guatemalan pottery, Neff et al. (1988) were able to discriminate between two potting communities utilizing the same clay by relating differences in the two compositional groups to differential tempering practices. Even Dean Arnold points out that only resource shifts “of the greatest magnitude” will be evident in changing compositional signatures, “demonstrating the robustness of such measures” (Costin 2000:387).

**Determining the Relative Number of Production Units through Compositional Analysis**

Ethnographic investigations of pottery production in small-scale societies suggest that consistent paste recipes reflect different potting communities, at least at the level of a single village.

“One important conclusion that emerges from this study [of Raqch’i pottery production] is that in the south highland region [of Peru] today, potters of one village prepare their pastes virtually in the same way and with the same clay and temper for all the forms they make (with minor differences). This situation suggests that when vessels having different pastes are found associated in a deposit at an archaeological site, then more than one production center may be inferred, an interpretation in fact frequently used by archaeologists.” (Chávez 1992:85)

In more complex societies the same principle holds true, though the patterns may be more complex as a reflection of the greater number of pottery producers.
“Larger-scale pottery manufacture likely would entail more potters in a single community making larger (or more frequent) batches of pottery using similar recipes and resources. Alternatively, smaller-scale manufacture…most likely would involve a range of different (and possibly dispersed) producers, using diverse resources and recipes, and making their vessels is smaller (less uniform) batches. Thus, even if individual potters working at a small scale of production were conservative, maintaining a stable clay-temper combination, a regional assemblage of the pots made by such small-scale, dispersed, independent producers likely would be rather heterogeneous, as each potter would use their own recipe (and resources) that would differ from others.” (Feinman et al. 1992:241-243)

The basic premise appears sound – different pastes are a good indicator of the number of pottery production units despite the size of the settlements. In addition, using multiple lines of inquiry alongside compositional analysis provides opportunities to distinguish the products of different production units that incorporate distinctive attributes, consciously or unconsciously, into their pots. Although the potter is somewhat culturally restrained by normative values and consumer expectations, even subtle distinctions in the products of different pottery production units should be detectable. The correlation of paste, form, and design elements together allows the ceramic analyst to isolate the products of distinct production units by searching for constellations of various attributes correlating with specific paste recipes.

“The broadest limits on variability in a ceramic assemblage are set by the physical properties of the resources available to the potters. Consumers further restrict variability by imposing demands for particular properties of texture, color, morphology, and decoration that correspond to individual and traditional preferences. Within these externally imposed bounds individual potters are potentially free to experiment with different materials and techniques, though sanctions to conform to traditional methods may be strong (Reina and Hill 1978:231-251). Hence, producers tend to generate variety, while consumers tend to reduce variety through their selections (P. Rice 1987a:201).” (Pool 1992:293)

The ecology of an area and mode of transportation influence the availability of suitable raw materials and limit the resources that potters will have available to them. Dean Arnold’s cross-cultural ethnographic work with potters has provided important variables for modeling the production and circulation of ceramics in archaeological
contexts. The 7 km threshold distance to procure raw materials for pottery production is widely accepted. Although his figures have seen multiple revisions (see D. Arnold 1985, 1988, 1991, 1993), some constants remain.

“The procurement distance preferred by most communities appears to be 1 km. The second threshold lies at 3 km for temper sources and 4 km for clay sources. The last threshold lies at 7 km for both clay and temper and includes a cumulative total of 86% of the distances to clay sources and 91% of the distance to temper sources (Arnold, 1985, pp. 35-57, 1988, 1991, pp. 337-340, 1993, pp. 200-204). Stated simply, potters use local sources of clay and tempers; most ancient potters probably did not trek more than 1 km to obtain clays and tempers and few probably traveled more than 7 km.” (D. Arnold 2000:343)

Ancient potters probably collected raw materials for ceramic production nearby and given variability in resources over geographic and geological space, variable paste compositions more than likely reflect differential access to these resources. The lack of efficient transportation throughout most of Mesoamerica suggests that potters would locate near their preferred raw materials and that the use of specific clays likely indicates proximity of pottery producers to these. Furthermore, individual potters, groups of potters, or workshops would have developed distinct paste recipes, and the archaeologist has a powerful tool at his disposal in compositional analysis for isolating the products of different pottery production units. Pottery also encodes information on production, function, and ideology. The ceramic analyst has multiple lines of analysis with which to differentiate the products of different production units. Of these, compositional analysis of paste is probably the most fundamental, but should not be used alone.

6.4 – Concluding Remarks to Chapter 6

This chapter began by considering the archaeological study of craft production and specialization. From intellectual beginnings characterized by simple dichotomies (i.e., attached versus independent), the rethinking of the subject of specialized production has become quite complex and involved. With time, fundamental categories and concepts have been questioned and refined. Some classifications have been debated to
the point of confusion. One must always specify the definition of a term employed; terms mean different things to different people. Unfortunately many of the important distinctions concerning the organization of production are difficult to uncover through archaeological data.

Throughout pre-Columbian Mesoamerica the production of craft goods was often conducted within a domestic setting or within the “household mode of production,” including the production of wealth or status items. Artisans often worked in several media and multicrafting was prevalent. The organizational typologies derived from Peacock (1982) and van der Leeuw (1976) still constitute the dominantly employed baseline for characterizing the organization of production. It is acknowledged that such schemes follow an evolutionary trajectory based in Western economic logic. Furthermore, a range of production contexts differing in scale and intensity have been subsumed within each category. For example, everything from ad hoc production of expedient flakes to fairly intense open-air workshop production of obsidian blades or pottery vessels has been characterized as “household mode of production” (e.g., Hagstrum 2001; Santley and Kneebone 1993).

Much effort has gone into defining the term specialization. It is important to state clearly what kind of specialization one is speaking of. Although difficult to ascertain from archaeological data, investigators want to know whether an individual concentrates on making just one or a small range of crafts or if they produce a more diverse range of things. Furthermore, does the artisan specialize in crafting from beginning to end, as in the potter who collects her own clay and temper to form her own pots which she fires herself, or does an individual specialize in just one step in manufacture, only mining clay or temper without performing the full range of tasks involved in the complete production process. This last point relates to the segregation of tasks within the productive sequence and the interdependence between producers and consumers. Archaeologists want to indentify intensification of production for greater output by recognizing any division of labor intended to maximize time and energy.
Greater production output is theoretically associated with more widespread exchange and greater interdependency among specialists within a community.

The term specialist has been applied to individuals crafting part-time and full-time; researchers want to know how much time is spent on craft production in respect to other primary production activities (i.e., producing their own food, clothes, and shelter). Within a market-based model, the specialized production of crafts to be exchanged in marketplaces (bartered or with currencies) allows specialist producers to craft full-time and exchange their products for all other necessities of life. This is not the only path to full-time crafting, and part-time specialists commonly rely on marketplace exchange as well. The anthropologist must face the varied circumstances under which both part-time and full-time specialization emerges and both the informal and institutional arrangements through which different forms of specialization can develop.

Different classes of archaeological data have been used to determine and characterize specialized production. Locating physical loci of manufacture is the surest means of determining the organization of production. In addition to (or in the absence of) excavating production loci, durable artifacts encode information about how they were produced. Opinions differ as to why production becomes standardized and what classes of artifacts will become standardized. Assuming that production for greater output will result in more standardized products, analysts have developed standardization measures to gauge the relative degree of product uniformity. The standardization hypothesis (see P. Arnold 1991; Arnold and Nieves 1992; Benco 1988; Blackman et al. 1993; Blinman 1988; Costin 1986, 1991, 2000; Costin and Hagstrum 1995; Hagstrum 1985, 1986; London 1991; Longacre et al. 1988; Rice 1981, 1987b, 1996; Sinopoli 1988; Stark and Hepworth 1982) proposes that greater product uniformity is caused by higher rates of production (Roux 2003:768).

Uniformity or homogeneity of product results from the process of standardization. In this regard, standardization is both a conscious and unconscious pattern resulting from
intentional and unintentional increases in production intensity. Increased production input is believed to result in greater uniformity of metric dimensions. Although it has been demonstrated that standardized craft products do not always result from a conscious effort to increase production efficiency and output, measuring the effects of standardization on pottery collections has seen considerable attention. Various statistical measures of uniformity have been applied to archaeologically recovered ceramic assemblages, including CV values, $F$ tests, and Analysis of Variance [ANOVA].

It is widely accepted that uniformity is a relative state and that the degree of uniformity seen in any archaeologically recovered assemblage must be compared with other such assemblages or ethnographically derived statistics from living studies of potters working under a known organizational mode and production intensity and output level. Comparing archaeologically recovered ceramics with ethnographic samples has an inherent flaw; the two collections represent products crafted over very different time scales. While ethnographic collections of pottery were usually produced within a single day, season, or year within a single production unit or community, archaeological collections represent the product of unknown multitudes of producers working over several generations, at least. Therefore, archaeological assemblages are characterized by a degree of “cumulative blurring” whereby slight differences in the metric attributes of pots produced by many hands over many years cumulatively add up to a greater degree of dissimilarity. For this reason, some analysts hold little hope for comparing archaeological assemblages with ethnographic ones.

Other analysts maintain that measures of the relative standardization of metric attributes reflect the relative number of production units responsible for the assemblage. In general, greater dissimilarity is equated with higher numbers of production units and greater homogeneity is congruent with fewer production units. In addition to metric attribute standardization, ceramic pastes or paste recipes may indicate the relative number of production units or even discriminate a single one. Although compositional analysis of paste has been practiced and refined for decades, some analysts are still wary of the
validity of the procedure; the effective scale of analysis and precision of the technique have been questioned. Although I maintain great enthusiasm for the ability of compositional analysis to distinguish production units, this should not be the only line of inquiry. Compositional analysis is strengthened when used in conjunction with the analysis of metric attribute standardization and concurrence of paste standardization with specific forms, types, and design elements.

The next chapter reviews direct archaeological evidence for the identification of craft production. These studies help to define the organization of production for different classes of goods in different places and times throughout Mesoamerica. Household production is the dominant basic organizational mode, although qualitatively and quantitatively characterizing differences in household production is key to understanding the variety and flexibility of production contexts. The degree of elite or state involvement in the obsidian blade production industry of various centers is characterized along a continuum from completely independent to state controlled. Furthermore, independent production of obsidian artifacts is variably characterized as production purely for household use (at Copán) to a commercial system of independent entrepreneurs actively engaged in production for marketplace exchange (at Xochicalco). Reconstructions of the degree of elite or state control over the obsidian blade production industry have varied from strict control over the importation of the raw material for distribution to sub-elites as an incentive for political allegiance (at Copán) to complete state control over an international trade monopoly (at Teotihuacán).

Beyond the excavation of physical loci of production, several case studies emphasize the metric or compositional standardization of ceramics. This indirect measure of the organization of production has reinforced the dominance of household production; compositional analyses of utilitarian pottery suggest that many production units coexisted, producing similar wares. Large ceramic workshops or manufactories did not develop frequently (or at all).
While production at the household level is both widespread and variable, it is not the only form of production present. Independent household production is compared and contrasted with attached production in state workshops or sub-elite households; nucleated industry of ceramic manufacture is also contemplated. Different production unit’s degree of independence is also discussed. The crafting of unique status items was organized in different ways in different communities, from the production of elite status ornaments and paraphernalia for consumption by the elite producer or his king at Aguateca to the production of elite costumes within large corporate groups at Teotihuacán.
Chapter 7– The Organization of Craft Production in Mesoamerica

A considerable corpus of literature exists concerning the organization of craft production in ancient Mesoamerican societies. Both archaeologically recovered evidence and theoretical constructions of systems of production vary from subregion to subregion. This is particularly frustrating for the Maya Lowlands because of the lack of eyewitness accounts of production and exchange from the Classic period. Analogies with Contact period societies (i.e., Aztecs or Mixtecs) inform of possibilities, but are perhaps misleading when directly applied to the Classic Maya Lowlands. A few cases characterized by exceptional recovery conditions do add considerably to our knowledge of production in the Classic period. After reviewing the evidence for and implication of production in the Classic Maya Lowlands, this chapter continues with a broader theoretical discussion of the contexts of production throughout Mesoamerica. The chapter then returns to contemplations of ceramic vessel assemblage sizes and the evidence for kiln production in Mesoamerica. The chapter concludes with a review of regional survey and excavation programs in Vera Cruz, Mexico aimed at recovering ceramic production evidence and reconstructing pottery economics in the Classic period here.

7.1 – Household Craft Production in the Maya Area

Artistic Crafting at Aguateca

Excellent evidence of craft production has been recovered from the epicenter of Late Classic Aguateca within definity elite contexts as well as in lesser status residences. The majority of occupation at Aguateca dates to the Late Classic (A.D. 600 – 830) when signs of warfare are at their highest in this region. An extensive system of defensive walls was constructed at this center, which is situated upon an isolated and defensible
plateau. Other centers in the general area also have defensive walls (Dos Pilas, Punto de Chimino) and some centers show clear evidence of violent ends at the hands of invading enemies (Dos Pilas, Cancuen). Likewise, Aguateca appears to have been sacked by outsiders who looted and burned the royal palace (Inomata et al. 2001) and set fire to the roofs of other elite residential structures, followed by the rapid abandonment of the entire community (Inomata and Stiver 1998).

While the excavated ruins of the royal palace are difficult to interpret owing to a complex termination scenario (Inomata et al. 2001), several multi-room structures interpreted as residential homes for nuclear families had large inventories of artifacts covering their floors. Aguateca Structure M8-10 (“House of the Scribe”), measuring 17.2 m x 4.2 m and consisting of three main rooms and two smaller ones, had an extensive artifact assemblage in situ. Excavations revealed that Structure M8-10 was built in a single construction episode, but did contained two subfloor burials. The excavators have interpreted this structure as the residence of a small nuclear family (3 or 4 persons) of elite status.

Artifacts representing production activities once performed within Structure M8-10 include stone mortars with chert or obsidian pestles (for pigment processing), halved conch shells (for holding processed pigments), shell artifacts (adornments), bone needles and spindle whorls (for textile production) and manos and metates (grinding stones for food production). The artifact distribution suggests that the structure was home to an elite male scribe and an elite female textile producer, most probably the scribe’s wife, who were engaged in some low volume craft production within a domestic setting in the site’s epicenter (Inomata and Stiver 1998). The artifact distribution also evinces a dextral/sinstral split, with scribal gear to the right and weaving gear to the left. The excavators interpret this division as a clear indication of differential male vs. female space, with a male scribe acting as household head and his wife engaged in textile production, among other things.
The excavators also found evidence of some bone and shellworking as well as finished ‘prestige’ goods which are interpreted as personal possessions of the Classic inhabitants. The shell necklace illustrated by Inomata and Stiver (1998:Figure 8) is certainly a finished product and probably a personal possession; however, the midden associated with Structure M8-10 did contain production debris from shell tinkler manufacture (Aoyama 2009:103). The cut bone within the structure and the bone and shell manufacturing debris recovered from the household midden are suggestive of production for personal consumption and/or exchange on a low volume basis. Several craft items recovered from M8-10 certainly qualify as status items reflecting occupation or rank distinctions. One shell artifact was inscribed with a personal name followed by the its’aat (scribe) title and the Aguateca emblem glyph; another shell artifact was carved into a monkey head quite reminiscent of monkey scribes in Classic Maya art (Inomata and Stiver 1998:437, 442 Figure 9). A human skull carved with a glyphic text referring to an accession ceremony attended by the Aguateca ruler was also recovered from M8-10 (Aoyama 2009:103).

It seems likely that the male household head who made Structure M8-10 his home was himself a scribe who worked in several media, most likely manufacturing his own ‘prestige’ goods. He was not the only scribe living in the epicenter of Aguateca. Structure M8-4 had the greatest concentration of scribal tools, including chert palettes [n=13] and thin pestles [n=2]; Structures M8-8 and M7-22 each had one matched pair of a chert palette and pestle (Aoyama 2009:74-75, Figures 5.19-5.21). Quantities of bifacially worked chert artifacts were also stored in the north room and north addition of M8-4. One cache consisted of 20 oval bifaces, 11 points, and 5 picks, the other contained 22 oval bifaces and 8 points; both were accompanied by chert flakes and flake cores. In contrast, no lithics from the Palace Compound [M7-22 and M7-32] show evidence of craft activity such as shell or bone carving, leading Aoyama to speculate that the royal family received such craft items from other households while they themselves did not engage in craft production (Aoyama 2009:75).
The boneworking may even indicate that the female (or the male) from M8-10 produced bone needles for weaving. Many craftspeople in preindustrial contexts prefer to produce their own specialized tools; it is not unlikely that even elite artisans at Aguateca preferred to manufacture their own tools and production implements. Cabrera Castro and Gómez Chávez (2008) report that evidence of craft production at the La Ventilla compound at Teotihuacán includes tools probably made by the artisans themselves. Production included jewelry (ear ornaments, beads, and pendants), masks and small sculptures worked from shell, slate, mica, travertine, greenstone, pyrite, crystal, and amethyst. These artisans produced their own tools from bone, obsidian, and chert; many bone implements were manufactured from human bone.

The overall picture that emerges from Structure M8-10 is one of a small nuclear family of elite status living in the site epicenter and engaged in multiple kinds of production within a domestic context, none of which were highly specialized or of high output volume. This situation is intriguing in light of the heavy emphasis placed on attached or tethered specialists (e.g., Brumfiel and Earle 1987; Earle 1981; Gero 1983) when discussing Classic Maya craft production and political economy. It would seem that, at least at Late Classic Aguateca, some craft production of ‘elite,’ ‘status,’ or ‘prestige’ items occurred within a domestic context for immediate consumption or under patronage of dynastic elites without any complex system of exchange, in the formal sense. Of course, we do not know the social system behind the production and distribution systems, so it would be premature to assume that production and exchange at Aguateca were simple matters. Any number of complex patron-client, kinship, or socio-political institutions may have regulated the circulation of items crafted under these circumstances. We are also unaware as to how the raw materials for pigment production, shell working and textile manufacture were obtained, but it does seem clear that the actual processing and manufacturing was completed within the domestic context.

The M8-10 elite couple likely produced craft items on an attached or commissioned basis for the royal family or other high ranking elites of Aguateca, or they
may have produced these items voluntarily within a reciprocal gift exchange situation. The scribe apparently produced his own badges of office, the very same ‘elite’ or ‘status’ costume adornments which marked his ‘profession’ and status at the royal court.

Multi-room residential structures excavated in the central district of Aguateca range from lower-status residences to the dynastic palace. Structure M8-13 was smaller and more poorly constructed than other residential structures nearby; the artifact inventory of this structure is essentially domestic, with basic tools for food preparation and storage while lacking in jade beads and shell ornaments (Aoyama 2007:14; Inomata et al. 2002:321). Hammerstones, chert cores, and chert flakes were present, though they appear to indicate low level household consumption of expedient tools (Aoyama 2009:96, 101).

“In sum, based on the lithic data from the [M8-10/M8-13] midden, the residents nearby engaged in the artistic and craft production of hide or leather goods as well as wood and bone or shell objects. They also prepared food and produced chert casual flakes and bifacial tools.” (Aoyama 2009:104)

Analysis of the lithic inventory of Structure M8-13 indicates that the inhabitants were engaged in wood carving, hide processing, and bone or shell carving in addition to basic subsistence work, which included cutting grass and digging in the dirt. The lithic analysis combined with the distribution of bone (Emery and Aoyama 2007) recovered suggest that these lower status individuals were involved in bone tool production from the early reduction stages to final finishing. Mostly bone perforators or blanks were produced in the west room of, in front of, and behind Structure M8-13 (Aoyama 2007:16).

Structure M8-13 is within the same compound as M8-10, the previously discussed “House of the Scribe,” and the inhabitants of these two structures must have been socially connected in some way. Evidently lower status families lived in close proximity to higher status relatives, or perhaps they were related as retainers by rank and not kinship.
In either case both households were engaged in craft production within a domestic setting.

“The scribe of Str. M8-10 appears to have conducted various activities, such as writing, painting, and carving of shell, bone, and wood. In other words, his work was not highly specialized. The amount of manufacturing refuse found in work areas and middens is small, indicating a small scale of production. It is also important to note that such manufacturing was carried out within domestic contexts, together with food storage, food preparation, and textile production by a female. These data suggest that some elite goods were manufactured by the elite themselves in a production system of small scale and of low intensity.” (Inomata and Stiver 1998:447)

Production within Other Elite Households at Aguateca

The recovery of a large number of polished stone celts [n=22] from a multi-room dwelling prompted excavators to name Structure M8-8 “the House of Axes,” apparently the home of an elite scribe and his nuclear family (Inomata et al. 2002:318-320). Microwear analysis suggests that these celts, as well as all other celts recovered from the Aguateca excavations, were used for stone carving. Aoyama interprets the polished greenstone celts recovered from Structure M8-8 as a stelae carver’s tool kit, noting that this residence is only 250 m from the Main Plaza of Aguateca where stelae commemorating Tahn Te’ K’inich (Ruler 5), the ruling king at the time of abandonment, are concentrated (Aoyama 2007:18). Other implements recovered from this structure, such as needles and spindle whorls, indicate that hide and textile production, as well as some finishing of bone perforators and shell adornments, occurred within the domestic context of Structure M8-8 as well (Emery and Aoyama 2007:85). Much like Structure M8-10, the “House of the Scribe,” Structure M8-8, the “House of Axes,” appears to be an elite nuclear family residence where the male household head and probably his wife were engaged in low volume craft production.

The lithic tool and artifact inventory from Structure M8-4, adjacent to the Palace Group at Aguateca, indicated that this was also the home of a high-status skilled craft
worker involved in the production of prestige goods fashioned from stone and bone. Stone mortars and pestles recovered from this structure were most likely used for pigment preparation. Structure M8-4 was named the “House of Mirrors,” because over 300 mosaic pyrite fragments were recovered in its south room, they appear to have been ornaments (Inomata et al. 2002:315). Square plaques and jester god ornaments carved from alabaster, which once formed a single headband, were recovered from the surface of an excavated bench in the south room of this structure (Inomata 2001:328). This is likely a personal possession of the last king of Aguateca, Tahn Te’ K’inich, who is depicted wearing a jester god headband on Aguateca Stelae 7 and 19. Shell and bone were also worked within and behind this structure with bifaces, drills, bifacial thinning flakes, tertiary flakes, and even chunks of chert (Aoyama 2007:19-21). The totality of evidence from M8-4 suggests that the craftperson(s) living here created or repaired royal regalia, including elaborate composite pieces worn as badges of rank by the king himself (Emory and Aoyama 2007:85).

“Although shell or bone carving was conducted on a part-time basis, the scribe living here may have engaged in a variety of artistic work as an attached producer serving the ruler, including the skilled low-volume production of shell and bone objects of high symbolic value as royal regalia. As Inomata (2001:324) asserts, such objects made by a skilled elite craftsperson were probably highly valued and the act of craft production itself was also heavily loaded with ideological meaning.” (Aoyama 2007:21)

Although partially confounded by a complex series of termination rituals conducted by victorious forces that sacked Aguateca (Aoyama 2007:22; Inomata 2003:57; Inomata et al. 2001), the excavated Palace Group structures [M7-22 and M7-32] did not contain lithic tools or other artifactual or contextual evidence of craft production on the same scale as that documented for Structures M8-4, M8-8, or M8-10, with one important exception. Excavation of Structure M7-22 of the Palace Group did produce seven polished greenstone celts used for stone carving. It is possible that members of the royal family were themselves involved in some stone carving, perhaps the carving of stelae. Occasionally the artists who painted figural scenes on pottery have been identified as members of the royal dynasties of specific Maya centers. The evidence from Aguateca
suggests that the majority of elite regalia production for the royal family was in fact produced by other households of elite status themselves. Aoyama believes that the royal family of Aguateca received finished status artifacts and regalia from the nearby craft-producing households, such as M8-4.

“If this interpretation is correct, it implies a socioeconomic difference in craft production, between households, i.e., elite attached producers working for the ruler…although there is no evidence for large-scale, full-time production at Aguateca, part-time production of both utilitarian and luxury goods occurred within the city…Aguateca was a center of artistic and craft production as well as of consumption…a significant portion of Maya elites, both men and women, engaged in artistic creation and craft production…in both attached and independent contexts and manufactured not only luxury goods and weaponry but also utilitarian items for intrahousehold and extrahousehold consumption…Importantly, such manufacturing was carried out in domestic settings.” (Aoyama 2007:23, 24)

While primary production debris is present at several structures excavated within the main group at Aguateca (M8-10/M8-13, M7-34, and M7-32), only at M8-10/M8-13 is primary debitage a substantial components of the recovered assemblage of modified bone artifacts. Excavation of other structures did produce evidence of secondary reduction and finishing of bone perforators (as well as finished tools), leading Emery and Aoyama to speculate that the residents of M8-13 may have been responsible for the production of bone perforator blanks which subsequently found their way into other crafting households for final forming, finishing, and use as tools (Emery and Aoyama 2007:81). Furthermore, they note the absence of bones with evidence of butchering or skinning at M8-10/M8-13, despite the recovery of lithics used in meat and hide processing from the group.

“It is tempting to suggest that both the production of perforators for hide working and the hide working itself were done in this area [M8-10/M8-13] but that the initial butchering of animals to obtain hide or bones was not done here.” (Emery and Aoyama 2007:83)

Evidence from test-pitting of the Granada Group [Structures L8-70 and L8-62], located a few hundred meters to the west of M8-10/M8-13 does indicate primary
butchering of mammalian animals bones (mostly deer). Combined with a lack of evidence for hide processing or any bone/shell working at this group, Emery and Aoyama have suggested the possibility of butchering by a hunter or specialized meat processor here (2007:83).

It may be tempting to view the distinct butchering local, the primary bone reduction household [M8-13] producing blanks, and the multiple households that finished the bone blanks before using them as evidence of assembly-line production. I think this would be overstating the degree of specialization apparent, in the sense of a segregation of tasks for the maximization of time and energy. While a separation of activity areas for production stages has been advanced as a criterion for defining a workshop (e.g., Peacock 1982; Underhill 1991), the situation at Aguateca seems to indicate a multitude of basically unspecialized crafting at numerous households without much hierarchical organization. This is not to say that the craft workers were unskilled, quite the contrary. Craft producers at Aguateca must have had knowledge of many aspects of the production sequence, from the skill to manually work stone, bone, and shell to literacy in glyphic writing and iconography to the penchant to finish their own tools for specific production aims.

**Lithic Analysis at Aguateca**

Kazuo Aoyama’s (2007) functional analysis of lithic implements from six residential structures has expanded our knowledge of craft production within Aguateca’s clustered elite residential sector. Microwear analysis of thousands of lithic artifacts from the burned and abandoned epicentral structures has elucidated the range and context of craft production within this Classic Maya center. The analyses of the artifact distributions strongly suggest that obsidian, predominantly from the El Chayal source in Guatemala [96.1%], was imported into Aguateca in polyhedral core form, where prismatic blades were manufactured on-site. Members of some elite households manufactured blades in or near their residences in the core of the site and allegedly

Obsidian, chert, and greenstone implements were employed in the manufacture of elite craft goods in some households, and obsidian and chert tools were also commonly used in a range of mundane household activities, such as processing hide. Expedient flake tools were dominant in all households excavated, apparently produced from chert cores on a need-by-need basis; flakes could be refitted to cores within the same structure. Biface thinning flakes also comprised a considerable percentage [17.9%, n=1100] of the chert artifacts excavated, indicating that biface manufacture was also performed at the household level (Aoyama 2007:9), or that biface thinning flakes were circulated as utilitarian cutting implements.

The artifactual and contextual evidence, taken together, indicate that the elite segment of society at Aguateca was made up of households involved in multiple domestic and craft production activities. Scribes made craft items for themselves and other elites and were most likely the warriors who defended the center when it was attacked and definitively sacked (Aoyama 2007:14, 2009:127).

**Distribution Patterns and Elite Control**

Obsidian is more frequent in excavations closer to the Palace Complex and increasingly less frequent in excavations further away. This concentric pattern of decreasing obsidian density with distance from the center suggests elite control of the substance with elite artisans receiving a disproportionate quantity of the substance while lower-status residence living further away from the core received considerably less (Aoyama 2009:133; cf. Sidrys 1976). Cache 4 from the royal temple [L8-5] at Aguateca contained eccentrics made from obsidian macroblades, large percussion flakes, and large complete blades – evidence of the initial stages of polyhedral core reduction. Perhaps the
importation of obsidian and other long-distance trade materials and the control over their circulation was of paramount concern to the royal dynasty of Aguateca (and other Maya centers). Much like the situation described for Tikal (Moholy-Nagy 1976, 1990, 1992), evidence from Aguateca suggests that initial stages of obsidian reduction were performed in or near the epicenter. Somehow the reduction macro-debitage from this production made its way into epicentral caches and “workshop dumps,” incorporated into architecture during periodic construction episodes.

Many investigations have viewed the central architectural complexes at Classic Maya sites as regal-ritual court complexes (e.g., Ball 1993; Sanders and Webster 1988), primarily consumption rather than production centers, owing to a lack of workshop facilities or segregated barrios dedicated to specialized production. The Aguateca research highlights the centrally located production of exotics or prestige goods within elite domestic settings. It is likely that domestic productivity would have been culturally valued by the Classic Maya simply as a way of life, as an indication of health and prosperity. Domestic production by both males and females may have been considered highly respectable, even fundamentally necessary.

If we assume that other Maya centers had similar organization as that described for Aguateca, then perhaps the scale and context of production have simply not been detected archaeologically except under circumstances of exceptional preservation where portable objects were left in situ. Without the recovery of the tools, materials, and debitage from craft production, the presence and scale of this activity would be virtually invisible archaeologically. Obsidian reduction and lapidary production have been successfully documented at Copán (Widmer 1997, 2009), Teotihuacán (Widmer and Storey 1993) and Xochicalco (Hirth et al. 2006) through microdebitage recovery programs.

Pondering the identities of the elite craftpersons at Aguateca, Emery and Aoyama conclude that,
“Other archaeological evidence from Aguateca indicates that most households did have a specialty, including such activities as wood working, stelae carving, or scribing, but that these sometimes overlapped among households (Inomata 2001). Our evidence suggests that, regardless of their other specialties, most residents at the site were involved in some stage of bone/shell-artifact crafting. Craft production of different types was carried out in separate areas in each structure, but the evidence suggests that early-stage animal-product crafting…was conducted in the rooms…also used for food and textile production.” (Emory and Aoyama 2007:84, 86)

While the crafting at different households varies in terms of materials worked and products produced, the overall picture is one of nuclear families producing a variety of status items in addition to their regular domestic chores. There is a certain redundancy in production among the elite households of the core group near the Palace Complex and specialization does not appear to have involved specific materials worked into specific forms, but rather a general level of crafting expertise and artistic creativity expressed by certain individuals on a low volume basis, many of whom were literate.

The term production has been used by the Aguateca researchers in a very generic and open fashion; in reference to producing everything from the king’s personal stone diadem headband to removing a single expedient flake from a chert nodule. The terms “crafting” or “artistic creation” have more restricted usages referring mainly to the production of prestige items – from shell tinkler necklaces to stelae.

Evidence for production, in the broadest sense of the term, exists for all the households excavated at Aguateca. Domestic activities, including meat and hide processing, expedient chert flake knapping, and grain grinding are always present in each household. At least one paired mano and metate ‘grinding station,’ was recovered from each residential structure, usually located in a separate room to the left hand side of the central room (from the occupant’s viewpoint looking outward). These multiple room structures are presumed to be the residences of nuclear families and evince a basic dextral/sinstral division of space – presumed male activities (scribal work, shell and bone
crafting) are focused to the ‘right’ of the central room, dominantly female activities (grain grinding, weaving) to the ‘left’ (Emery and Aoyama 2007:86). Although evidence suggests some overlap between certain production activities (bone carving, expedient chert flake production), the division of gendered space appears to be a constant of the Aguateca households. The redistribution or exchange of goods between households is clear from the Structure M8-13 bone tool production and the production or repair of items for the ruler at Structure M8-4. Aoyama cross-fit the distal segment of an obsidian blade recovered from Structure M8-13 with the proximal segment recovered from Structure M8-4, assuming that a resident of M8-4 “allocated” the piece to someone at M8-13 (Aoyama 2009:97). None of these exchange situations involved high volume production or required complex exchange institutions.

Production from grain grinding to chert knapping through high-status goods manufacture was done within the household, either inside the roofed rooms, in ancillary rooms to the sides or back of the structure or in open spaces immediately adjacent to the structure. None of the excavated structures appears to have been a specialized workshop dedicated solely to craft production to the exclusion of all domestic functions. In general, Aguateca households were much like households from around the globe at all times in history; they were active arenas of a variety of domestic activities, many of which fall under the heading of production. Interestingly, the elite households of Aguateca appear to be the residences of nuclear families and not large extended-family compounds. Many of the routine daily activities represented by the artifact assemblages of these households would be expected of inhabitants of any social rank – food processing and cooking, expedient chert flake production, hide and textile working. The crafting of elite items within these domestic contexts suggest that high-status goods were produced in low volume by a number of individuals; the time required for production and the labor intensive process of manufacturing the goods imbuing each with high value.

A surprising number of craft producers have been identified through the Aguateca research, it seems that most, if not all, of the elites living in the habitation zone clustered
around the Palace Group were craft producers of one kind or another (Aoyama 2009; Emery and Aoyama 2007).

“We feel that the bone and lithic evidence strongly supports a conclusion that all members of the elite court were involved in some sort of crafting – it is possible that residents of even the primary residence of the king were involved in hide production, sewing, and decorating. Was the king’s family also involved in crafting? We believe so, on the basis of correlations between tools, debitage, and final products. However, it is also possible that apprentices or attached specialists worked in and around the palace of the king’s family on valuable raw material and in creating high-status goods.” (Emery and Aoyama 2007:84)

While the elite households of nuclear families lived within discreet structures or houses in the epicenter of Aguateca, inter-household kinship relations are unknown. Could the families of the densely populated core of Aguateca represent a single large administrative court? Could all inhabitants have been related by birth and marriage, forming a single extended corporate group? What was the social implication of the production mode and how did this influence distribution?

Crafting of high-value items was carefully controlled by the highest-status elites in Mycenaean polities, even in a much higher volume production context.

“Elites wanted to control those crafts that generated wealth. This in large part was because of the competition among the peer polities that made up the Mycenaean landscape (Cherry 1986). Anything that offered an opportunity for such accumulation was closely regulated.” (Kardulias 1999:70)

In the Mycenaean examples documented in Linear B texts, palace control extended over all stages of production. For example, wool from palace flocks was issued to weavers that were supported from palace storehouses, under administrative scrutiny. Likewise, the bronzeworkers would receive a large shipment of the raw material (ingots) which,

“…came to the centers, and was then assigned to bronzesmiths. The finished products were carefully inventoried by the scribes and kept in storerooms. The same situation seems to hold for the
production of perfumed oil, certain pottery, and other commodities (again, mostly precious items that provide low bulk and high value)." (Kardulias 1999:70)

The production contexts at Aguateca do not paint of picture of mass production for market exchange or high output production for redistribution on any great scale; nonetheless, production may have been sponsored and monitored in a number of ways. The general picture emerging is one of low-level production of unique items denoting occupation within highly limited exchange likely under direct patronage. Some more mundane items, such as bone needles, may have been produced in greater numbers and exchanged among households, but the majority of crafting evidence suggests that non-utilitarian or exotic status items were a major focus of production at the individual household level.

Craft Production within Copán Compound 9N-8

A somewhat parallel recovery context was encountered at Copán Group 9N-8, where the roofs of several structures had collapsed, presumably following an earthquake. Group 9N-8 is labeled a Type 4 extended habitation groups under the Harvard typology system (Willey and Leventhal 1979). This extended residential compound is located near the northeastern end of the Las Sepulturas causeway about 700 m from the Main Group at Copán. Group 9N-8 consists of eleven conjoined courtyards of varying sizes with forty to fifty structures (Webster 1989:12), and some parts of 9N-8 have been washed away by the river.

“The comparatively rare Type 4 units…are the most complex, consisting of many structures, some in excess of 5.0 m high, usually arranged around courtyards. At least some of the larger buildings have vaults, well-cut stone, and sculpture associated with them.” (Webster 1989:7)

In situ evidence of craftworking was recovered from horizontal excavations of Structures 110A, 110B, and 110C, located on the west side of Patio H of this extensive elite residential compound (Webster 1989; Webster et al. 1998; Widmer 1997, 2009).
Evidence from residential structures within this group suggest that attached specialists, probably working part-time within unspecialized domestic contexts, produced elite status goods from exotic materials at low volume rates for consumption by higher status elites. Structures 110A through 110C are multi-room buildings oriented in a line along the west side of Patio H with their doorways facing east, inward toward the plaza. Crafting activities have been reconstructed from the combinations of in situ artifact assemblages, architectural configurations, and debitage concentrations recovered (Widmer 1997, 2009).

I will briefly review the artifacts and recovery contexts from each of the structures, beginning with the central Building, 110B. Structure 110B has three main rooms and one smaller one (numbered 4, 1, 2, 3 from south to west) arranged in a line. The central room (1) has a large raised bench, or sleeping platform, and a small interior passageway leads from this room into Room 2, which has no exterior entrance. A second interior passageway leads from Room 2 into the smaller Room 3, which likewise has no exterior access. Room 4, while connected under the same roof, has an exterior doorway which opens onto the patio, but no internal passageway connected it to the other three rooms; one would have to exit the central room in order to access Room 4 from its outside entrance.

Room 2 of 110B, accessed through the small passageway from the central room, contained clear evidence of craft production in the form of a low stone bench or shelf upon which two ceramic vessels, craft production paraphernalia, raw materials, and both finished and unfinished adornments were resting when the structure was abandoned. Some of the artifacts were recovered from inside two of the pottery vessels while other artifacts were sitting directly upon the stone shelf; a third vessel was an incensario with copious amounts of burnt charcoal remaining in the bowl. Ten prismatic obsidian blade segments recovered from this feature were analyzed for use wear, and four of them were
dated using obsidian hydration, yielding a two sigma range of A.D. 713 – 1126\textsuperscript{23} likely placing abandonment of the structures in the Terminalate Classic period.

In addition to the obsidians, five pieces of cut and worked *spondylus* shell, freshwater mussel shell, two bone tools (fashioned from an antler and a mammalian femur bone), a basalt anvil, a shell bead, and a shell gorget were recovered from this feature. The antler bone tool had been ground to a point; wear suggests that it was used for working material softer than bone. The ten obsidian blade segments appear to have been hafted tool bits used mainly for sawing. Cut marks on the unfinished star shaped gorget confirm that it was made by laborious sawing with obsidian blades. A variety of unique artifacts were found in situ on the floor of Room 2 of Structure 110B, including a stone cylinder, two unusual stone palettes, and a possible stone box lid (Widmer 2009:179-182).

Within the even more restricted Room 3, accessible only through the small passageway from Room 2, a straight-sided cylindrical sandstone cup was recovered from floor level, along with a olivine-basalt celt tool; wear on this celt indicates that it was being used to form the stone cylinder (Widmer 2009:183). The restricted access pattern and manufacturing context indicate a specific form of isolated or ‘secret’ crafting within this structure (Widmer 1997:147).

“The unusual layouts of rooms 2 and 3 suggest distinct non-domestic activities. The secluded nature of the rooms with restricted access suggests that secretive activities took place inside them that might relate to esoteric, religious behavior, even restricted from other elites.” (Widmer 2009:177)

Room 4, whose floor-space is almost entirely covered with a raised stone bench or sleeping platform, also produced a few artifacts associated with craft production. Unlike Rooms 2 and 3, no in situ *de facto* refuse indicative of craft production was recovered

\textsuperscript{23} The four dates dates are A.D. 921, 955, 980, and 988 before calculating error (David Webster, personal communication).
here. With direct access through an exterior doorway, Room 4 may have been re-entered to recover artifacts after the earthquake collapsed the roof over the other restricted access rooms. Alternately, this may have been primarily a domicile room for sleeping and resting, and not a locus of craft production.

A four-room structure situated upon the same platform as, and less than a meter to the north of, Structure 110B, Structure 110A also produced some evidence of craft production activities around Patio H. Two side rooms, accessible only through the central room, provided roofed space for craft activities away from public view; a fourth room appears to be a later addition to the front of the structure. A few spindle whorls and bone needles within the central room suggest textile working in a domestic context, while a more specialized artifact assemblage and “work-station” were recovered from the more restricted lateral room to the south. Within this side room, a portion of a pedestalled metate, a faceted olivine-basalt anvil and an intricately carved bone spatula suggested to Widmer that,

“Room 3 functioned as a workshop involved in cloth production, embroidering of marine shell, feather working (cutting and gluing), and perhaps cutting hide for the production of elite costumes.” (Widmer 2009:185)

The identification of feather working is largely based on the bone spatula which Widmer equates with Aztec feather working referenced by Sahagun (1959:162-169), adding that the basalt anvil would provide an acceptable surface for cutting feathers (2009:184). No use-wear analysis of lithic tools or physical evidence of the presence of feathers was recovered. What were recovered from the patio in front of Structure 110A are more bone needles, 44 fragments of marine shell, and 10 fragments of exotic stone, which led Widmer to conclude that Structure 110A was a “dedicated non-domiciliary” workshop (Widmer 2009:187, 194). Clearly, some craft production involving textile and shell working did occur within and in front of this structure. The third building of this group, Structure 110C, is considered a purely domiciliary structure; no production
evidence was recovered from either of its two large rooms, each containing a bench, or sleeping platform.

What are the general conclusions reached after the analysis of the three buildings and patio surface making up this group? First of all, residents appear to be of elite status. Although not the primary elites living in the extended 9N-8 compound, a large vaulted tomb chamber was found under Structure 110B. One of only two multiple-interment tombs in all of Group 9N-8, this chamber was, “architecturally elaborate and costly and contain[ed] the most lavish grave goods of any burial context in the 9N-8 complex.” The chamber contained four adult males and a child. One adult male individual had cranial deformation indicative of ascribed elite status; his skeleton also evidenced pronounced muscle attachments on the arm and wrist bones indicative of prolonged, repetative physical work. No burials were recovered from Structure 110C, the proposed workshop (Widmer 2009:188-190,194).

The craftworkers once residing at Patio H are interpreted as attached specialists, probably related to the dominant family of the 9N-8 complex through blood ties. Admitting that weaving, carding and spinning are not exclusively female activities in agrarian societies, Widmer does seems to suspect some division of labor by sex, although strict gender divisions are not readily observable in discreet activity areas of the group. At least six craftworkers are represented within the three structures of this group, although it cannot be said whether these were married couples or nuclear families (Widmer 2009:194-195).

The production at Structure 110A is characterized as lower intensity than at Structure 110B. A partial metate was also present in Room 3 of Structure 110A which Widmer interpreted as,
“indican un uso domestic, anque también puediera indicar una especialización economica en tejido.” (Widmer 1997:147)

[“indicating a domestic use, although it could also indicate an economic specialization in textile manufacture]. (Widmer 1997:147, my translation)]

So what were these individuals producing? Evidence suggests that craftworkers living in Structures 110B and 110C pursued ‘secular’ crafting within the domestic rooms of these structures and Structure 110A, the alleged workshop, while intermittently using the restricted interior Rooms 2 and 3 of Structure 110B for ‘sacred’ production of status items. The star-shaped shell gorget found in Room 2 of Structure 110B is argued to be a status adornment produced for the primary elite scribe household head of Group 9N-8. This directly parallels Inomata, Aoyama, and their colleagues’ view of the stone jester god headband recovered from an elite Aguateca household workstation as a unique personal adornment crafted especially for, and reflecting the supreme status of, the king of Aguateca.

Stressing the economically inefficient methods of production employed, Widmer does not consider Structure 110A a workshop for the production of commercial goods as much as an area devoted to manufacturing highly individual and personalized items. In general, Structures 110A and 110B are viewed as basically domestic space for the production of rare esoteric status markers within a larger household engaged in ‘secular’ production. Regardless of the ‘secular/sacred’ division of craft production, the overall tool assemblage of the group indicates that multiple crafts were practiced on a low volume basis (Widmer 2009:191-197). In conclusion, Widmer equates the low level of production within the compound as a probable indication that the residents were crafting on a part-time basis and that manufacture was inconsistent with production for a market system or market economy.
Concluding Comments on Craft Production in the Maya Area

These examples from Aguateca and Copán point to either independent or attached specialists probably working part-time at low volume craft production for themselves and/or higher status elites living in direct proximity. All of the elite-status structures from Aguateca discussed above (except for low-status M8-13, itself attached to elite-status M8-10) conform to the same pattern. A male household head produced status goods, while a female counterpart engaged in textile production; food preparation and varied other craft production were also carried out by the primary couple and perhaps other immediate relatives or retainers. Production context and intensity do not suggest commercial endeavors as much as they suggest precise crafting on an individual or nuclear family basis. Cathy Costin (2007:152) has pointed out that the Aguateca elite craft workers did not engage in physically strenuous production for survival – they were actively producing elite goods for their own advantage and social standing. The basic unit of production is either the individual, in the strict sense, or the household. These households could house a single ritual specialist, a married couple, or a more complex family group inhabiting multiple structures.

The Obsidian Industry of Classic Copán

“Evidence for the ubiquitous production of obsidian blades is conclusive. The presence of exhausted cores, and evidence of onsite core rejuvenation, is sufficient proof, backed up by the presence of core preparation byproducts and blades possibly broken in production and therefore unused. It would appear that all ranks of households had access to partially prepared macrocores, given the presence of but rarity of core preparation flakes and/or cortical material at all ranks of sites. Control of access to blades would not have been a major source of revenue to elites already in control of the most valuable productive resource, land.” (Mallory 1984:225)

John Mallory’s (1984, 1986) data derived from excavations conducted throughout urban and rural portions of Copán and come from both test-pit excavations and extensive horizontal excavations. Phase I data was compiled from 25 test-pits excavated within the
rural-urban zone of the Copán pocket and cover a range of site ranks, indicative of wealth differences. Phase I excavations were conducted by the PAC I project under the direction of Claude Baudez (1983) between 1977 and 1980; they were not randomly chosen (Mallory 1984:148). The Phase II data were collected from five operations combining horizontal and penetration excavations uncovering around 80% of each group tested. The PAC II excavation program was directed by William T. Sanders, between 1980 and 1984 (see Fash 1991:58-59; Webster et al. 2000:32-35).

Phase I test-pits each produced a few dozen to a few hundred pieces of obsidian, usually less than one hundred, and Mallory conflated these samples into larger units for analysis, maintaining samples separated by rank (i.e., all small residential groups or all large residential groups); all test-pits included in the analysis date to the Coner ceramic phase (ca. A.D. 700 – 850). Residential groups at Copán are ranked based on size, number of courtyards, and architectural elaboration according to the Harvard typology system (Willey and Leventhal 1979) on a scale from one to five; the Main Group or Principal Group is the only Type 5 Group, 17 Type 4 elite residential compounds and 29 Type 3 elite residences have been located. The majority of settlement is made up of Type 1 and 2 residences, all Type 3 and 4 residences together make up only 7.3% of all mound groups in the Copán Valley (Aoyama 2001:347; see also Fash 1986: Table 1; Webster et al. 2000:43-46).

Phase II operations are characterized by the opposite sampling strategy, with horizontal excavations exposing the majority of architecture and interior plaza space with close to full recovery from “Late Classic primary contexts” (Mallory 1984:151). Time and budget constraints precluded screening at these operations. Only backdirt from Operation CV-34 was fully screened and the microdebitage counts were slightly higher here while the counts of blade fragments recovered were about equal to all other operations. After evaluation of the recovered data, Mallory found no appreciable differences in obsidian consumption patterns as a function of rank (1984:259).
One Type 1 mound group, labeled Operation 12 or “El Duende,” and located in the mountain zone approximately 2.7 km northeast of the Main Group, was originally suspected to be an obsidian production site when surface concentrations of obsidian were noticed in a logging road cut (Mallory 1984:177). El Duende is a lower class “residence” lacking jade or architectural elaboration, and, in fact, no clearly residential features were identified through excavation of the mound group (Mallory 1984:184-185). Extensive excavation of this group confirmed that it was the loci for the production of prismatic obsidian blades and their subsequent use in some specialized non-lithic production. El Duende was the site of blade production for immediate consumption and not a workshop for the production of blades for exchange beyond the group (Mallory 1984:178).

An obsidian cache of about 3800 obsidian pieces and measuring 50 x 75 cm and 10-15 cm thick was recovered from the fill of the upper platform of Structure 1 of the El Duende Group, a non-domicile structure. The cache contained 26 whole and broken exhausted blade cores, over 700 percussion blades, and over 3000 pressure blades with evidence of edge wear. The deposit contained pieces from nearly all phases of core preparation and blade manufacture and was only missing very large cortical flakes and macroblades indicative of initial core preparation (Mallory 1984:181). The excavation of several platforms and a dense midden, all with obsidian production evidence, definitely confirmed that the El Duende Group was the physical site of obsidian blade production.

The excavation of a tamped clay platform approximately six meters square produced elevated densities of obsidian blades and exhausted cores indicating a production area. Another rough cobble platform covered with obsidian debitage was also associated with a Coner phase midden from which over 30 whole and fragmentary obsidian cores and nearly 1000 blades were recovered (Mallory 1984:181-182). The largest concentration of obsidian at this group was recovered from a sheet midden measuring 14 m x 6 m and was almost entirely composed of obsidian.
“North of Str. 3 and west of Str. 1 is a large midden composed almost entirely of used blade fragments, core fragments, and amorphous chunks of shatter, as well as scattered sherds. Total estimated volume of the midden is approximately 34 cubic meters, containing about 3500 pieces, or about 8900 grams, of obsidian per cubic meter.” (Mallory 1984:183-184)

Mallory initially estimated that, if obsidian densities were consistent throughout, this sheet midden would contain 91,056 blade fragments (33.6 m³ times 2710 blade fragments per m³) (Mallory n.d.). Using his published figure of approximately 3500 pieces/m³ a total of 117,600 pieces of obsidian would be in the single deposit, more than the total number of obsidian pieces analyzed by Aoyama for all of Copán. A much smaller obsidian workshop dump (.2 m³) with a comparable density (by weight) was recovered from the Main Group of Copán; it was about one meter square and twenty centimeters deep containing 4835 pieces of obsidian (OD = 7979 g/m³) (Aoyama 1999:115-117, 2001:352).

Mallory suspects that a few generations of specialists lived and/or engaged in craft production at El Duende during the Coner phase (ca. A.D. 700 – 850). The limited inventory of domestic artifacts recovered through full excavation of the group suggests that it was perhaps occupied only part of the year (Mallory 1984:184-185). Approximately 30,000 obsidian blades were produced and then used at the El Duende Group during this relatively short time span (Mallory 1984:243-244). The use-wear pattern of these obsidian blades was markedly different than those blades recovered from typical domestic units throughout Copán, suggesting that the craft specialists of El Duende were engaged in more specialized production on a part-time basis (Mallory 1984:246, 260). Approximately 24% of the obsidian blades recovered lacked evidence of use-wear (Mallory 1984:223).

The El Duende Group or workshop produced the most extensive and definitive evidence of obsidian blade production, but this was not the sole evidence of obsidian blade production reported in Mallory’s study. Two test-pits at Sub-Operation 54 encountered higher than average obsidian debitage densities. This probable workshop
context produced 190 pieces of obsidian/m³ (OD = 97.9/m³). At Sub-Operation 54 less than 3% of the recovered obsidian was represented by prismatic blades as opposed to the approximately 50% blade fragments recovered from general excavations of residential sites of all ranks. The Sub-Operation 54 assemblage contained 27 lithic flake cores (six of obsidian and twenty-one of chert) indicating the intentional production of flake blades; the debitage did not represent biface reduction debitage (Mallory 1984:247). Table 7.1.1 lists Mallory’s calculated obsidian densities at Copán.

The Obsidian ‘Industry’ of Copán, a Second Viewpoint

Obsidian from at least six geological sources was imported into Copán: Ixtepeque, El Chayal, and San Martin Jilotepeque in highland Guatemala; La Esperanza in Honduras; and Pachuca and Ucareo in central Mexico (Aoyama 1999:15-19). Nearly all the obsidian recovered archaeologically from the entire pre-Columbian sequence (ca. 1400 B.C. – A.D. 1200) came from Ixtepeque, the closest source, about 80 km from Copán (Aoyama 2001:348). Aoyama believes that the central political authority at Copán monopolized the importation and redistribution of the nearest source of obsidian, largely to the exclusion of other sources, as a form of political consolidation of power.

“During the Late Protoclassic period, one of the ‘pre-dynastic’ rulers of Copán [see Stuart 1992:171] may have begun to sponsor the procurement of Ixtepeque blade cores and local production of fine blades on behalf of his community as one means of consolidating and legitimizing his own political authority. The decision does not appear to have been motivated by a desire to economize or to make a profit. Blades may have been distributed as a type of payola – as gifts used to attract subordinates.” (Aoyama 2001:351)

Aoyama analyzed 91,916 pieces of chipped stone from Copán pertaining to Early Preclassical through Early Postclassical times (1400 B.C. – A.D. 1100). His lithic collection comes from “a stratified random sample and extensive excavations of Phases I and II of the Copán Archaeological Project, Copán Acropolis Archaeological Project, the Carnegie Institution of Washington, and the La Entrada Archaeological project” (Aoyama
The study was initiated to address both changes in the obsidian exchange systems in Copán and its hinterland through time as well as the relationship between these systems and the development of sociopolitical complexity at the site (Aoyama 2001:346).

Table 7.1.1 – Obsidian densities for Copán excavation (After Mallory 1984:Table V.1).

<table>
<thead>
<tr>
<th>Site</th>
<th>OD (M³)</th>
<th>CD (M³)</th>
<th>O/C</th>
</tr>
</thead>
<tbody>
<tr>
<td>CV-34</td>
<td>54.6</td>
<td>26.0</td>
<td>2.1/1</td>
</tr>
<tr>
<td>CV-30</td>
<td>19.3</td>
<td>5.0</td>
<td>3.9/1</td>
</tr>
<tr>
<td>LCURBAN</td>
<td>13.3</td>
<td>4.6</td>
<td>2.9/1</td>
</tr>
<tr>
<td>LCRURAL</td>
<td>9.4</td>
<td>3.6</td>
<td>2.6/1</td>
</tr>
<tr>
<td>CV-26</td>
<td>9.3</td>
<td>3.4</td>
<td>2.8/1</td>
</tr>
<tr>
<td>CV-36</td>
<td>8.0</td>
<td>2.8</td>
<td>2.9/1</td>
</tr>
<tr>
<td>UCURBAN</td>
<td>13.4</td>
<td>1.6</td>
<td>8.6/1</td>
</tr>
<tr>
<td>UCRURAL</td>
<td>3.4</td>
<td>0.8</td>
<td>4.2/1</td>
</tr>
<tr>
<td>El Deuende</td>
<td>482.0</td>
<td>0.6</td>
<td>851/1</td>
</tr>
<tr>
<td>Sub-Op 54</td>
<td>97.9</td>
<td>90.0</td>
<td>1.1/1</td>
</tr>
</tbody>
</table>

OD = obsidian density
CD = chert density
O/C = ration of obsidian to chert

LCURBAN = Lower class urban sites
LCRURAL = Lower class rural sites
UCURBAN = Upper class urban sites
UCRURAL = Upper class rural sites
The chipped stone artifacts were classified by Aoyama by raw material and technological types (see Aoyama 1999) following the methodology and cannons established by Sheets (1978) and Clark and Bryant (1997). All obsidian artifacts were visually sourced (Aoyama 1994, 1996, 1999) and a subset was subjected to neutron activation analysis (Glascock et al. 1991). Kazuo Aoyama is well acquainted with the range of visual attributes of the various obsidian sources exploited by the ancient Maya. A 98% accuracy rate for Aoyama’s visual sourcing efficiency was confirmed through a blind test of 100 artifacts from the La Entrada region which were checked against neutron activation results (Aoyama and Glascock 1991). Additionally, he conducted microwear analysis on 3232 chipped stone artifacts using high-power microscopy (Aoyama 1989, 1995, 1996, 1999). His reconstruction of the Copán obsidian exchange system is based on multiple lines of inquiry, from technological analyses, source analyses, microwear analyses, and the statistical analysis of distribution patterns.

The data assembled by Aoyama displayed a statistically significant correlation between settlement rank and the percentage of obsidian recovered from midden deposits. A higher percentage of obsidian (to all chipped stone) was recovered from excavations of the Principal Group (Type 5) than at large residences (Types 3 and 4). Excavations at small residences (Types 1 and 2) recovered even lower proportions of obsidian than larger residences or the Principal Group. Expressed as the percentage of all chipped stone recovered, a pattern of decreasing access to obsidian characterizes the settlement hierarchy of wealth or rank as ascribed by architectural elaboration. The percentages of obsidian recovered from differentially ranked sites are as follows:

The Principal Group (Type 5): mean = 94.9%, s.d. = 4.2
Large residences (Type 3 or 4): mean = 85.4%, s.d. = 9.6
Small residences (Type 1 or 2): mean = 69.3%, s.d. = 19.6

Hence, a consistent pattern of decreasing access to obsidian and a concurrent increased reliance on local chert follows household rank, from elite to commoner status.
Microwear analyses of discarded obsidian blades indicate that those recovered from the Principal Group were less intensively used than those outside this group, suggesting that obsidian blades were discarded and replaced more frequently by the residents of highest social status\textsuperscript{24} (Aoyama 2001:354).

**Imported Green Obsidian at Copán**

Mostly during the Early Classic period small quantities of green obsidian were imported into Copán from the Pachuca source of highland Mexico, located approximately 50 km to the north of Teotihuacán (Charlton and Spence 1982:11-28) and hypothesized to have been controlled by this centralized state (Charlton 1978; Sanders, Parsons and Santley 1979; Santley 1983; see Clark 1986 for a critical evaluation of this opinion). This importation still represents a low volume undertaking and the recovery contexts of green obsidian at Copán suggest a social, more than an economic, undertaking. The small numbers of finished artifact made from green Pachuca obsidian include mostly prismatic obsidian blades, but also some bifacial points. Microwear analysis of the green obsidian prismatic blades indicate that these blades were used for a variety of mundane tasks such as meat or hide processing, or for working wood/plant material (Aoyama 1999:107).

Eighty-two green obsidian artifacts were recovered from the Yax structure (commissioned by the dynastic founder Yax K’uk’ Mo’) of the Early Classic version of Copán’s Principal Group, representing 9.8% of the recovered obsidian artifacts from this structure. Aoyama notes that Yax K’uk’ Mo’ has long been considered an outsider that arrived at Copán from the north (Sharer et al. 1999:20; Stuart 2000:492). Yax K’uk’ Mo’ is portrayed on Copán Altar Q (commissioned by the 16\textsuperscript{th} ruler in the line) and in a ceramic effigy vessel found outside of Ruler 12’s burial chamber (see Fash 1991:106-\textsuperscript{24}

\textsuperscript{24} The El Duende Group excavated by Mallory (1984) is a striking exception to the trend described by Aoyama (2001). At this modest group, a high volume of obsidian was encountered in a dense concentration and an estimated 24\% of obsidian prismatic blades from this deposite lacked use-wear (Mallory 1984:223).
111), in both portrayals wearing Teotihuacán-style Tllocogoggles; evidently his foreign nature was accepted and remembered up until the end of his dynasty’s rule in A.D. 820. Aoyama notes that the percentage of green obsidian recovered from Copán is lower than other centers to the north (i.e., Tikal and Kaminajuyu) that were affiliated with Teotihuacán symbolism, and presumably had stronger exchange ties with Teotihuacán itself (Aoyama 2001:352; Aoyama and Inomata 1997:105).

“At Copán, the percentage of bifacial points in green obsidian artifacts was only 2.7% during the Early Classic period, while at Tikal that percentage was 13.8% (Moholy-Nagy et al. 1985: table 1) and at Kaminaljuyú 18.8% (Kidder et al. 1946:136, 138). These data may indicate that the Yax K’uk’ Mo’ dynasty had different exchange ties with Teotihuacan than the other cities.” (Aoyama 2001:352).

This pattern could also be interpreted as representing a down-the-line trade pattern with decreasing amounts of green obsidian passed on to more distant Maya affiliates of the Teotihuacán state. Aoyama has noted the near absence of green obsidian from centers in the vicinity of Copán that did not have close connections (real or fictive) with Teotihuacán, such as Quiriguá, Chalchuapa, and those of the La Entrada region (2001:352). The importation of green obsidian at Copán, in finished forms, is interpreted in terms of social identity and personal interactions between local and foreign elites, not in purely economic terms (see Spence 1996).

**Obsidian Deposits Recovered from the Principal Group at Copán**

A small workshop dump (1 x 1 x .2 m) of 4835 pieces (OD = 7979 g/m³) recovered from the Principal Group was associated with the Gran Cornizas Platform (Aoyama 1999:115-117, 2001:352). The dump consisted of primary production debris and manufacturing rejects. The analysis of blade widths from the deposit produced a bimodal distribution, suggesting that many blades are missing from the assemblage and that they were removed as finished tools for exchange or use elsewhere (see Clark 1986:58). Following Clark’s estimates, the dump represents reduction of about sixteen
polyhedral cores (at 150 – 200 blades per core) and that 4186 – 8986 blade segments are not present in the debitage deposit. Applying an estimate of ten whole blades per family of five consumed annually, the deposit represents production to cover between 1000 and 1500 consumers (i.e., 200 – 300 households) for a year. The scale of production implies local consumption, not an export industry. Aoyama estimates that “a skilled part-time craft specialist could have manufactured these prismatic blade fragments in fewer than ten days” (Aoyama 2001:352).

Another epicentral deposit, or cache, was recovered from the Principle Group in 1938 and Aoyama considers this deposit of primary production debris a strong indication of centralized control over Ixtepeque obsidian and the subsequent distribution of polyhedral cores for the production of prismatic blades. The Late Classic deposit was comprised of 700 “unusually large macroblades” (mean length = 19 cm, s.d. = 3.4 cm) and macroflakes (mean width = 7.9 cm, s.d. = 1.7 cm) of Ixtepeque obsidian. Recovered by the Carnegie Institute of Washington project from the Great Plaza of the Principle Group (Longacre 1952:109), this macrodebitage indicates initial forming of polyhedral cores before blade production. Aoyama suspects that this material was ritually cached in the Great Plaza during a ceremony dedicated to demonstrating the religious and economic power of the Copán ruler (2001:354). This deposition may also be interpreted as conspicuous consumption to restrict the flow of obsidian and enforce the hierarchical distribution of the substance, first to loyal followers, as pre-shaped cores, and then to lesser ranked kinfolk of these, as prismatic blades produced from these cores. Accepting that the obsidian distribution pattern could be interpreted as indicating differential “purchasing power,” as a function of rank, Aoyama favors a different scenario.

“I believe, however, that this pattern may indicate a centralized dispersing mechanism (i.e., that the allocation of Ixtepeque obsidian blade cores was institutionalized by the Yax K’uk’ Mo’ dynasty [A.D. 426 – 820] as part of the political or public economy). This assertion clearly contradicts an earlier study conducted by Mallory (1984, 1986) in which he suggested that obsidian prismatic blade production was carried out in all households at Copán and that obsidian was equally available to all social classes.” (Aoyama 2001:355)
Hattula Moholy-Nagy has likewise suggested that obsidian core importation and obsidian blade manufacture was centrally controlled at Tikal, based on the recovery of eleven large obsidian debitage deposits from architectural levels within the North Acropolis at Tikal (1976, 1990, 1992, 1997). Unfortunately, thorough analyses of the Tikal deposits have not been attempted and questions concerning the organization of the obsidian industry at Tikal remain unanswered. Aoyama distinguishes the Copán obsidian procurement and distribution system from that of other Classic Maya centers based on Copán’s direct access to the Ixtepeque obsidian source.

“Copán’s direct access to high-quality obsidian signals a major difference between Copán and other major Maya cities. While the rulers of Copán were exporters as well as consumers of obsidian blade cores, the rulers in most [centers of the] Maya lowlands were mainly consumers of obsidian blade cores and middlemen within long-distance exchange networks...In contrast, obsidian was not a critical resource but a ‘preferred’ and scarce resource at Tikal, Palenque, and other Maya lowland cities far from the obsidian sources (Johnson 1996:166; Moholy-Nagy 1976:103).” (Aoyama 2001:357)

John Mallory concluded that control over obsidian would not have been a revenue generating mechanism, suggesting that control over land was the dominant prerogative of Copán elites (1984:225). Aoyama also rejects the hypothesis that control over obsidian was motivated by elites attempting to maximize efficient production or to generate profit (2001:351). The major difference in the conclusions of the two studies rests on the different viewpoints of the sociopolitical organization of the Copán polity. Both view the production of prismatic obsidian blades as decentralized. The difference of opinion concerns the mechanism of supply, Mallory favoring a model of unfettered access to the raw material, Aoyama seeing greater centralized control over the distribution of blade cores, not for profit, but for political motives. Aoyama’s conclusion that there was a materialistic underpinning to Copán’s administrative success and state development may bridge the gap between the centralist/decentralist camps’ perspectives on the basis of Classic Maya political authority referenced in his article.
“[O]ne group of scholars reconstructs unitary- or regional-states with strongly centralized organization and sees the major Classic Maya cities as the urban loci for administered economies integrated by organic solidarity [Brumfiel and Earle 1987; Drennen 1984; Earle and Ericson 1977; Ericson and Earle 1982; Johnson 1987; Rathje 1971; Sabloff and Lamberg-Karlovsky 1975]. Another group sees weakly centralized segmentary-states and proposes that lowland Classic Maya states had weak economic functions and that their power was heavily based on ideology [Adams and Jones 1981; Chase and Chase 1996; Culbert 1991; Folan 1992]. Some of the proponents of these models disagree widely about whether Classic Maya had strong managerial functions of exchange systems in utilitarian goods or whether such functions were weakly developed.” (Aoyama 2001:347)

This statement is both fact and a simplification of reality. A centralist-decentralist divide still exists, but the arguments of various authors are often complex and multifaceted. In order to be consistent, I will quote directly:

“[I]t cannot be too strongly emphasized that despite Fox’s [1977] occasional overstatement of the ritual/ideological determinants of the regal-ritual city…he is not reviving the old ‘theocratic/ceremonial’ perspective…He clearly believes that centralized power and authority derive mainly from control of important resources (especially proprietorial domination of capital resources), not from manipulation of ritual and ideology disembodied from their material and political underpinnings.” (Sanders and Webster 1988:527-528)

Hence, Sanders and Webster quite emphatically deny the overemphasis placed on ideology when they employ the regal-ritual city model. In a previous article, Inomata and Aoyama (1996) emphasized the restrictive nature of sticking doggedly to any one side of a dichotomous debate, a viewpoint that I admire. In an article discussing the organization of the Palenque polity, I chose to examine the evidence of political, economic, and ideological integration without phrasing these in terms of centralized vs. decentralized control. Largely because of the paucity of evidence, our broad discussion focused on differing levels of integration and control and the intensity and frequency of interactions at the local, regional, and interregional levels.
“Throughout this chapter we have intentionally avoided the ongoing debate in Maya studies as to whether Classic Maya polities should be considered centralized or segmentary states (Fox et al. 1996). A priori, our approach favors neither model; ‘a simple dichotomy between two models sometimes blinds us to important details of political and economic organization’ (Inomata and Aoyama 1996:308).” (Marken and Straight 2007:306)

I have provided a lengthy discussion of this debate in Chapter 4.5, but I stand behind my 2007 statement that I personally favor neither model over the other. Aoyama notes that not all households had access to polyhedral obsidian cores for blade production and that some of the poorer rural households must have received obsidian prismatic blades through some form of exchange or redistribution. Households also worked small river-born obsidian cobbles and large flake spalls for less sophisticated production of obsidian flakes (Aoyama 2001:353). In general, the Copán obsidian industry was characterized by a low degree of specialized production.

“There is no evidence for full-time chipped stone production or other nonsubsistence production with chipped stone tools in the ancient city of Copán, even during the Late Classic period...Although the presence of exhausted polyhedral cores or fragments is not definitive evidence for on-site manufacturing of prismatic blades, their presence in several residential groups suggests that the production of fine obsidian blades was not centralized.” (Aoyama 2001:353)

To address a more fundamental concern, were obsidian blades exchanged at all? What mechanisms or institutions facilitated this exchange? Mallory’s (1984, 1986) study suggests that the ubiquitous household production of obsidian blades made exchange unnecessary. Aoyama’s (1999, 2001) analysis suggests that the production of obsidian blades for exchange was not conducted on a large scale. Nonetheless, his model does postulate the control of obsidian cores by elites and their distribution to political supporters. Combined with the lack of production evidence at some poorer, rural households, some low level exchange is implied by his model. How was this exchange structured? Did sub-elites continue to redistribute obsidian cores down-the-line through kinship ties, finally distributing blades to the most junior of lineage members.
Aoyama interprets the presence, quantity, and context of green obsidian at Copán to indicate “social and symbolic rather than economic importance during the Early Classic period” (2001:357; see Spence 1996 for a similar conclusion for Tikal). He also suggests that green obsidian tools originating from highland Mexico may have been “redistributed” by the Yax K’uk Mo’ dynasty as gifts to supporters and to attract political supporters (Aoyama 2001:357) – the same reasoning he applies to the redistribution of Ixtepeque obsidian cores at Copán. Cassandra Bill reported that imported Maya polychrome vessels were rare in the urban core of Copán, and almost never encountered outside it (1997:543), again suggesting that the control over distribution of imported elite utilitarian goods was an important means of political control.

Aoyama does make a distinction between the long-distance acquisition and ‘redistribution’ through gift-giving of foreign green obsidian and the “local exchange” of obsidian cores in the development of sociopolitical complexity at Copán.

“However, local exchange was more crucial for state development than was long-distance exchange.” (Aoyama 2001:357)

One crucial aspect of the local circulation of goods not directly addressed by Aoyama’s study remains the basic mechanism of exchange to the most humble consumers of obsidian blades at Copán. Mallory’s data from the workshop labeled “El Duende” suggest that the elevated levels of obsidian blade production were not intended for exchange but were used at the same location for processing some other material. The overall obsidian density for the entire group of El Duende was calculated at 482 grams/m³, a figure that averages dense obsidian deposits (cache and midden) with extensive excavations of structure platforms and “empty” ground around the group. The obsidian density estimated for just the sheet midden (3500 pieces/m³, 8900 grams/m³) does support Mallory’s observation that most of the lithic material recovered was characterized by discarded blades (2.54 grams per piece).
The evidence from Mallory’s and Aoyama’s calculations combined suggests that the intensity of obsidian reduction at Copán was variable from one location to the next. The 2.54 grams per piece of obsidian at El Duende is greater than at Sub-Operation 54 (190 pieces/m³ at 97.9 grams/m³ = .515 grams per piece) or the workshop dump reported by Aoyama (4835 pieces/m³ at 7979 grams/m³ = .33 grams per piece). This last deposit was only .2 m³ and the average weight per piece is very low even though the overall density by weight is about the same as at the El Duende sheet midden, likely indicating that very small debitage was included in the calculation. Mallory’s excavations were not screened, and I suspect that higher weight per piece figure is a product of using only blade segments and not very small debitage. Nonetheless, three different assemblages produced three different obsidian densities.

Given that Mallory excavated only a small portion of the estimated 100,000 pieces of obsidian present at the El Duende sheet midden, full excavation of this deposit would add considerably to our knowledge of obsidian production and use at Copán. Full tabulation of the assemblage and more accurate estimates of the obsidian density would provide a better qualitative and quantitative basis for comparison with other deposits at Copán and other lowland Maya centers.

The Distribution of Obsidian in Areas to the South of Tikal

The Tikal-Yaxha Transect

The intersite area between the centers of Tikal and Yaxha was investigated by Anabel Ford (1981, 1986) by mapping portions of a 28 km transect, 500 m wide, between the two centers. Approximately 40% of the habitable area (i.e., non-bajo) was surveyed for structure mounds to be test-pitted; the study was primarily aimed at collecting data on settlement density and chronology. A total of 135 residential groups were mapped within 29 survey grids (500 x 500 m) comprising 3.2 km². A 10% sample (1 in 10
groups) was randomly selected for excavation by test-pits. The thirteen groups selected through this stratified random sampling procedure were initially probed with a post-hole digger (see Fry 1972) in order to determine areas of highest artifact concentration. One to three test-pits, measuring 1.5 x .75 m, were then excavated at each of the selected groups for a total of twenty-three test-pits at thirteen groups. All cultural materials (i.e., artifacts) were collected and all test-pits were screened through ¼ inch mesh.

Recovered ceramics range from Middle Preclassic through Terminal Classic times (ca. 800 B.C. – A.D. 950). Thirty-eight percent of the tested groups produced Middle Preclassic ceramics, although ceramics from this phase represent only seven percent of the total ceramic collection. Just over half of the ceramics recovered (51%) were Late Classic in date and 92% of the groups produced evidence of Late Classic habitation. Eighty-five percent of the groups produced evidence of Terminal Classic habitation, though again, Terminal Classic ceramics make up only 11% of the ceramic collection. In general, populations appear to have been stable in the tested areas, with continuity of habitation from Late Preclassic until Late Classic times, with only a slight drop (7% decrease) in habitation into the Terminal Classic period.

Table 7.1.2 – Chronological assessment of the Tikal-Yaxha transect groups indicated by ceramics (After Ford 1981:Table 5.4; 1986:Table 5.2).

<table>
<thead>
<tr>
<th></th>
<th>Middle Preclassic</th>
<th>Late Preclassic</th>
<th>Early Classic</th>
<th>Late Classic</th>
<th>Terminal Classic</th>
</tr>
</thead>
<tbody>
<tr>
<td>Percentage of groups with occupation levels from temporal periods</td>
<td>38%</td>
<td>92%</td>
<td>77%</td>
<td>92%</td>
<td>85%</td>
</tr>
<tr>
<td>Percentage of overall collection</td>
<td>7%</td>
<td>18%</td>
<td>13%</td>
<td>51%</td>
<td>11%</td>
</tr>
</tbody>
</table>

Seventy-two obsidian artifacts were recovered from the twenty-three test pits: 67 blade fragments (93.05%), 2 utilized flakes (2.78%), and 3 tools (4.17%). Ford reports an average obsidian density of 2.7g/m³ for the excavations (Ford and Glicken 1987:493).
From the published data, I calculate the excavated area of the twenty-three test-pits at 18.25m³; this figure has not been augmented to reflect the 141 post-hole tests (Table 7.1.3).

Using these figures I reconstruct the total obsidian recovered by weight at 49.275 grams for an average weight of .684 g per artifact. The OD from this intersite area is over three times higher than the OD calculated for the PST Project peripheral test-pitting program (.85 g/m³; average weight per artifact = 1.32 g). I suspect that screening of test-pits from the Tikal – Yaxha transect facilitated a slightly greater recovery percentage, but not enough to justify the discrepancy between the two collections. I attribute this difference in average obsidian density more to differences in excavation procedure than to any actual greater access to obsidian in the intersite area; many of the PST test-pits were not excavated through midden or refuse material, they were placed in non-artifact bearing interior plazas. One test-pit into a probable communal dump from a residential sector just southeast of the minor center of Chalpate produced 26 g (22% of the PST collection by weight) of obsidian blade fragments from approximately 2 m³ of excavated material, yielding an OD of 13g/m³ (the highest OD for any single test-pit in the PST sample). Evidently residents living around this minor center, about 9 km southeast from the Tikal epicenter, still had considerable access to obsidian blades.
Table 7.1.3 – Excavated volume of Tikal-Yaxha transect test-pits (After Ford 1986:Table 3.3).

<table>
<thead>
<tr>
<th>Group</th>
<th>post-holes</th>
<th>test-pits</th>
<th>depth (cm)</th>
<th>volume (m³)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2A</td>
<td>30</td>
<td>1</td>
<td>63</td>
<td>0.70875</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>48</td>
<td></td>
<td>0.54</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>65</td>
<td></td>
<td>0.8125</td>
</tr>
<tr>
<td>3A</td>
<td>15</td>
<td>1</td>
<td>60</td>
<td>0.675</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>89</td>
<td></td>
<td>1.00125</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>75</td>
<td></td>
<td>0.84375</td>
</tr>
<tr>
<td>5E</td>
<td>9</td>
<td>1</td>
<td>60</td>
<td>0.675</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>60</td>
<td></td>
<td>0.675</td>
</tr>
<tr>
<td>8A</td>
<td>7</td>
<td>1</td>
<td>185</td>
<td>2.08125</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>75</td>
<td></td>
<td>0.84375</td>
</tr>
<tr>
<td>19A</td>
<td>10</td>
<td>1</td>
<td>45</td>
<td>0.50625</td>
</tr>
<tr>
<td>25C</td>
<td>8</td>
<td>1</td>
<td>45</td>
<td>0.50625</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>75</td>
<td></td>
<td>0.84375</td>
</tr>
<tr>
<td>30C</td>
<td>13</td>
<td>1</td>
<td>90</td>
<td>1.0125</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>60</td>
<td></td>
<td>0.675</td>
</tr>
<tr>
<td>41E</td>
<td>11</td>
<td>1</td>
<td>45</td>
<td>0.50625</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>70</td>
<td></td>
<td>0.7875</td>
</tr>
<tr>
<td>44C</td>
<td>11</td>
<td>1</td>
<td>60</td>
<td>0.675</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>45</td>
<td></td>
<td>0.50625</td>
</tr>
<tr>
<td>58D</td>
<td>6</td>
<td>1</td>
<td>60</td>
<td>0.675</td>
</tr>
<tr>
<td>59A</td>
<td>7</td>
<td>1</td>
<td>90</td>
<td>1.0125</td>
</tr>
<tr>
<td>63D</td>
<td>8</td>
<td>1</td>
<td>90</td>
<td>1.0125</td>
</tr>
<tr>
<td>67E</td>
<td>6</td>
<td>1</td>
<td>60</td>
<td>0.675</td>
</tr>
<tr>
<td>totals=</td>
<td>141</td>
<td>23</td>
<td></td>
<td>18.25</td>
</tr>
</tbody>
</table>
The Central Peten Historical Ecology Project, or CPHEP (D. Rice and P. Rice 1979, 1980), conducted investigations around the Peten lakes region of Guatemala to the south of Tikal. Only one major center, Yaxha falls within the survey zone and the majority of survey and excavation represent non-center contexts. This recovery program was characterized by fairly extensive coverage and random selection of excavation locations covering the full range of elite to commoner contexts. Randomly placed survey transects radiating outward into the various basins from the lakes were generally 2 km long and 500 m wide. About 25% of the mapped mounds were randomly selected for sampling by 1 x 2 m test-pits, mound fill was not screened (Aldenderfer 1991:120).

Obsidian recovered from these excavations around Lake Peten Itza provide data from habitation to the south of Tikal. The Lake Peten CPHEP test-pitting program produced 826 pieces of obsidian from 355 structure fill or midden excavations. 296 pieces of obsidian (223 or 75.3% bladelet fragments, 4 projectile points, one chipped disc, one ground disc fragment, 2 scrapers, 24 prismatic core fragments and 41 flakes) were submitted for compositional sourcing (Rice et al 1985:592-593).

“The patterns of obsidian procurement in this [Lake Peten] area conform to the general outline of source exploitation identified for the larger civic-ceremonial centers of the Peten, in that most of the Preclassic obsidian artifacts are from the San Martin Jilotepeque source, most of the artifacts from deposits phased to the Classic period are from El Chayal, and most of the obsidians from Postclassic contexts can be traced to the Ixtepeque source.” (Rice et al 1985:604)

While eight discrete sources for the obsidian artifacts recovered from the Lake Peten regional survey have been identified through compositional sourcing (P. Rice 1984: Table 2), the majority were produced on obsidian from El Chayal (70.1%). Another 18.2% of the sample was produced from obsidian from San Martin Jilotepeque, 5.2% from the Ixtepeque source, and 5.2% from four other minor sources (Aldenderfer 1991:123-124). Interestingly, only two pieces (.2%) of green obsidian (sourced to the
Pachuca quarry in central Mexico) were recovered during the CPHEP program (Rice et al. 1985:598-599). The Lake Peten area is only 23 km from the center of Tikal, so distance does not seem to be as important of a factor as is the elite context of much of the green obsidian recovered from Tikal. The correlations between obsidian source and artifact form suggest that different quarries produced stone more amenable to the production of certain forms, or that craftspeople specializing in certain forms did not have access to all quarries.

The Lake Peten survey obsidian distribution data add another dimension to the overall distribution model; obsidian was even less abundant in the lakes region which was largely peripheral to the interior centers (i.e., Tikal). This situation supports a model of down-the-line trade or of a hierarchical market-system which did not effectively redistribute much obsidian to the lowest level of society (i.e.; C. Smith’s 1976b dendritic or solar system). Sidrys interpreted the quantitative Peten obsidian data as supporting an exchange model of centralized redistribution through Maya political centers, although he stated that the data could also support a central place market-system model. Any quantitative analysis of trade, such as Sidrys’ 1976 study, is still subject to the equifinality dilemma; we cannot discriminate between the alternate modes of exchange from the examination of the recovered distribution pattern alone (K. C. Chang 1975:24; Tourtellot 1978:15-16).

Mark Aldenderfer (1991) examined the obsidian artifacts from Late Classic contexts (Tepeu I and II, A.D. 600 – 830) recovered by the CPHEP. Only eighteen small, irregular chunks and three small fragments of obsidian blade cores were recovered, all from Late Classic community contexts. These irregular chunks are likely the product of direct percussion of exhausted cores. The three core fragments indicate that these cores were completely exhausted, each exhibiting a terminal’ “overshot fracture” from direct percussion, likely the last effort to remove a blade. None of these core fragments were associated with blades or blade production debitage and appear to have been
removed from any production context, likely recycled (Aldenderfer 1991:136, Table 7). The overwhelming majority of recovered obsidians were spent prismatic blade fragments.

“Fully 96% of the bladlets exhibit some kind of edge damage, and many of the artifacts have very steep, blunted edges which cannot be resharpened or effectively used. The superficial appearance of the blades is that they have been used to exhaustion and then discarded” (Aldenderfer 1991:132)

Obsidian density was found to decrease as a function of distance from the only major regional center, Yaxha. In addition, obsidian access appears to correspond with wealth; elite settlements, as perceived through architecture size, had greater access to obsidian blades (Aldenderfer 1991:133). The overall distribution of recovered obsidian indicates that obsidian blades were utilitarian goods available in small quantities to all residents of the lakes basins. Bifacial reduction of chert was confined to the major center of Yaxha and the smaller community of Macanche (Aldenderfer 1991:134). Evidence for obsidian reduction was extremely sparse, leading Aldenderfer to conclude that obsidian blades circulated to basin residents, not cores (1991:127).

“There is no evidence, however, of obsidian workshops similar to those discovered at El Pozitos (Nievens and Libby 1976) and Tikal (Moholy-Nagy 1976) in any community context in the basins sampled.” (Aldenderfer 1991:136)

Obsidian reduction appears unimportant in the Peten lakes region, practiced at a low intensity level and any obsidian available was evidently scavenged and recycled (Aldenderfer 1991:137).
Craft Production at Teotihuacán

Teotihuacán was the capital of a large and complex state-level society (Millon 1973, 1976), the second largest prehispanic city in the New World which dominated a large portion of Mesoamerica for a time (Cowgill 1979; Millon 1981, Spence 1986:76). Teotihuacán’s population is estimated at 150,000 in the Middle Horizon (A.D. 250 – 750) (Spence 1986:76), although the specifics of the demographic growth curve are interpreted differently by various authors (see Cowgill 1997). Numerous surface concentrations of obsidian debitage were located by the Teotihuacán Mapping Project (Millon 1973; Spence 1981, 1984, 1987).

A drastic increase in the number of obsidian workshops at Teotihuacán has been documented dating to the Tlamimilolpa phase/Metepec phase transition (ca. A.D. 400) (Santley 1984:59, Figure 3.6). Originally estimated at over 400 workshops (Santley 1984:56 after Spence 1981), a large and highly specialized obsidian industry has been proposed (Sanders and Santley 1983:283; Santley 1984, 1986; Spence 1977, 1981, 1984). After reconsideration of the physical evidence, the number of obsidian workshops was downgraded to around one hundred, grouped into twenty-nine areas with from two to twelve workshops each (Spence 1986:76). No core-blade workshops have been excavated at Teotihuacán (Hirth 2006a:1) and only one biface workshop has (see Carballo 2007, 2011).

The two main sources of obsidian worked at Teotihuacán are the Pachuca [green] source, located approximately 50 km to the north of the center, and the Otumba [grey] source, around 16 km to the east of the center (Charlton and Spence 1982:11-28, 39-50). Spence believes that the raw material was imported through a state-organized network and equitably distributed among all blade production workshops within the city (Spence et al. 1984; Spence 1986:79).
Santley et al. (1986:124) suggest that the low consumption rates for obsidian by Middle Classic agriculturalists within Teotihuacán’s immediate periphery indicate that the obsidian industry was primarily geared toward wholesale export, bypassing the immediate demand market. Clark (1986) generally views the Teotihuacán obsidian industry in terms of self-sufficiency and the provisioning of the immediate population under control of the Teotihuacán state with long-distance trade between elites primarily in exotic items.

The term “workshop” has been applied variably in Mesoamerica (Clark 1986:48). Originally called ‘workshops,’ or ‘work-shop areas,’ these obsidian debitage surface concentrations documented at Teotihuacán appear to equate with Moholy-Nagy’s concept of a ‘workshop dump.’ As Spence has clarified in a more recent publication,

“What I have called "work-shop areas" are therefore really in most cases spatially clustered secondary deposits of workshop refuse. Some may be refuse pits exposed by modern activities, but most seem to be lenses of refuse used as ancient construction fill.” (Spence 1996:30)

John Clark (1986) questions Spence’s interpretation of a state controlled obsidian industry at Teotihuacán. While Teotihuacán is interpreted as the primate urban center of a large regional state (Sanders et al. 1979) and allegedly controlled the nearby Pachuca and Otumba obsidian sources (Charlton 1978; Santley 1983), in Spence’s model, state control over obsidian workshop production is indicated primarily by their proximity to elite buildings. Clark finds these two viewpoints at odds with one another, suggesting that control is difficult to determine and that control may be exerted by the central ruling authority over some distances.

“Nonetheless, it is supposed that Teotihuacán exercised little control or no control over obsidian workshops unless they were located within spitting distance of major public structures! Surely a powerful state like Teotihuacán could have exercised control over resources anywhere within its domain and over craft production anywhere within the city’s limits.” (Clark 1986:33-34)
John Clark (1986) is also unconvinced that the workshops at Teotihuacán were producing for an external market. The absence of irregular initial series blades and the abundance of later reduction stage fine pressure blades (Spence 1981) indicate to Clark that cores could have been exported directly from the Pachuca mines to outside markets without direct intervention from Teotihuacán (Clark 1986:37). Suggesting that the commercial obsidian empire model is less supported by data than by consistent lip-service by reputable Mesoamerican scholars (Clark 1986:68), Clark favors a model of elite goods exchange (between elites only) to account for the presence of Teotihuacán obsidian artifacts outside the immediate area of control (Clark 1986:65).

“Citing Spence’s conclusion that 42.6 – 88.2 percent of all obsidian blades recovered from Teotihuacan ‘obsidian workshops’ were in fact used, Clark (1986) argues convincingly that areas yielding high densities of obsidian tools were workshops where such tools were used to manufacture other items, rather than primary obsidian workshops.” (Costin 1991:20)

Responding to the assertion that without excavation, the nature of the Teotihuacán obsidian deposits cannot be fully assessed (Clark 1986), Spence has emphasized just how abundant these features are and that it is unlikely that obsidian debitage was moved very far from the production context. What he has decided to call “work-shop areas” most certainly represent “discreet loci of workshop activity,” even if the particulars of absolute volume and technological attributes of the reduction sequence are unknown (Spence 1996:31). Hester and Shafer (1992:244) have used a ‘polythetic set’ of criteria to identify lithic workshops at Colha in the Maya lowlands. These include the recovery of manufacturing tools, debitage coding and tabulation, and technological analysis of the finished products, blanks, and discards. They concur with the notion that large debitage deposits do, in fact, reflect workshop activity and that debitage was probably not moved far from the production context.

“Regardless of whether the chipping occurred there or 50 m away does not alter the fact that the number of workshop deposits and production estimates for Colhá clearly support the presence of community-wide lithic specialization.” (Hester and Shafer 1992:244)
Researchers at Teotihuacán have linked the center’s obsidian export industry to demographic growth and state level political development (e.g., Santley 1983, 1984; Spence 1981). Recognizing the importance of an ‘obsidian industry’ at Teotihuacán, Cowgill suspects state control of the Otumba source, but thinks that claims of the dominance of this trade item in the rise of the state (e.g., Santley 1983, 1984; Santley et al. 1986) have been exaggerated and neglect the importance of military and ideational bases for the widespread diffusion of Teotihuacán ideology and symbolism (Cowgill 1997:144). Nonetheless, the Teotihuacán obsidian industry apparently expanded with the growth of settlement and social complexity.

“The Tzacualli phase (A.D. 1-150) shows some striking changes. There was enormous growth, with Teotihuacan probably becoming a state at some point early in the period. Population rose to about 60,000-80,000, there was a high degree of occupational specialization, the Sun Pyramid was erected, and much of the population of the Valley of Mexico appears to have been relocated (R. Millon 1973; Cowgill 1974; Parsons 1976; Sanders et al. 1979). There was a striking expansion in the number of workshops from 9 to 48 sites. Many of these were clustered in groups representing corporate social units with economic and religious functions. Most workshops were oriented toward production for local consumption, but for the first time the local-regional workshop area distinction now appeared.” (Spence 1981:781)

George Cowgill (1997:144) interprets the evidence for craft production at Teotihuacán to indicate differentially organized production of the same class of craft items. Production at the apartment compound level was not state-directed, although some workshops in the city’s epicenter were controlled by the state. Obsidian working debris in a walled precinct west of the Moon Pyramid [Site 6:N5W1] and a workshop for the production of “theatre” incense burners and their mold-made adornments in an enclosure attached to the Ciudadela [Site 2:N1E1] indicate either attached specialized production or periodic labor service. Cowgill characterized such production situations as independent craftspersons “probably working under state or at least institutional supervision and sponsorship” (2008:101). Surface indications of a theatre censer production local have been reported near map square N6W3, far from the core of the city and may indicate independent production of the same type of ceramics (Cowgill 2008:101).
Manzanilla (2009b:31) has identified craft production at four different scales at Teotihuacán:

1. Part-time craft production within apartment compounds.
2. Craft sectors with concentration of production.
3. Multiethnic barrio (oikos) centers with full-time craft specialists.
4. Workshops attached to central institutions.

Cabrera Castro and Gómez Chávez envision considerable decentralized production, viewing the evidence for production within the apartment compounds of different wards as indicating “strict control over the production and distribution of goods” at a local level (2008:39). La Ventilla is an elite neighborhood with formal architectural compounds for different functions, including a barrio temple, an administrative building, a residential apartment, and a large, open plaza (Manzanilla 2009b). Gómez Chávez et al. (2004:175-176) suspect a community function for this plaza, including exchange activities, festivities, and ballgames. Excavations at one of the La Ventilla compounds produced evidence of shell, slate, mica, travertine, greenstone, pyrite, crystal, and amethyst working. Production included jewelry (ear ornaments, beads, and pendants), masks and small sculptures. Quantities of debitage, tools, discards, and finished products were recovered from construction fill. Evidently, these artisans also produced their own tools from bone, obsidian, and chert. Production debitage as well as some finished items and tools were included with the burials of certain individuals, likely indicating that the individual was a craftsperson in life. The analysis of space and architectural elaboration suggests that elite households of high rank lived interspersed with lower ranked artisans. Lapidary production debris within low status apartments connected to high status apartments probably indicates client-patron relationships among the inhabitants (Cowgill 2008:101).

“The explanation for the direct coexistence of elite groups with groups of producers in close proximity may be found in the relationship that each social class maintained with the means of production, as well as the mechanisms that permitted the operation of the socio-economic system.” (Cabrera Castro and Gómez Chávez 2008:39)
Their materialist model posits a differentially ranked elite class directly controlling and profiting from the productive capacity of a lower class of artisans. They view the close residential setting not as a function of kinship ties as much as a reflection of the direct control of production following rank or class distinctions. They envision dispersed full-time production in all the wards of the city regulated by a hierarchical social order.

“This proposal suggests the existence of elite groups charged with supplying raw materials that, once transformed into various goods, were transferred by the group that had provided them, so that they could exchange them in the marketplace, giving up a portion of the production to the ward authority. This ward authority, in turn, channeled a portion toward the central authority to support grand public works.” (Cabrera Castro and Gómez Chávez 2008:77)

Linda Manzanilla views the neighborhood as the basic unit of social integrations and redistribution (i.e., the basic social and economic unit) at Teotihuacán, Tula, and Monte Albán. At Xochicalco the joint-family residing in a house-compound served this function (Manzanilla 2009a:3-4). Manzanilla discusses the La Ventilla elite neighborhood as a prime example of corporate group organization at Teotihuacán. Horizontal excavation of this compound has documented the ritual, domestic, and craft production activities once performed within. Other barrio centers within Teotihuacán suspected of having similar organization are Tepantitla to the northeast and Teopancazco to the southeast (Manzanilla 2009b).

Manzanilla (2009b:24-25) proposes that these compounds or elite neighborhoods housed corporate landholding groups or “noble houses” and were organized much like oikos units described for 3rd millennium B.C. Mesopotamia by Pollock (2002). In the Mesopotamian analogy the growth of nucleated settlements was followed by a decline in rural tribute. As a result, a reorganization of production for tribute followed. This reorganization was characterized by the growth of urban oikos estates controlling vast landholdings and the rights to heritable productive resources. Rural inhabitants likely worked for part of the year within these urban compounds receiving food rations in return.
Hence, the heads of these estates benefited from commoner labor while maintaining control of the productive resources themselves while the state appropriated tribute in goods from the entire estate, not the individual. It should be emphasized that the compounds at Teotihuacán are not rural estates, such as some largely self-sufficient Greek *oikos*, but rather urban estates with intermediate elites acting as heads of corporate groups with diverse productive capacities and channeling this production to the state as tribute.

“These intermediate elites may have been organized as noble ‘houses.’ A ‘house’ or *maison* is a large corporate group organized by shared residence, subsistence, production, origin, and ritual (Gillepsie 2000a:1). Following Lévi-Strauss (1982:174), they may have cultivation, hunting, fishing, and gathering areas, perpetuated through the transmission of their name, titles, and goods. The social group called the *maison* is represented by the house itself: by the relics, emblems, masks, dress, and so on; and by the hunting, gathering, and food-producing lands (Gillepsie 2000a:3, 2000b:25-26.” (Manzanilla 2009b:24)

Manzanilla (2009b:25-27) lists seven components of the elite neighborhood compounds at Teotihuacán, each representing a separate component of domestic life and physically manifested in discreet architectural configurations within the compound.

1. Ritual
2. Administration
3. Craft production
4. Residential
5. Military
6. Domestic (i.e., kitchens/storerooms)
7. Communal

The ritual component is characterized by central courtyard altars and temples with sanctuaries dedicated to ancestor worship, a likely mechanism for maintaining a distinct identity and corporate group unity. The administrative component provided physical meeting space for negotiation with craft specialist leaders and for the exaction of tribute. Domicile and domestic space permitted group members to live together and perform both intra- and inter-neighborhood communal activities. While part-time craft production was the norm, there is also evidence of full-time craft production in some multiethnic barrios.
Obsidian prismatic blade production and edge rejuvenation was practiced within most apartment compounds. Specialized tool kits including abundant bone needles recovered from the “tailors’ shops” at the Teopancazco barrio center (Terrazas 2007) suggest that lapidary work was sewn into costumes by full-time specialists (Manzanilla 2009b:32).

John Wayne Janusek (1999) has documented craft production within multiple-family neighborhood or barrio centers located in the urban peripheries of centers in the Tiwanaku polity of ancient Peru. Acknowledging that the strict dichotomy between politically controlled (i.e., redistributive) and laissez faire modes of production masks variation and overlap between the two categories, he does suggest that production within suprathousehold complexes was organized through segmented lineage principles primarily for internal redistribution. He refers to this form of production as “embedded specialization.” Janusek (1999:126) sees a possible parallel between the Oaxaca barrio at Teotihuacan and the Ch’iji Jawira neighborhood of the Tiwanaku capital, suggesting that immigrant populations residing in the multiethnic Tiwanaku capital were both valued within the stratified social system for their artistic and productive capacity as well as maintaining a somewhat peripheral position within that society, both socially and geographically (Janusek 1999:126). Similar to Manzanilla (2009b) and Cabrera Castro and Gómez Chávez (2008) for Teotihuacán, Janusek interprets production within residential compounds at Tiwanaku urban centers in terms of hierarchically organized and internally managed corporate groups ultimately subservient to central authority while production was largely decentralized.

“I argue that urban craft specialists in Tiwanaku and Lukurmata were corporate groups resembling segments of minimal ayllus or estancias, and that skilled production was coordinated by local authorities who ultimately answered to state rulers.” (Janusek 1999:125)
**Teotihuacán Barrios with Distinct Ethnic Affiliations**

The “Oaxacan Barrio,” or Tlailotlacan, at Teotihuacán has a distinctive pattern of artifacts, architecture, and mortuary practice suggesting a foreign origin and cultural pattern extending back in time considerably (Rattray 1993; Spence 1989, 1992). Distinctive Zapotec style tombs have been excavated at the compound (Spence 2002:56). A foreign enclave may also have lived in nearby Structure 19, of west Mexican (Michoacán) immigrants.

“Nonetheless, we should specify how we have argued in other publications that this is not a ward, but only a compound occupied by a group from West Mexico, in which their descendents lived as well, who with the passage of time adopted and integrated local cultural elements and elements from other foreign groups to their own.” (Cabrera Castro and Gómez Chávez 2008:39)

Stable isotope analysis of bone and tooth enamel from 25 individuals recovered from the Tlajinga 33 compound indicates that 29% of these inhabitants were immigrants from other parts of Mexico, including Michoacán (White et al. 2004). Tomb 50 at Tlajinga 33 is a shaft tomb, a foreign mortuary practice found in Michoacán and all individuals tested from this tomb produced foreign isotope signatures; most immigrants in the compound had come to Teotihuacán as children or young adults of both sexes. The stable isotope analysis of individuals from another high status burial from a different apartment of the same compound (Burial 56) reflected all local signatures. Although its members probably had ties to other regions, Tlajinga 33 was not an ethnic barrio, but a conglomeration of local residents and diverse immigrants whose role was to produce crafts (White et al. 2004:193-195).
The “Merchants’ Barrio” at Teotihuacán

Ceramic sherds suspected as Maya imports were recovered from the “Merchants’ Barrio” of Teotihuacán test-pitted by the Teotihuacán Mapping Project (Millon 1973) and partially excavated by Evelyn Rattray (1987). Rattray has argued that two compounds within the “merchants’ barrio,” Mezquititla and Xocotitla, were founded by lowland Maya during the Tlamimilopa phase (A.D. 200 – 350). Rattray associates the round structures from the “merchants’ barrio” with Gulf Coast architecture, also noting that pottery prominent in the Xolalpan phase (A.D. 350 – 550) is more reminiscent of Gulf Coast cultural traditions than local pottery. Pottery produced in the Vera Cruz coast has been recovered from the “Merchants’ Barrio” (Millon 1988:126; Rattray 1988:173, 1990:126, 129; Santley 1994:261; Spence 1996:339, 341, 345, cited in Pool and Britt 2000:158).

A sample of 121 ceramic sherds was subjected to Instrumental Neutron Activation Analysis (INAA) in order to confirm and evaluate the importation of Maya vessels to Teotihuacán (Clayton 2005). Half the sample [n=61] is represented by sherds recovered from excavation of the “Merchants’ Barrio” and the other half [n=60] came from various areas of the site and was collected by the mapping project. The compositional variation among the suspected Maya sherds indicates that no single compositional group is represented; the various Maya sherds were surely manufactured in different parts of the lowlands before being imported into Teotihuacán. However, several sub-groupings could be identified as having likely been produced in specific parts of the Maya Lowlands. Based on compositional similarity, ten of the 161 sherds (8%) were likely manufactured at Tikal, and twenty-two sherds (20%) were produced in the central Peten area. Two sherds from Balanza Black tripods (602 and 608) recovered from excavations in the Mundo Perdido complex at Tikal had nearly identical composition
signatures as the specimens recovered from Teotihuacán and assigned a Tikal provenience.\(^\text{25}\)

INAA also identified seven of the suspected Maya sherds as likely originating from Calakmul. The sherds assigned to Tikal, Calakmul, and other unidentified Peten centers were recovered in equal proportion from the two compounds; no single Maya center could be affiliated with a specific Teotihuacán compound. While Maya ceramics are concentrated in the “Merchants’ Barrio,” they are not confined to it and have been recovered from surface survey and conform to a widespread and basically random distribution pattern from Late Preclassic through Late Classic times, although there is an Early Classic peak in Maya ceramic frequency at the “Merchants’ Barrio,” where 60% of all Maya sherds were recovered. Nonetheless, Early Classic Maya sherds are also present in the ceremonial core (Clayton 2005:444-445).

An ethnic affiliation with the Gulf lowlands has been proposed for the Merchants’ Barrio (Rattray 1987, 1989) based on cultural patterns and the fact that gulf lowland pottery is more heavily represented than lowland Maya pottery. The “Merchants’ Barrio” may not have been directly settled by a single group of foreign origin and may represent a complex set of interactions between social groups originating from multiple regions of the lowlands.

“The Merchants’ barrio does not represent a single transplantation of an ethnic population from elsewhere. Instead, materials there evince a continued flow of interaction, involving regular movement of people across great distances.” (Clayton 2005:442)

Philip J. Arnold and Robert S. Santley (2008) have most recently postulated that a Teotihuacán faction migrated from that city and settled in the Gulf coast, not as merchants or visitors, but as residents colonizing a new homeland. The archaeological

\(^{25}\) These two Balanza sherds do not have compositional signatures equivalent with the statistically refined “Blacks” compositional reference group that I isolated from sherds recovered by the PST Project (see Chapter 9.5).
record indicates the movement of goods and of groups of people between central Mexico, the Gulf Coast, and the Peten.

**Flexible Residential Patterns at Teotihuacán Apartment Compounds**

“...each [Teotihuacán] apartment compound probably was associated with a core of individuals claiming descent from a common ancestor, plus others whose rights to residence were based on marriage, some more tenuous kin tie, or a wide variety of special circumstances, perhaps including servants and apprentices.” (Cowgill 1997:141)

Annabeth Headrick (1996, 1999) has proposed a segmented lineage model for Teotihuacán in which descent groups residing in apartment compounds were tied to larger hierarchically organized groups, with their heads of elite status living in closer physical proximity to the architectural core of the city (Cowgill 1997:141). Cowgill (1997, 2008) interprets the excavation data from Teotihuacán apartment compounds to indicate flexible residence patterns based around kinship ties. It is likely that a great deal of variation in kinship organization, co-residential patterns and ethnic affiliations characterized the different apartment compounds within the city. The space dedicated to domestic, ritual, and craftwork activity also had to be flexible to accommodate the evolving social structure of the extended apartment compound’s residents.

“Within Classic period Teotihuacan, we can now appreciate how people were willing to move and change their lives, probably mostly for the economic opportunity. Immigrants were integrated into the social and economic framework of the state in complex ways, probably mostly by joining and becoming parts of the families already there.” (White et al. 2004:195)

Linda Manzanilla (1996) found qualitative differences in the ceramic assemblages used by three distinct households residing within the Oztoyahualco compound [15B:N6W3] at Teotihuacán. Household 1 was associated with Matte and Red Hematite wares, Household 2 with black, brown, Copa, Granular, and San Martin wares, and Household 3 with orange and Thin Orange wares. She concludes that this may reflect
differential access to pottery production for each household within this compound, that pottery was not a centrally regulated or redistributed good within the entire apartment compound. From Hirth’s (1998) analytical standpoint, the assemblages are not homogenous and do not reflect unfettered access to commercial products within a market exchange system. Considering the apartment compound as the residence of a maximal lineage or corporate group, it appears that different households maintained distinct consumption patterns. Perhaps co-residence was not as dependent upon kinship ties as it was a pragmatic solution to the need for a numbers of families to organize at the compound level for political recognition.

“[O]ther individuals and small family units may well have shifted residence expediently, depending on availability of space; social relations such as marriage, apprenticeship, and possibly clientage of servitude; and to escape from compounds where internal relationships were troubled. As Millon pointed out long ago, such residential flexibility seems the only way to make the fixed dimensions of apartment compounds compatible with the inevitable fluctuations in compositions over time of individual domestic units.” (Cowgill 2008:91)

**Craft Production at Tlajinga 33**

The apartment compound labeled Tlajinga 33 is a fairly typical Teotihuacán residence with a ca. 500 year occupation span. This compound is interpreted as the residence of a lineage made up of increasingly smaller social units, down to discreet extended and nuclear families (Widmer and Storey 1993:88). San Martin Orange pottery was obtrusive in the surface survey of the area and quantities of misfired San Martin Orange sherds were recovered from levels of substructure fill during excavation of Tlajinga 33 (Sanders 1993:279). The apartment compound was occupied from Early Tlamimilolpa phase [ca. A.D. 200 – 350] to early Metepec phase [ca. A.D. 550 – 650]. During the Xololpan phase [ca. A.D. 350 – 550] ceramics were added to the repertoire of crafts produced at the compound (White 2004:178-179). It has been hypothesized that the entire Tlajinga barrio was involved in the production of San Martin Orange ceramics (Kroster 1979; Kroster and Rattray 1980). Excavations recovered ample evidence of the
organization of production at Tlajinga 33 at the macro scale, as well as evidence of lapidary work recovered from soil samples (Widmer and Storey 1993:98). Overall, the compound appears fairly typical of apartments throughout Teotihuacán.

“Tlajinga 33 can heuristically be considered a typical low-status Teotihuacán compound with respect to domestic household structure.” (Widmer and Storey 1993:89)

Greenstone, marine shell, slate, and onyx were worked into jewelry within the Tlajinga 33 compound (White 2004:178; Widmer 1991). Evidence of lapidary production from two discreet areas is interpreted as the work areas of two independent decision-making groups from the same lineage. But how does this take the immigrants into account? The ceramic industry is hypothesized to have been organized at the maximal lineage level or on a compound-wide level at the same time that lapidary work was restricted to certain sub groups; spatial analysis and mortuary data support this segregation hypothesis (Widmer and Storey 1993:98).

Ceramic production areas are also fairly discreet, located on the peripheries of the compound next to refuse disposal loci and have earthen floors. A ceramic drying room and a possible pit kiln were excavated at the northwest margin of the compound, two roofed rooms with earthen floors are suspected to represent storage or bodega space. Feature 12 was a large depression filled with wasters thought to be an open-air kiln (Rattray 1983) while Feature 23 was a midden comprised entirely of San Martin waster sherds. Burnt and reduced wasters were also recovered from an ash deposit at the bottom of the suspected pit-kiln (Sheehy 1992:756). The majority of San Martin Orange pottery is represented in two shape classes, craters and amphora, which have previously been considered high status types (Cowgill 1983). Tools, production features, ceramic molds, unfinished products, and debitage are characteristic of the production context. Tlajinga 33 is just 225 m south of a suspected clay source for orange ceramics (Widmer and Storey 1993:98-99).
Using a polythetic set of criteria, Kristen Sulivan (2006) inferred the existence of 21 definite production units or workshops and an additional 14 areas with some indications of pottery production from the Teotihuacán survey data and map. The presence of unusual concentrations of specific wares or forms, wasters, special features, specialized tools, and fired clay or daub were considered markers of ceramic production. She does note that blistered or overfired waster sherds were uncommon, likely because of low temperature firing (below 1000° Celsius) without the use of a true kiln (Sulivan 2006:47), a conclusion also reached by Sheehy (1992).

“The color analysis indicates that SMO vessels were fired in an open or pit oven environment that was covered by ceramic wasters. Thermal differences in the firing environment, mirrored in the various surface color varieties, suggest that there existed little quality control and ceramic vessels with different surface colors might result from a single firing event.” (Sheehy 1992:751)

The general absence of waster sherds in collections from Mesoamerican centers likely indicates that high temperature kiln firing of pottery was not a common practice and that the presence of waster sherds should not be considered mandatory for the identification of a pottery workshop (see Stark 1985).

Sherds from these hypothesized workshop areas were measured and statistically analyzed in terms of uniformity of product representing standardized production. Standardization measures were calculated for rim diameters of San Martin Orange sherds from workshop and non-workshop contexts (Sullivan 2006:41, Figure 3). Ceramics from those areas designated as workshop contexts did have slightly lower CV (coefficient of variation) scores, interpreted as an indication of more specialized production, predictably enough. However, individual workshop units did not exhibit highly distinct internal uniformity of product. The only statistically significant indicator of differential standardization came from “craters” between workshops.
“Based on the standardization hypothesis, I expected more specialized producers to make more standardized goods because of the increased efficiency and skill related to repeated pottery production. The results from this study indicate that SMO pottery produced in the Tlajinga district was neither very specialized in form nor very standardized in size.” (Sulivan 2006:45)

Sullivan concluded that Tlajinga 33 did not house a nucleated workshop for the production of ceramics and follows Sheehy (1992, 1998) in interpreting the ceramic production unit as an extended family, noting that Sheehy’s extended family equates to Widmer and Storey’s (1993) lineage or compound (Sullivan 2006:46). Sheehy’s cross-cultural comparison of 55 ceramic producing groups suggests that the Tlajinga 33 potters likely produced at his level III, which included agricultural societies from Pakistan, Guatemala, Mexico, New Mexico and South Carolina. These level III groups produced from 400 to 2160 pots annually (Sheehy 1992:89-91, 757).

**Obsidian Production at Tula**

Assuming an average population density of 5000 / km² (after Sanders and Price 1968) within the nucleated urban core of Tula, Healan and Stoudtamire (1989:235) estimate the population at 60,000 inhabitants. These authors are careful to point out that their population estimate is a very rough one, following the earlier published conclusion of Stoudtamire (1975), and meant only to give a relative idea of the probable magnitude of the center’s population in comparison to other Mesoamerican centers. This rough estimate does place Tula’s nucleated population far higher (and presumably denser) than the ‘urban’ core of Classic Tikal and two or three times as high (although of similar density) as Monte Alban, but considerably lower than Classic period Teotihuacán or Postclassic Tenochtitlan (Table 7.2.1).
Table 7.2.1 – Population estimates for select Mesoamerican centers (After Healan and Stoudtamire 1989: 251).

<table>
<thead>
<tr>
<th>Site</th>
<th>Area (km²)</th>
<th>Estimated Population</th>
<th>Persons/km²</th>
</tr>
</thead>
<tbody>
<tr>
<td>Teotihuacán₁</td>
<td>20</td>
<td>125,000</td>
<td>6,250</td>
</tr>
<tr>
<td>Tenochtitlan₂</td>
<td>12</td>
<td>175,000</td>
<td>14,583</td>
</tr>
<tr>
<td>Monte Albán₃</td>
<td>4</td>
<td>24,000</td>
<td>6,000</td>
</tr>
<tr>
<td>Tikal, Central Zone₄</td>
<td>16</td>
<td>10,000</td>
<td>625</td>
</tr>
</tbody>
</table>

mean = 6,854.50

¹ Millon 1970: 45.
² Calnek 1976: 288.
⁴ Haviand 1970: 193

Obsidian is ubiquitous at Tula and “enjoys a widespread, nearly continuous surface distribution within the urban zone” (Healan and Stoudtamire 1989:224). Sixteen thousand pieces of obsidian were recovered from the general survey, which covered less than 1% of the site. Another 25,000 pieces were recovered from residential excavations by the University of Missouri (Benfer 1974), not including the workshop area excavation by Tulane University (Healan et al. 1983). Seventy-five percent of all blades recovered from the general survey of Tula were green, indicating a heavy exploitation of the Pachuca source (Healan and Stoudtamire 1989:224). The workshop excavation produced even higher percentages of green obsidian [83%], indicating a strong reliance on the Pachuca source for nearly all obsidian tool manufacture within this production unit (Healan et al. 1983).

The distribution and differential percentages of grey versus green obsidian indicate changes in the ‘industry’ over time. Initially, grey obsidian from the Zinapécuaro source was worked on the outskirts of Tula’s urban zone. To the south of
the early urban core, the workshop specializing in green obsidian core/blade reduction excavated by Tulane University (Healan et al. 1983) had a smaller obsidian working area for processing grey Zinapécuaro obsidian. These earliest levels are dated to the Corral Ceramic Phase (ca. A.D. 800 - 900), while the latter levels are dated to the Tollan Ceramic Phase (ca. A.D. 900 - 1100). Grey Zinapécuaro obsidian was initially dominant at Tula during the Corral phase, and was later eclipsed in importance by green obsidian. The Tula survey reveals a pattern of early obsidian workshop deposits located on the peripheries of the center that were later incorporated into the expanding urban sector of the site (Healan and Stoudtamire 1989:236; Healan et al. 1989:244).

Surprisingly large amounts of Wavy Line Mazapa pottery, a diagnostic type in Terminal Classic and Early Postclassic sites in the Basin of Mexico and the Teotihuacán Valley (Cobean 1978), were recovered from the lowest excavation levels of the obsidian workshop at Tula. Abundant Mazapa ceramics, heavily concentrated to the south of the urban core and within the workshop excavated by Tulane University, suggest an ethnic affiliation between these early obsidian working people and the Basin of Mexico. It is hypothesized that early immigrants from the Basin of Mexico initially formed a distinct ethnic community living in the southern periphery located on the edge of a brackish marsh where they worked obsidian (Healan 1986:148). The peripheral location of the workshop may also reflect consideration of the safe disposal of debitage.

“[Even] if the archaeological data ultimately provide full support for [Tula’s] founding by conquering Tolteca-Chichimeca from Northern Mexico, this does not explain how or why it ultimately rose above the level of a regional center to dominate Central Mexico in the Early Postclassic. At the present time there are a few clues but no immediate answers. We know that immediately prior to Tula’s Tollan phase expansion there may have been an influx of peoples using Mazapa sphere ceramics who settled on the south periphery and were later incorporated into the city…Possibly connected to these people is the development of Tula’s obsidian workshop industry, which originated along the periphery of early Tula and later grew in size.” (Healan et al. 1989:251)

The percentages of green obsidian versus grey obsidian recovered from general survey surface collection and excavations at Tula mirror those of the obsidian workshop
excavated in the early 1980's by Tulane University (Healan and Stoudtamire 1989:210-211). The working of green obsidian was focused on the final stages of core/blade reduction and tools made from blades; grey obsidian working is more heavily represented by biface reduction debitage and the initial stages of core reduction. This dichotomy in reduction strategies may indicate a need for greater preparatory work on grey obsidian cores prior to blade manufacture; green obsidian cores are presumed to have entered the site in a more advanced stage of preparation. Alternately, the differential representation of initial core preparatory work may indicate inherent difference in the workability of the two materials (Healan and Stoudtamire 1989:210-211).

The Tula workshop was located not far from residential architecture and is presumed to have been the physical manufacturing site for obsidian artifacts by one or more specialist knappers living in close proximity. The amount of production debris discarded suggests a fairly consistent output from the manufacture of mostly green prismatic blades. However, excavation of several dug-out pits used for refuse disposal produced no pure deposits of obsidian debitage. While lenses of discreet loads of dumped debitage were identified, a mixture of workshop and domestic refuse is represented (Healan 1986:139). This situation has been described as a “cottage industry” where residents lived and performed their craft activities within the same space (Healan 1986:143); the actual “workshop” was highly ephemeral.

“The actual obsidian working area (i.e., the ‘workshop’ proper) was apparently little more than open ground and even lacked appreciable quantities of visible debitage, since this was systematically removed to the refuse dump.” (Healan 1986:145)

Single residences or isolated houses were rare at Tula, Teotihuacán, Xoxicalco and (based on archival sources) Tenochtitlan (Healan 2009:85). Horizontal excavations at the Canal locality revealed three juxtaposed house compounds. Each house compound was comprised of two or more houses facing inward toward a central courtyard with a central altar; access to each compound was controlled through a single L-shaped entranceway. Although grouped together around a single courtyard, each house appears
to be the residence of a nuclear family. Although probably inhabited by related families, each house was equipped with its own independent cooking facilities. Ritual activity within the house compounds appears to have been conducted on three different levels. Ritual paraphernalia was present in each house (the nuclear family or single house level), each compound also had a formal altar centrally located in the interior courtyard (entire compound level), and a small temple constructed on the west side of the east compound (local neighborhood level) (Healan 2009:74-77).

Dan Healan reconstructs the organization of production at the household level, with the male head the primary knapper assisted by other family members, noting that distinctive stone slabs, presumably for grinding obsidian blade core platforms, were all recovered from inside the houses excavated in association with the workshop. He even suspects that some obsidian refuse represent practice pieces for the grinding of platforms, although these could also be true rejuvenation pieces (Healan 1986:146-147). Much like the house compound at the Canal locality at Tula (Healan 1977, 2009), the workshop area is interpreted as the residence of a fairly small corporate kin group, presumably an extended or joint family, made up of a few houses for nuclear families (Healan 1986:147). It is unclear if the scale of production was full-time to meet the demands of the state as well as independent consumers (Healan 1986:150).

**Maya Ceramics at Tula**

Excavations at Tula produced evidence of pottery importation from Central America around A.D. 1000. A pit inside one house contained four Tohil Plumbate vessels and five Central American polychrome vessels (Diehl et al. 1974); over one thousand Plumbate sherds were recovered from the Canal locality, suggesting consistent importation of this ceramic type (Healan 1993:113).

Anna O. Shepard (1948) hypothesized a limited area of production for the stylistic and technologically distinctive Plumbate pottery. A temporal development from early
“Guayabal Plumbate” through San Juan Plumbate (through intermediate “Robles Plumbate”) into Tohil Plumbate was hypothesized. Although Bruhns (1980) had suspected multiple production zones for Plumbate pottery, INAA analysis of Plumbate pottery (Neff 1984, 1995, 2000:123-127; Neff and Bishop 1988) has confirmed a limited production area located in the Soconusco region of the Pacific slope of southern Mexico/northern Guatemala. Following various developmental hypotheses suggested by Shepard (1948) and by Lee (1973, 1978), Neff and Bishop (1988) reconstruct the specific development of Tohil Plumbate out of the previously widespread and long-lived tradition of Plumbate production. They identify Tohil Plumbate as the specific product of a small group of potters that emerged from a somewhat larger “background tradition” of earlier Plumbate development (see Neff 1991 for the history of investigation into the origin of Plumbate pottery). The distribution of Tohil Plumbate vessels with distinctive compositional signatures is “inferred to represent the specialization of a rather small group of ceramic artisans responding to external demand for Plumbate ware” (Neff and Bishop 1988:519). Tohil Plumbate pottery production seems to have proceeded along commercial lines, destined for exchange as a commodity. The superior quality and distinct attributes of Tohil Plumbate probably made it an immediately recognizable object, garnering the ware a reputation of fine craftsmanship.

The Obsidian Industry of Epiclassic Xochicalco

The Epiclassic center of Xochicalco, Morelos, emerged as the capital of a regional conquest state during the Gobernador phase (ca. A.D. 650 – 900), subsequent to the decline of Teotihuacán (Hirth and Webb 2006:18) and eventually reached a peak population estimated at 10,000 to 15,000 people (Hirth 2000; 2009:43). The rapid destruction, burning, and abandonment of the center around A.D. 900 (Hirth 2006a:14; Hirth and Cyphers Guillerén 1988; Hirth and Webb 2006:57) left “Pompeii-effect” intact artifact assemblages in situ on house floors (cf. Aguateca in the Classic Maya lowlands), facilitating an accurate reconstruction of the activities performed within houses. Twelve surface concentrations of obsidian debitage were identified during initial mapping of the
site; four of these were subsequently identified through excavation as secondary deposits or ‘dumps’ (Hirth 2006a:20). Seven of the twelve surface concentrations were inferred to have been obsidian workshops, five of which were excavated. Four of these are labeled as domestic workshops (i.e., occurring within households) and a fifth was located in a centrally located, open marketplace plaza (Hirth 2006a; 2009:51).

The average household at Xochicalco has been identified as a joint or extended family (15-20 people) living in an easily recognized residential compound similar to “house compounds” described from Tula by Healan (2009); larger “apartment compounds,” such as those documented for Teotihuacán (Cabrera Castro and Gómez Chávez 2008; Manzanilla 1993, 2006, 2009; Storey 1992), are not present. Families living within house compounds at Xochicalco had only one ‘kitchen’ area per compound where they evidently prepared food for all families of the compound, although nuclear families did keep separate corn grinding areas (Hirth 2009:51). At Xochicalco, domestic organization was evidently slightly different than in the house compounds excavated at the Canal locality at Tula where nuclear families residing in the same compound each maintained a separate cooking area (Healan 2009:75). Household compounds range in size, quality of construction, and location within the settlement along a four-fold hierarchy and are grouped into at least fourteen barrios within the center; workshops or production units were not consistently grouped physically within the same barrio (Hirth 2009:57-58).

The actual production of obsidian goods took place inside the house compounds, in interior patios, corridors and room doorways or in exterior patios or ancillary structures (ateliers) (Hirth 2009:53). Evidence of obsidian and lapidary production was recovered through a systematic microdebitage recovery program (Hirth and Flenniken 2006). Much of the obsidian debitage recovered from workshop contexts was very small and dominantly represented platform rejuvenation (Hirth 2006a:14). Nonetheless, the excavation of house compounds with workshops did produce tens of thousands of pieces of debitage each; Operation H produced 136,836 pieces of obsidian alone (Hirth 2006d:
Table 6.1). The management of obsidian (and other lithic) debitage was a constant domestic chore; accomplished through sweeping, collecting, and dumping aimed at keeping debitage levels low enough so as not to seriously interfere with domestic activities (Hirth 2009:53). Reduction debitage of potch opal was provisionally stored in a ceramic jar with the neck broken off. In addition to ceramic vessels, these inhabitants probably employed a variety of cloths, wooden bowls, gourds, and baskets to sort and carry out lithic debitage for disposal (Hirth 2006d:171).

Although three to five male knappers worked simultaneously within a single house compound no division of labor or specialized task segregation was practiced (Hirth 2009:55).

“Artisans apparently picked a spot to work and carried out all production tasks in the same locale, including core rejuvenation, blade production, and the production of tools from prismatic blades.” (Hirth and Andrews 2006:261)

Craft production at Xochicalco was diversified, not specialized, and multicrafting was the norm (Hirth 2006d; 2009:55-57). Obsidian was not the only material worked within these workshops. Cherts and potch opal were also transformed into finished goods (lanceolet or side-notched bifaces, retouched flakes, and small biface eccentrics) through direct percussion techniques. This direct percussion work was “small in scale and an ancillary activity to prismatic blade production” (Hirth and Flenniken 2006:96). Producers also made expedient tools for their own use and direct percussion chert flakes were important as percussion bits for the rejuvenation of obsidian cores prior to blade removal. Although there was little systematic production of bifacial or unifacial obsidian forms within workshops, some obsidian bifaces were evidently produced on (likely imported) flake blanks through direct percussion techniques. Hirth suggests that locally available potch opal was knapped when obsidian was not available. Obsidian Lapidary work also involved the manufacture of tubular, oval, and round obsidian beads from core sections (Hirth and Flenniken 2006:97-113).
Evidence of lapidary working as an ancillary activity, conducted within households also engaged in the production of ceramics, has been recovered from the Tlajinga 33 apartment compound at Teotihuacán (Widmer and Storey 1993; White et al. 2004) and at a house compound at Ejutla, in the Valley of Oaxaca (Balkanski et al. 1997; Feinman and Nichols 2007). Within Copán Group 9N-8, Widmer (1997, 2009) documented household level lapidary work alongside shell, groundstone, and possibly feather working.

“Lapidary production has always captured the interest of Mesoamerican archaeologist because this technology was used to manufacture ornamental goods used by elites in important social, political, and religious contexts” (Hirth and Flenniken 2006:96).

The artisans at Xochicalco may have exchanged small objects that were labor intensive to produce for needed obsidian cores or other material goods entering the center through itinerant traders or long-distance merchants.

**Commercial Organization at Xochicalco**

Kenneth Hirth characterizes obsidian blade production at Xochicalco as a “commercial undertaking” (2009:51). Nonetheless, actual production was conducted at the household level by independent craft producers working part-time outside of elite or centralized control; no guilds or other supra-organizational institutions existed (Hirth 2009:44, 55). Hirth (2006d) follows Feinman (1999) in placing the majority of Mesoamerican production at the household industry level, although emphasizing the variation in size and output intensity among various production units. Indeed, the archaeologically recovered data from the workshops at Xochicalco (see Hirth 2006d) supports this contention; different workshops produced at different output levels and procured varying percentages of their raw material from the various sources (Hirth et al. 2006:128).
Obsidian specimens from Xochicalco were subjected to instrumental neutron activation analysis (INAA) in order to determine the sources of the raw material entering the center (Hirth et al. 2006). Three major and two minor sources were identified. Ucareo, Michoacan was the dominant origin source for grey obsidian recovered from workshops with 70% of the submitted samples identified as Ucareo obsidian; an estimated 63% of the entire recovered obsidian assemblage is represented by Ucareo obsidian. Around 24% of the obsidian assemblage derived from the Zacualtipan, Hidalgo grey obsidian source and around 11% was green obsidian from the Pachuca, Hidalgo source 155 km to the northeast of Xochicalco. The Ucareo and Zacualtipan grey obsidian sources were heavily exploited for core/blade reduction throughout central Mexico in the Epiclassic. Two other minor sources of grey obsidian were also isolated from the sampled assemblages and together make up about 4% of the total obsidian recovered from the center. These were Otumba, Mexico (110 km away) and Tulancingo, Hidalgo (170 km away). The majority of this imported obsidian was employed for core/blade reduction and each workshop had unique proportions of obsidian from the varied sources. In addition to the obsidian imported, mainly in latter stage core form, some finished bifaces produced on obsidian from Otumba, Tulancingo, and Pachuca likely entered the center through a system of “interregional exchange” (Hirth et al. 2006:126).

The scale of production at Xochicalco was much smaller than at Teotihuacán or Tula (Hirth et al. 2006:127). During the Epiclassic period in central Mexico independent obsidian distribution networks developed around six different obsidian sources (Hirth 2006e). Each workshop at Xochicalco independently procured its own raw material for obsidian blade production along decentralized lines (Hirth 2009:58). The raw material for obsidian blade production reached the community as polyhedral cores already at an advanced reduction stage. Extensive rejuvenation of these cores, practiced on site (Hirth, Andrews, and Flenniken 2006), suggests to Hirth that procurement was through middlemen, probably itinerant peddlers (2009:58; Hirth et al. 2003; Hirth et al. 2006:134). The entire obsidian industry at Xochicalco was limited by the importation of
sufficient raw material, with the rejuvenation of cores to produce blades the dominant focus of lithic reduction (Hirth, Andrews, and Flenniken 2006).

Estimating low consumption rates for obsidian blades (four to six blades per capita per year), Hirth and Castanzo (2006) suspect that annual production was circulated solely within the center of Xochicalco and not destined for distribution to the surrounding hinterlands. This is an interesting point, that urban production within the core of the capital was not destined for exchange with a periphery; that the urban core was self-sufficient with obsidian blade production within these workshops matching urban consumption. Eleven percent of the complete obsidian blades entering domestic contexts at Xochicalco were not produced within the workshops there (Hirth and Castanzo 2006:240; Hirth et al. 2006:134). Hirth suspects that these imported blades were probably produced by itinerant obsidian craftsmen, possibly the same agents responsible for the importation of the majority of advanced stage obsidian cores that local workshops depended upon.

Concluding Remarks to Mesoamerican Production

The investigation of the obsidian industry at Epiclassic Xochicalco is a great case study, again demonstrating that part-time diversified household level production was likely the norm throughout Mesoamerica. Unfortunately (for the rest of us), this extensive study was predicated on the very rare preservation contexts encountered at the site. Because warfare was common throughout Mesoamerica, including the Classic Maya lowlands, it is reasonable to believe that similarly excellent preservation contexts created by the destruction, burning, and abandonment of other centers will be found (i.e., as at Aguateca). In the meantime, Hirth and colleagues’ thorough analyses have provided an exemplary model of investigation as well as a clearly documented and well thought out reconstruction of one craft production system in Mesoamerica, one which may prove not to be so unique.
Hirth does follow a strictly commercial model and finds no evidence for centralized control of the obsidian industry of Xochicalco at any level. He suggests that entrepreneurs made unrestricted decisions, buying and selling in the marketplace, even purchasing raw material from itinerant peddlers specifically for resale and profit (Hirth and Flenniken 2006:113), all outside of centralized or internally organized (i.e., ward or guild) sponsorship or control.

“The procurement, manufacture, and movement of obsidian goods reaching Xochicalco took place largely without political involvement. Instead, obsidian goods were in the hands of independent craft specialists and merchants who moved material in sufficient quantities to meet regional demand.” (Hirth 2006a:17)

However, Hirth (2006c:181-182) does note that central marketplaces within the later Aztec empire were convenient outlets for the rapid conversion of one commodity into another (see Berdan 1982; Carrasco 1978) and that mandatory, state enforced tequitl tribute or tax obligations were likely enforced at Xochicalco. Tequitl was an organizational mode for the effective transfer of tribute or tax through service or craftwork. Artisans either supplied goods they produced as a specialty or their skills in a particular trade were applied to elite projects. An example of this arrangement is the Aztec featherworkers who made elite status objects under monitored conditions in centralized locations using feathers acquired by the state through the imperial tribute system (Hirth 2006c:181). Xochicalco was also a fortified urban center expanding its political control through conquest; like the Aztecs, tribute from conquered communities certainly formed a portion of the economy (Hirth 2006a:18).

7.3 – Ceramic Vessel Assemblages

Household size (number of individuals) has a fairly small range in the New World, but ceramic assemblages (number of pots in use) are quite variable within these households. At one end of the spectrum, Phillip Arnold has reported a very low number
of vessels per household in the Sierra de los Tuxtlas, Veracruz, Mexico [n=50, mean=6.58, median=6], from a sample of 50 households (P. J. Arnold 1988:361-362). He contrasts these low numbers with the findings of several ethnographic studies which have documented assemblages an order of magnitude greater.

“The reader may be struck by the relatively small number of vessels encountered within the average Tuxtlas household. When the assemblage sizes reported from other New World groups who rely on maize agriculture are considered, that surprise appears justified. Recent studies conducted among the Highland Maya in Chiapas, Mexico and Huehuetenango, Guatemala, indicate a significantly greater number of ceramic vessels within assemblages (Deal 1983; Nelson 1981, 1985). From a sample of fifty-one households, Nelson (1985) notes that the average household in San Mateo Ixtatan contains 57 vessels. A comparable number of pots was documented by foster (1960), who recorded an average of 61.22 vessels from three households in Tzintzuntzan, Mexico. These two cases constitute the high extreme of vessel frequencies documented for New World groups.” (P. J. Arnold 1988:364-365)

Citing several ethnographic case studies, Arnold (1988:365) continues to fill out the continuum of assemblage sizes for various cultural groups, including highland Peru ([n=200, mean=8.4] Hagstrum 1985, 1987), the Shipibo-Conibo of central Peru ([n=18, mean=15] Deboer and Lathrop 1979), and the Tarahumara of northern Mexico ([n=10, mean=c.12] Pastron 1974).

Working with the Kalinga of the Philippines, Trostel (1994:210, 222-223) reported ceramic vessel assemblages from the village of Dangtalan for forty-eight “average” and six “wealthy” households [average household size = 4.8 persons]. The average number of ceramic pots was 12 for all 54 households; total number of pots, both ceramic and metal, show only minor variation between “average” households [n=48, mean=18] and “wealthy” households [n=6, mean=21]. Masakuzo Tani (1994:56) found no significant correlation between the number of pots present and the number of residents in the household at several Kalinga villages, noting that the variable most influential on assemblage size is the absence or presence of a potter in the household. Dangtalan households which contained a potter had almost twice as many pots in their household assemblages as households without resident potters.
The small ceramic assemblages from Peruvian households \([n=200\), mean=8.4 pots per household\] inventoried by Hagstrum (1985, 1987) appear to be a function of greater access to replacement vessels. In the Peruvian case-study fairly high output \([over 140 ollas per person per month]\) by part-time specialists working at village-level specialization appear to have increased the availability of pottery which has reduced the need for households to keep a large supply of pots on hand (P. J. Arnold 1988:369).

Excavations of households at Ceren and Aguateca under superior conditions of preservation have produced very large ceramic vessel assemblages from Classic period residences (see following discussion). The Classic Maya household living at a lowland center such as Tikal probably had dozens of pottery vessels for cooking and storage, as well as wooden bowls, gourds, baskets and bags. Accumulating new pots while older vessels are still in use, or ‘stockpiling,’ may be a household level strategy in response to the short use-lives of vessels, lack of market access, or storage for exchange (P. J. Arnold 1988:365-369; Nelson 1985; Tani 1994:56-57).

**Individual Vessel Use-lives**

Dean Arnold (1985:152) cites average use-lives for ceramic vessels from Foster’s (1960) study at Tzintzuntzan of six months for plates and griddles; one year for vessels for drinking chocolate, boiling milk or soaking maize; up to 4 years for water carrying pots and 6.3 years for water storage pots. However, as Barry Isaac has pointed out, Foster’s often cited ceramic assemblage sizes and vessel use-life estimates are based solely on four households, and were never meant to be considered definite or statistically robust (Isaac 1986a:10). Use-lives of ceramic vessels reported by DeBoer and Lathrop (1979:128) for the Shipibo-Conibo are comparable (except for water transport vessels); .88 years for daily cooking vessels, 1.38 years for beer brewing vessels, .78 years for water carrying jars, and .31 years for food bowls used daily. Longer use-lives have been reported for the Kalinga and Fulani (see D. Arnold 1985, also Tani and Longacre 1999,
for their more recent lower estimates); including an average life-span for Kalinga cooking pots at 2.2 years and large Fulani cooking or storage vessels at more than ten years.

Generally speaking, vessels used for eating and drinking chocolate had the lowest use-lives. The high percentages of ‘serving wares’ recovered from household excavations at Tikal indicate to some that this class of vessels must have been distributed through markets (e.g.; Fry 1979, 1980) while others do not feel that the volume of exchange in these vessels precludes their having been acquired through non-market mechanisms (Stanton and Gallaretta N. 2001; Rice 1987a). Ceramic inventories recovered from middens at Tikal are made up of the sherds of vessels with different breakage and replacement rates. Vessels which break more frequently soon fill up household middens, while long life-span vessels will be underrepresented in such deposits (Mills 1989).

Ceren Assemblages

Excavations from the Classic period (circa A.D. 600) site of Ceren in El Salvador (Sheets 2002) have yielded abundant information about agrarian household organization. A few households have been excavated from beneath the five meters of volcanic ash deposited by the series of eruptions of the Illopango volcano approximately 1400 years ago. Each household is comprised of several structures made from clay and perishable materials, along with their artifact assemblages, set out in groups which most likely represent some sort of family or kin units. Each household has several discreet buildings grouped together, often so close that the thatched roofing of one would have touched that of the next closest building. This configuration of “discrete functional housing” is known from ethnographic and archaeological examples throughout the Maya Lowlands. The Ceren households appear to conform to a long-standing Maya pattern of building separate facilities for storage, kitchen function, and domiciles, hence the inventory and distribution of artifact assemblages recovered archaeologically from the Ceren
households provide an exceptional analogy for the interpretation of Maya households, modern and ancient, all over Central America.

Given the unique “Pompeii Effect” preservation at Ceren, artifact assemblages are amazingly intact and the position of most artifacts at the time of the volcanic eruption can be reconstructed with great confidence. The basically agrarian nature of the households is attested by the specific ceramic vessel forms and lithic tool counts and proveniences. While still under excavation, a slow and arduous process, the few archaeologically investigated households at Ceren do provide a wealth of information concerning the organization of daily life in this Classic Period valley community.

Payson Sheets has described the general character of the households as, “agrarian and craft oriented” (2002:59). Artifact assemblages from the excavated households are generally similar and suggest a redundancy of activities performed at each household. Ceramic vessels were recovered from domiciles, storehouses (bodegas), kitchens, and outside activity areas; the number of ceramic vessels recovered from a single household is quite large in comparison to similar agrarian societies (D. Arnold 1985; Rice; 1987b; Sheets 2002:115). The overall artifact assemblage of each of the households indicate an emphasis on food storage and preparation, some craft and clothing production, and some use of imported lithics.

Ceren Household 1 has been the most completely excavated and consists of four structures, a kitchen garden, and a small maizefield. Structure 6 of Household 1, the bodega, contained 28 ceramic vessels in total, ten with minor damage to their rims that were retained because their storage capacities were not seriously compromised. Even large sherds of broken ceramic vessels were kept in the bodega, presumably for limited storage or other ‘provisional discard’ reasons. Five ceramic vessels from the bodega were painted polychromes. Another 15 ceramic vessels were recovered from the domicile structure of Household 1, 26 from the kitchen structure, and another five outside under the eave of the domicile. This brings the total number of ceramic vessels recovered
from Household 1 to 74, including damaged and retained vessels; another dozen vessels are expected within this single household given full excavation.

Besides pottery, ground stone and obsidian artifacts account for much of the inventory of Household 1. Groundstone metates and manos, four pairs in all, document the reliance on maize within the household. Five hammerstones are interpreted as production implements in the forming and maintenance of these maize grinding apparati and other ‘donut stones,’ which appear to be nut grinders, digging stick weights, or other utility implements. The excavators of this household believe that the inhabitants were manufacturing their own ground stone implements for household use and perhaps limited exchange with nearby households. In addition to low level ground stone production, evidence suggests that cotton garments, agave fiber rope and twine, and utility ceramics for storage and cooking were also produced at the household level here (Sheets 2002:59-60).

The domicile structure and bodega of Household 2 confirm the agrarian family household function encountered at Household 1. Multiple ceramic vessels were recovered, including three polychrome vessels (including two Copador vessels) located within a niche of a low platform or bench – one with the impressions of “finger swipes” across the interior, likely indicating that the vessel was used as a food serving bowl. A decomposing set of painted gourds was also recovered, a subtle reminder that perishable containers stood alongside the more durable ceramic and stone artifacts recovered by archaeologists. Other ceramic vessels from the domicile were probably originally sitting on a wooden shelf and one other was most likely suspended from the roof interior. Ceramic vessels were also suspended from the roof of the bodega from Household 2, while ceramic storage jars and large pots full of seeds were kept on the ground. In all, 24 ceramic vessels were recovered from the bodega of Household 2, roughly the same number as recovered from the bodega of Household 1 (Sheets 2002). A polished jade celt, used as an axe head, was recovered from each household and appears to be an
imported utilitarian item – the jade probably originating 150 km to the north in the Montagua River valley (Sheets 2002:113).

An interesting cache of sundry artifacts recovered from the Household 2 bodega was once held in some form of organic container. The cache consisted of five miniature ceramic pots accompanied by 9 beads (7 jade, 1 undesignated stone, 1 shell), a small figurine carved from bone, and a star shaped shell pendant. The beads and pendant may have been part of a composite necklace and the miniature vessels contained traces of red pigment identified as mercuric sulfide (HgS), or cinnabar. The inhabitants of Household 1 used a different recipe for their red pigment which consisted of hematite with mica added. Three blades and one bifacial knife of obsidian were originally kept in the thatch of the bodega from Household 2; a cache of four unused obsidian blades was likewise once stored in the thatch of the bodega of Household 1. Although obsidian blades were not abundant (8 in total from Household 1; 9 in total from Household 2), along with the jade celts (axes) recovered from the households, they indicate the importation of foreign artifacts or the stone for their production into the Ceren site. The Copador ceramic vessels and shell are also suspected imports.

In summary, each household kept a house garden for growing some specialty plants, such as cacao, agave, or chilis, and a separate plot for monoculture of a staple crop – maize or manioc. These house gardens and plots, however, were not sufficient to supply a household with all of their food requirements, and fields away from the households must have been cultivated as well, perhaps on a rotational swidden or milpa system. Each household had a domicile, a kitchen, and a bodega, and each of these structures appears to be the locus of a variety of activities. All structures were crowded with artifacts, especially the kitchens and bodegas; in order to maximize space, artifacts were kept in the roof thatch and many ceramic vessels and perishable containers were suspended from structure interiors. The overall picture at Ceren is one of bustling households engaged in a variety of everyday tasks, utilizing all possible space to the
greatest effect. Payson Sheets’ reconstruction of the bodega from Household 4 sums this feeling up well:

“An impressive range of grain storage techniques were employed, including drying and hanging, storage in pottery vessels, storage in a permanent [wooden] crib, storage in adjustable features, and storage in suspended and floor-contact organic containers such as baskets. As with the other bodegas, less than half of the fired clay vessels were directly placed on the floor. The others were on the big, high shelf of the north room, on walltops, up with the rafters, or suspended from roof beams with rope. The garden of agave plants evidently was supplying raw material for cordage on a regular basis. The excavated evidence shows a great demand for cordage to fasten roofing members, to make walls and shelves and doors, to suspend pots and hang a variety seed and organic containers, and to make grain storage facilities. A wide variety of grains was being stored, including maize, beans, cacao, guayaba, pipian, and chilis.” (Sheets 2002:89)

The Ceren households likely produced groundstone maize-grinding metates and manos, a variety of cloth and cordage, and perhaps some utilitarian ceramic vessels at the individual household level. The large ceramic assemblages recovered from the excavated households indicate a significant reliance on pottery vessels for storage and cooking; it is likely that other unexcavated households manufactured pottery in higher volume than the few households sampled. Households also processed their own pigments and probably cultivated and decorated gourds for household use and possibly low-level exchange. Some ‘exotic’ items were imported into the site, including obsidian and jade from approximately 80 and 150 km away, respectively, though the mechanism for obtaining these items is not known. The Ceren households appear highly self-sufficient, meeting everyday needs through household level production or the domestic mode of production (e.g.; Sahlins 1972).

Aguatéca Assemblages

As we have already seen, horizontal excavations at Aguatéca under the direction of Takeshi Inomata and Daniela Triadan uncovered a number of intact artifact assemblages in situ on the floors of rapidly abandoned and burned structures. Many of
these “Pompeii-style” deposits appear to be comprised of artifacts that were left where they lay when the site was hastily abandoned after an enemy attack and sacking. Of particular interest are the high numbers of ceramic vessels recovered from the floors of many structures which likely represent entire inventories in use at the time of abandonment. The rich artifact assemblage retrieved from Structure M8-10 is characterized by exotic pieces of high social and economic value (Inomata and Stiver 1998:437). Given the number of portable possessions left behind by the inhabitants of M8-10, it is unlikely that ceramic vessels were carried away at abandonment, looted post-abandonment, or introduced by squatters. The assemblage of ceramic vessels recovered from Structure M8-10 includes storage jars, cooking and storage vessels, and serving vessels, in all 78 whole vessels are represented (Inomata and Stiver 1998:Figure 5). While it is likely that some of the vessels recovered from the floor were once suspended from the perishable roof beams, it is clear that they were all contained within the household when the roof was burned and collapsed, sealing the deposit.

Aquateca Structure M7-35 was more carefully constructed than M8-10 although both are located in close proximity to the royal palace complex. It does not appear to have been the residence of a nuclear family. While the situation is difficult to interpret, the high status markers of construction quality, a painted ceramic vase with court scene and glyphic inscription, an imitation stingray spine fashioned from bone, and proximity to the royal compound suggest that the resident or residents of M7-35 were of high status. The recovered artifact assemblage indicates that craft production occurred here. The stone tools used for wood carving were recovered from smaller, lower-quality construction rooms connected to the rear of the structure, and may not have been used by the main occupant of this building. Inomata and Stiver speculate that the inhabitant of M8-35 may have been a solitary ritual specialist, perhaps carving wooden statues, but concede that the presence of food preparation and spinning implements, concentrated in the west room confound this interpretation (1998:442). Perhaps the structure was home to a married couple or a single elite craftsperson with a servant. Although the overall volume of the lithic and ceramic artifact assemblage recovered from M8-35 is roughly
one-sixth that of M8-10 (Inomata and Stiver 1998:442), a substantial ceramic vessel assemblage is nonetheless represented; 23 vessels from the three front rooms and five more from the west backroom for a total of 28 vessels within the household (Inomata and Stiver 1998:Figure 11).

Accepting the interpretation of Structure M7-35 as the residence of only one or two people and M8-10 as the residence of a nuclear family, the ceramic vessels counts from these two households fall at the upper range of the continuum for agrarian households cross-culturally. Following meticulous excavations and an intensive ceramic refitting program, reconstructed Aguateca household ceramic assemblages have been fully published by Inomata and Triadan and associates (2010). At Structure M8-4, 85 ceramic vessels were present, mostly recovered from tight concentrations indicating a relatively undisturbed assemblage. The 77 ceramic vessels recovered from Structure M8-8, 62 from Structure M8-13, and 95 from Structure M7-34 (including two ancillary buildings, M7-91 and M7-92) support the assertion that Classic Maya households had very large ceramic inventories. Given the ‘utilitarian’ character of the pottery and the distribution and range of common household forms (bowls, jars, dishes, and the occasional comal), it is highly likely that the recovered assemblages approximate the original distribution of the vessels (Inomata 2010:372).

Sacking of the Epiclassic fortified center of Xochicalco, Morelos at ca. A.D. 900 left intact household artifact assemblages in situ after structures were burned and abandoned (Hirth 2006a:14; Hirth and Cyphers Guillén 1988; Hirth and Webb 2006:57). Complete excavation of three domestic compounds reconstructed ceramic assemblages of 42 to 87 whole vessels each (Hirth 2009:48). Horizontal excavation of a fifteen room house compound with three interior courtyards (probably three related nuclear families, or 15-20 people), Operation H, produced 87 vessels (Hirth 2006a:Table 2.4). Another household, Op I, produced 42 vessels (Hirth 2006a: Table 2.6) forming a typical domestic assemblage of vessels for cooking and serving food, water storage, and ‘ritual’ (miniatures, incensarios, subhumadors) (Hirth 2006a:35).
Of course, the Aguateca households represent persons of high rank, which is also indicated by the quality of some of the ceramics recovered. However, taken together with the ceramic vessels counts from more humble households at Ceren (Sheets 2002) and Xochicalco (Hirth 2006a:14), it appears that Classic Maya household inventories contained high numbers of ceramic vessels, on the order of 60-70 per nuclear family; perhaps a dozen or more per occupant. Given the recovery of perishable containers (including gourds and net bags) from the households at Ceren, these high tallies are all the more impressive. It appears that Classic Maya households made use of numerous storage, cooking, serving and other ceramic vessels routinely, at all status levels.

The high numbers of ceramic vessels recovered from these abandoned structures likely represent a combination of storage and food preparation needs as well as stockpiling of vessels for future use. The most probable reason for this situation is that households consistently received them from part-time specialists producing at moderately high rates. A lack of market access may also account for the high numbers of vessels, as households procured vessels whenever they could and did not rely upon consistent access to marketplace exchange year-round.

7.4 – Archaeological Recovery of Kilns from Mesoamerica

Various ceramic firing features have been reported from archaeological investigations at numerous Mesoamerican sites, from central Mexico to Honduras. Jacques Bordaz (1964) reported three kilns from Peñitas, Nayarit, Mexico dated to A.D. 1000-1300 associated with wasters and other indications of ceramic production (Carter 2000:123). The site of La Sierra in the Naco Valley to the northwest of Copán produced evidence for true kilns measuring five to six meters across associated with a ceramic production locus at the northern edge of the site (Schortman and Urban 1991:18). These two kilns, and a third smaller kiln closer to the site center, are described as circular kilns.
having cobblestone foundations with wattle and daub superstructures (Schortman et al. 2001:316-317; Wells 2000).

Kilns have also been reported from sites in Puebla, Mexico, including a group of 20 kilns associated with a group of houses and a large detached workshop (Abascal 1976). Four subterranean stone-lined fireboxes were reported from Puebla (Redmond 1979), most likely from disturbed updraft kilns, also associated with a large detached workshop. Two more vertical (updraft) kilns were excavated at Loma del Trapiche, Oaxaca by Winter and Nardin (1982). Winter and Payne (1976) report an updraft kiln associated with true waster sherds from Monte Alban, Oaxaca dated to ca. A.D. 450 – 950 and a number of simple updraft kilns have been reported from Matacapan, Vera Cruz, Mexico (P. J. Arnold et al. 1993; Pool 1990, 2000; Santley and Kneebone 1993; Santley et al. 1989). The site of La Lomita, situated in the Western Tuxtla, has a concentration of kilns exposed at the surface (Santley 1994:254) much like the situation encountered at Matacapan (Comoapan) before excavation. Possible kiln-like structures have also been reported from Preclassic Yaramela in Honduras (L. R. Joesink-Mandeville 1987, 1997; Carter 2000:120).

López Varela et al. (1999, 2001) have reported a pottery production area at the Maya center of K’axob in northern Belize, described as a double-chambered kiln dating to the Late Classic period (A.D. 550 – 700) alongside simple pit kilns. Joseph Becker (2003:111) suspects that the one dual-chambered feature is actually two distinct pit kilns. Prudence Rice (2009:127) questions whether or not the K’axob features were used for pottery firing at all because there is no evidence of burning, smoke, ash, or wasters. Whalen (1981) reported four earthen pits with adobe dividing walls as possible kilns situated within a domestic setting at Santo Domingo Tomaltepec, Oaxaca. Ephemeral firing facilities have been reported from Ejutla, Oaxaca (Balkanski et al. 1997) and described as “pit kilns;” simple dug out depressions used for basically open firing, although these may have been covered with impromptu adobe and sherd accumulations during firing. A similar pit kiln feature was also encountered during excavation of the
Tlajinga 33 apartment compound at Teotihuacán (Sheehy 1992; Widmer and Storey 1993). A possible firing hearth associated with overfired and spalled waster sherds was also excavated at the Teopancaxco compound at Teotihuacán and interpreted as a specialized workshop context (Krotser 1979). Another firing hearth with walls made from large jar sherds was excavated at Mound 91 at Lambityeco, Oaxaca (Swezey 1973).

Pit kilns have been reported at La Mojarra, along the Acula River in the Western Lower Papaloapan Basin of Veracruz (Diehl, Vargas González, and Vásquez Zárate 1997); they were detected through electrical resistivity as magnetic anomalies. Three kilns were excavated and two more are expected. Linear ditches filled with ash and broken ceramic sherds have been called “trench kilns” at San Carlos, Veracruz in the Coatzaquito Drainage (Kruger 1999) and appear to represent another variation on ephemeral pit firing not far from areas with extensive archaeological evidence of true updraft kiln use contemporaneously.

While some researchers equate the use of kilns with increased production intensity or output (e.g., Balkanski et al. 1997; Sheehy 1992), others ascribe the greater control of firing temperature and atmosphere to the adoption of the kiln (e.g.; Arnold 1985). Christopher Pool (2000) accepts the general correlation of kilns with greater output from cross-cultural comparisons, noting that there are some exceptions such as modern Sehualaca, where pottery fired in informal open conditions is distributed through the regional market system node at Santiago Tuxtla. Pool (2000) advocates a more careful analysis of specific ecological and cultural factors in determining the reason(s) for the adoption of updraft kilns. Research in both the Valley of Oaxaca and the Tuxtla Mountain regions has demonstrated the coexistence of simple updraft kilns and open or pit firing among different groups of potters living in separate communities within 30 km of one another (P. J. Arnold 1991; Balkanski et al. 1997; Pool 2000).

P. J. Arnold (1991) reports that modern potters of the San Isidrio community in the Tuxtla mountains have both the highest intensity production and the smallest
houselots; he suspects that available space may be a decisive factor in the adoption of updraft kilns. Sheehy (1992) found a cross-cultural tendency for the intensity of pottery production to relate to choice of firing method.

“We recognize, as Arnold (1991:109-110) has persuasively argued, that multiple factors govern technological choices in ceramic firing, so that the use of updraft kilns as opposed to open firing cannot be reduced to the intensity of manufacture alone. Still, following Sheehy [1992], we suspect that intensity of production may be one of the critical factors that influences firing decisions.” (Balkansky et al. 1997:155)

However, this correlation does not account for the fact that different kinds of pottery require the use of, or at least can be made more efficiently with, certain firing technologies. Pool and Britt (2000) equates the adoption of the simple updraft kiln with the mechanical properties of untempered fine paste ceramics. Becker (2003a) notes that finely decorated vessels (i.e., Classic Maya polychromes) were not fired in open-air conditions that would mar their surfaces.

Becker (2003a:111) discusses a possible kiln excavated at Tikal in 1984 by the Proyecto Nacional Tikal. The kiln structure was located below Structure 3D-34 of the North Acropolis and was described as having curved walls and a completely smoked stained roof (bóveda). Becker is unsure if this represents a sweatbath (Becker 2001), a lime kiln, or a pottery kiln. The date of this structure may be Early Classic (following Harrison) or Late Classic (following Laporte). Aside from this single kiln, only indirect evidence of ceramic manufacture has been reported from Tikal. Partially excavated during the University of Pennsylvania Tikal Project in the early 1960s, Tikal Group 4H-1 produced indirect evidence of polychrome ceramic production but this was based on the recovery of a large de facto waster dump; no actual firing facilities were located or excavated (Becker 2003a).
An Early Discovery of a Pottery Kiln in Central America

Excavating down four feet below the surface of a typical residential mound, Stone and Turnbull (1941) reported locating a pottery kiln in the Sula-Ulúa valley of Honduras. The cone-shaped kiln was constructed of clay with 4 ½ inch thick walls, four feet tall (122 cm) with a base circumference of 16 feet 10 inches (513 cm). Sixteen stones formed the interior floor of the kiln and a hole for the introduction of fuel was placed ten inches from the base. Some pottery sherds and lumps of burned clay were recovered from the inside of the kiln; an assortment of artifacts was recovered from the surrounding floor level. The artifacts can be separated into five classes: 1. pottery sherds, 2. pottery molds, 3. pottery figurines and figurine whistles, 4. stone and pottery tools, 5. miscellaneous objects.

No blistered, warped or vitrified waster sherds were reported. The discarded pottery assemblage is made up of fragments of various vessel forms in a variety of pastes, some monochrome, some polychrome, and some with plastic designs incised, gouged, or carved into the vessel surfaces. The majority of the pottery found in association with the kiln appears Maya in form and design, although the authors associated a minority of specimens with Sula-Jicaque or Paya culture groups. Polychrome sherds representing cylinders, bowls, and tripod dishes were abundant. Monochrome specimens designated Sula-Jicaque or Paya were rendered in a rough sandy clay paste while the dominant Ulúa-Maya group consists of “dark red ware with faint suggestions of pattern in a lighter red-orange,” polychrome cylinders, bowls and tripod dishes, plus a few "slate-like ware” specimens were also identified as Maya. The variety of pastes suggests that not all of the pottery recovered was actually manufactured at this location, but represent vessels made elsewhere by different potters.

Pottery figurine molds are dominantly from “formalized, fat, squat female figures with circular ear-plugs and bracelets and various styles of low headdresses.” Figurines and figurine whistles are varied in form, some anthropomorphic specimens with more
Maya elements, others lacking distinct Maya features; Paya bird heads were also present. These pieces were primarily made from two piece molds, while some cruder hand fashioned figurines, mostly birds, were also present. Small round river pebbles were recovered from the kiln, hypothesized to be pottery smoothers and a stone mortar and pestle are suspected to have been used in pigment processing. The excavators also associate three clay “candelaria” recovered from the base of the kiln with the act of painting; two of these artifacts are single-holed and the third is a two-holed specimen.

“Considering that here was a pottery kiln where there is actual evidence that polychrome pottery was produced, and that similar ‘candalaria’ have been found in the Sula-Ulúa bearing traces of coloring matter in the interior, it is not unreasonable to suppose that these ‘candelaria’ with their vial-like shape, and rough, clay, undecorated exterior, might well have been used as some sort of paint container.” (Stone and Turnbull 1941:45)

The Sula-Ulua kiln is suspected to be a sweatbath by Bordaz (1964:56) and by Becker (2003a:111) because of the thin walls of the structure. Their interpretations are both based on review of the short article published by Stone and Turnbull (1941) in American Antiquity. The size and configuration of this kiln is congruent with evidence for true kilns five to six meters across associated with a ceramic production locus excavated at site of La Sierra in the Naco Valley to the northwest of Copán (Schortman and Urban 1991:18). I believe that the associated painting implements and ceramic molds support the identification of this feature as a kiln (see also Carter 2000:121-122), although my interpretation is also based on the single published article.

It seems likely that the owners of the kiln produced polychrome pottery in the Ulúa-Maya style, as well as mold-made figurines. Perhaps some of the sherds recovered do not represent vessels produced there and are simply broken vessels discarded in proximity to the kiln incidentally. Context suggests that potters manufactured a variety of vessel forms, painted them, and fired them at this location. The totality of evidence suggests that a group of potters was specializing in polychrome production, emphasizing cylinder and tripod dish forms. They processed their own pigments and painted the
pottery in house. In addition to vessel manufacturing, they also producing figurines and figurine whistles from molds.

A Unique Downdraft Kiln at Tula

Excavation of residential architecture at the Epiclassic center of Tula, in central Mexico, uncovered a distinctive feature that had been constructed into a house with a plastered floor, although it is on the edge of the building within a “room” or exterior porch with no roof, open to the east side. Feature 4 from Room 2 of House VIII, located on the west side of the Central Group in the Canal locality, has been interpreted as a downdraft kiln used to fire ceramic drain tubes (Healan 1989:254). The excavated feature appears to have been a two-chambered kiln, with both the firebox and firing chamber constructed below the plastered floor surface. In addition to the kiln chambers, a subfloor duct system was constructed into the house platform and must have been planned as part of the final construction (Healan 1989:255).

Unlike an updraft kiln, constructed with a firebox directly below the chamber used to hold ceramics during firing, a downdraft kiln is constructed with the firebox to one side of the firing chamber. While heat and gases from the firebox of an updraft kiln naturally flow directly upward during the firing process, the downdraft kiln requires that the combustion gases be drawn laterally into the chamber holding the ceramics to be fired. Dan Healan suspects that the ducts associated with Feature 4 were constructed in order to produce a “chimney effect” whereby a stronger draft drew combustion gases from the fire box through the firing chamber and then out of the kiln (Healan 1989:255).

Excavation data indicate that the east chamber of the kiln feature, measuring 50-55 cm in width and perhaps three times as long, was probably the firebox where fuel was placed prior to, and possibly during, firing ceramics in the separated west chamber. The west chamber, measuring about 45-50 cm in width, lay about 10 cm deeper than the east chamber. Both chambers were constructed of adobe blocks and showed evidence of
intense heat. However, only the east chamber contained ash and carbon suggesting that this was the firebox while the west chamber was a separated chamber for holding ceramics to be fired without direct contact with the fuel (Healan 1989:254). A partition constructed of loosely spaced basalt and cantera blocks separated the two chambers, effectively blocking off the west chamber from direct contact with the fuel source of the east chamber while permitting heat and combustion gases to pass into the west chamber; specially constructed sub-floor stone-lined ducts encouraged this process.

While the upper portion of the kiln feature appears to have been open, without a “roof,” a variety of debris overlying the feature is interpreted by Healan as furniture for covering the top of the kiln during firing episodes. Stone slabs, metate fragments, and overfired sherds (i.e., wasters) recovered during the excavation of this feature were probably used to seal the kiln after it was filled and while the ceramic tubes were fired. The stone slabs would also have been useful for closing the firebox and controlling draft during the firing process (Healan 1989:257).

All pottery kilns reported archaeologically and ethnographically from Mesoamerica are either circular or square, while the Feature 4 kiln at Tula is a long rectangular construction which would not be optimal for firing pottery vessels (Healan 1989:257). However, six complete ceramic drain tubes recovered from outside the kiln suggest that these represent the last load fired within it. The tubes would have easily fit within the west chamber and the overall constructed configuration of the downdraft kiln appears to have been conceived for the sole purpose of firing these tubes. Ceramic drain tubes are uncommon outside of the neighborhood where the kiln was excavated. Given the lack of broken or misfired tubes and their restricted distribution, it seems likely that this kiln was specifically constructed for the production of a single form that was not widely used. Given that ductworks had to be constructed at the same time as the household platform, it is likely that the kiln was deliberately planned as a production locus for a specific product.
“Thus ceramic tubes appear to be of localized importance, and the needs of a local neighborhood could probably have been met by a small number of kilns operated infrequently.” (Healan 1989:259)

Joseph Becker does note that the duct system and firing chamber are reminiscent of Roman hypocaust systems used to heat houses, suggesting that the Tula example is either a heating system or that a kiln was built into this house and then only fired during winter, heating the house incidental to the firing of ceramic tubes (Becker 2003a:112). It should also be stressed that the ceramic tubes recovered from the feature were not used in the construction of the subfloor ducts, which were made from clay and stone lined. Neither do the ceramic tubes appear to have been used inside this small kiln as furniture to support ceramic vessels and distribute heat evenly as has been reported for modern potters in Mexico, who use a latticework of fired clay tubes inside very large rectangular kilns, constructed of concrete blocks.

The recovery of this downdraft kiln is a stark reminder that the precise configuration of pottery kilns may vary considerably. No single kiln form is to be expected in any area, in fact, the use of kilns should not be automatically assumed. A number of open, pit, or kiln-like firing structures could have been used alone, or in addition to true kilns.

**Pottery Kilns of Ancient Ejutla, Oaxaca**

Traditional pottery manufacture in the Valley of Oaxaca is household-based, although the degree of intensity and method of firing are variable (Balkansky et al. 1997). In modern Oaxaca, cylindrical updraft kilns are used by Atzompa potters (Hendry 1992; Stolmaker 1976, 1996) to produce high volumes of glazed ceramics, thrown on wheels, just 5 km outside of the region’s largest market in the city of Oaxaca de Juárez. These cylindrical kilns are fairly permanent features, constructed from stones and/or adobes and a specific clay mixture is used as a mortar and for coating for the inside of the kiln. These modern kilns are “broadly analogous in design” to those reported in an
archaeological context by Winter and Payne (1976) from ancient Monte Albán (Balkansky et al. 1997:140). The relatively high intensity production at Atzompa is contrasted by relatively lesser intense ceramic production at San Marcos Tlapazola that does not involve wheel-throwing, glazing, or the use of true kilns; these potters fire in open-air or bonfire conditions in which pottery and fuel are intermingled (Balkansky et al. 1997:140). Given the proximity of Atzompa to Monte Albán and the archaeological recovery of kiln fireboxes at the site, ephemeral firing features were not anticipated at pottery producing sites in the valley. There has been an unwarranted expectation that ancient potters throughout Mesoamerica employed fairly permanent kiln constructions.

Excavations at Ejutla, a valley floor settlement at the southern end of the Valley of Oaxaca, produced strong evidence for both ceramic production and shell artifact production within a presumed domestic context (Feinman and Nicholas 2007). Nine hundred wasters were recovered, including figurines (160 wasters) and sherds from comales (tortilla griddles) and sahumadores (handled incense burners). Fifteen definitive figuring molds were identified among around fifty mold fragments recovered (Feinman and Nicholas 2007:194-198). Concentrations of waste sherds, figuring molds, deformed ‘waster’ figurines, and ash and charcoal were found to overlie shallow pit features dug into the soft bedrock (tepetate); the Ejutla pit kilns measure from 2 to 4 m meters across and 40 to 70 cm in depth and are non-symmetric (Balkansky et al. 1997:149). These features were not immediately equated with the firing of ceramics mainly because they did not conform to the general design of “kilns” believed necessary for ceramic firing.

“Despite this evidence, the implication that these bedrock features were for ceramic firing did not fit our expectations, which were based on the familiar production methods of the potters at Atzompa and the formal kiln features excavated at Monte Albán.” (Balkansky et al. 1997:142)

The assumption that kilns must have been constructed of durable materials and will be obtrusive in excavation or even survey has plagued Mesoamerican archaeology. On the other hand, Becker (2003a) has approached this conundrum from a different angle. He argues that large volumes of polychrome pottery recovered from Tikal were
not likely to have been fired in open-air conditions because the elaborate slipping and painting programs of these ceramics would have been damaged in firing conditions where fuel and pottery were intermingled. Balkansky et al. (1997:147) note that the pit kilns from Ejutla do not provide a sufficient separation of fuel and would produce miscoloration and fireclouding of pottery, so this type of kiln would probably be unsuited to the production of fine polychrome pottery. However, the Ejutla pit kilns would be ideally suited to the production of monochrome pottery in a reduction atmosphere, although holes through the impromptu coverings of the features could also maintain an oxidizing atmosphere. Evidence suggests that the ceramic inventory fired within the pit kilns was made up of figurines, incense burners (*sahumadores*), tortilla griddles (*comales*), and reduced grey bowls (Balkansky et al. 1997:144); painted polychrome pottery is not present.

The ceramic production does seem to be dedicated to just a few forms, and *comales* are the only common utilitarian form present; *sahumadores* and figurines do not typically dominate household assemblages in the area. The limited range of products produced does suggest a degree of specialization, and the position of these pit kilns “out back” of the residential structure (Balkansky et al. 1997:144, Fig. 4) suggests a household or household industry level of organization.

In addition to firing ceramics, the inhabitants of this residence also worked shell and were engaged in low intensity lapidary production (Feinman and Nicholas 2007; Feinman, Nicholas, and Middleton 1993). Twenty thousand pieces of imported marine shell (*Spondylus, Strombus, Pinctada*) were recovered in various stages of preparation while only 1% of the recovered shell assemblage is represented by finished artifacts, leading to the conclusion that finished objects left the production locus and entered an exchange system. Finished shell artifacts were uncommon in the household excavations; only one shell bead was recovered from a subfloor tomb (Feinman and Nicholas 2007:194-199). Shell debitage is also concentrated “out back” around the pit kiln
features and the shell production unit was evidently embedded in the same household context as the pottery manufacturing unit.

Mixed domestic and craft production debris were recovered from the same household midden deposits (Feinman and Nicholas 2007:198-200). Micro-artifact analysis (heavy fraction) of samples from the earthen house floor documented the working of shell, chert, greenstone, and rose quartz within the actual domestic structure (Middleton 1998; Feinman and Nicholas 2007:199-205). The residents were evidently involved in the manufacture of chert microdrills, cylindrical drill plugs, onyx plaques as well as greenstone and exotic stone working. Cylindrical drills were subsequently used to perforate shell artifacts (Feinman and Nicholas 2007:198). Members of the household must have engaged in various production tasks, from lapidary work to pottery manufacture, or various portions of the household unit may have dedicated some time to specific crafting activities. Perhaps the males worked at low level lapidary work and shell artifact production while the females of the household produced pottery. Whatever the internal division of labor, multiple craft activities were performed within a single extended household. As already noted, several cases of multiple craft activities performed within a single household have been documented at various Mesoamerican sites, including elite households at Aguateca (Aoyama 2007, 2009; Aoyama and Emory 2007; Inomata 2007) within the Tlajinga 33 apartment compound at Teotihuacan (Widmer and Storey 1993), and at the excavated house compounds of Xoxicalco (Hirth 2006, 2009). The location of production refuse accumulations 4 to 10 m away from the main residential structure is also reminiscent of the obsidian “workshop” reported from Tula, also situated just behind a house compound (Healan et al. 1983).

James Sheehy suggested that ephemeral pit features filled with ash, wasters, broken pottery, and burnt adobe recovered from the Tlajinga 33 compound at Teotihuacán may be the remains of ceramic firing features adjacent to the residential compound (1992:755-756, 768-769). Both pottery manufacture and lapidary work were conducted within the larger Tlajinga 33 apartment compound (Widmer and Storey 1993).
In general, the pit kiln features are highly ephemeral and even after excavation were not immediately identified as pottery firing features. Nonetheless, the overall context strongly supports this identification – near a residence and associated with a suite of diagnostics (wasters, broken pottery, ash, and burnt clay or adobe).

The Kilns of Matacapan

Both open firing and simple updraft kilns are used ethnographically in the production of ceramics in the Tuxtla Mountains of Veracruz, Mexico. P. J. Arnold (1991) has described modern pottery firing in the Tuxtla Mountains where one widespread firing procedure is to stack vessels to be fired over a layer of wood placed directly on the ground surface. Fuel and pots are then stacked up in a teepee fashion, set a fire, and allowed to fire for about two hours; around twenty-five vessels are fired in a single event. Also in the Tuxtla region, simple, circular, updraft kilns are employed in San Isidro Texcaltitlan (P. J. Arnold 1991) and Francisco I. Madero (Pool 2000). Pool (1997, 2000) has pointed out how similar the updraft kilns constructed by the potters of Francisco I. Madero are to the archaeologically recovered kilns from Matacapan. Potters from Francisco I. Madero use grass-tempered adobe and stone to construct the firebox and walls of their updraft kilns, utilizing scrap iron to form the grate separating the firebox from the firing chamber; construction of a single kiln requires less than three hours and utilizes materials typically already available on the potters own houselot. These kilns are constructed directly from ground level by first tracing an approximately 1 m diameter circle to guide the construction which begins with a stone foundation. The potter then continues to build up the firebox with adobe and stone to a height of about 27 cm at which point larger slab stones are placed upon the built up firebox to protrude inward, providing a platform to set the iron gate and provide a separated firebox. The kiln is finished to a height of around 70 cm.

Regional survey and excavation targeting the recovery of ceramic production facilities in the Matacapan area have securely dated some kilns to the Early Classic
period (A.D. 300-450) and perhaps even earlier during the Terminal Formative period (A.D. 100-300) (P. J. Arnold et al. 1993; Pool 1990, 1997, 2000; Santley et al. 1989). In the nearby Mixtequilla region, Curet (1993) documented Middle Postclassic (ca. A.D. 1200-1300) kilns associated with comal production. The survey of one large workshop at the site of Matacapan located 36 kilns grouped together and associated with high ceramic densities, waster sherds, and kiln construction debris on the surface (Pool and Santley 1992:212-215; Arnold and Santley 1993:235-236). In addition to this “workshop” (area 411 or Comoapan), kilns and ceramic production debris have been identified within other areas of Matacapan, though no other area appears to represent the same intensity of production as that inferred for Comoapan.

The excavated Matacapan kilns had their “grates” constructed from the same adobe mixture as their fireboxes and walls, with approximately ten slits cut through to allow heat and oxidizing gasses to pass from the firebox to the firing chamber; little additional time would be needed for this, perhaps an additional hour (see Pool 2000:Figure 4 for photo of a Matacapan kiln). The ancient kilns tend to be slightly larger than the modern ones, ranging from 109 to 138 cm in diameter. The upper walls of the firing chambers of the eight excavated kilns from Matacapan have collapsed over time, leaving a circular pile of adobe construction debris, a clear surface indicator of a kiln firebox below the surface.

Updraft kilns permit greater control over temperature increases during the firing period (Rye 1981:98), even if the absolute maximum temperature of both updraft kilns and open or pit firing are about the same. P. J. Arnold (1991:55) estimated kiln temperatures at 800° Celcius and open firing at 750-800° Celcius; Gosselain (1992:244) estimates a 600-900° Celcius range for open firing and kiln firing, with kiln temperatures not clearly exceeding those of open firings. Balkanski et al. (1997:148) report reaching a maximum temperature of 768° Celcius in an experimentally constructed pit kiln. Refiring experiments with comales suggest that some specimens were fired at temperatures lower than 400-500° Celcius (Curet 1993:431, Footnote 2).
The simple updraft kilns from Matacapan were used to fire untempered fine paste pottery which requires ‘water smoking’ (see Rice 1987b:87) or a more gentle increase in temperature over the firing period; drastic temperature increases during firing are liable to fracture pottery as water vapor within their fabric is heated, expands, and attempts to escape rapidly.

Over forty recognized ceramic types have been assigned within the four major wares (or ceramic groups) of Matacapan (Ortiz and Santley 1989; Pool 1990, 2000); these are Fine Orange, Fine Grey, Coarse Brown, and Coarse Orange. The Fine Orange and Fine Grey wares are dominantly represented in serving vessel forms, while the Coarse Orange and Coarse Brown wares are mostly represented by ‘utilitarian’ forms, such as jars and basins. Although no open pit firing loci have been found at Matacapan, vessel defects within the coarse brown ware tradition are possibly associated with open firing conditions and suggest to Pool (2000) that vessels of this tempered ware were most likely fired in open firing conditions. Fine paste serving ware and coarse orange jar production are archaeologically associated with simple updraft kilns, supporting the hypothesis that the adoption of the updraft kiln can be associated with the use of (untempered) fine paste clays for pottery production.

7.5 – Classic Period Pottery Production in Veracruz, Mexico

Pottery Production at Matacapan

The site of Matacapan in the Tuxtla Mountains of Veracruz, Mexico, has been interpreted as a Teotihuacán enclave, possibly settled by merchants from the Basin of Mexico ca. A.D. 300 (Parsons 1978; Santley 1983; Santley, Ortiz and Pool 1987; Santley, Yarborough and Hall 1987, see also P. J. Arnold and Santley 2008 for a recent alternate interpretation). Although several light occupation episodes are documented for the area
during Early Formative (ca. 1800 – 1300 B.C.) and Late Formative (ca. 400 B.C. – A.D. 100) periods, these were both abruptly halted by volcanic eruptions (Pool and Santley 1992:211-212). The Teotihuacán influence at Matacapan can be seen in the presence of talud-tablero architecture, green obsidian and a ceramic assemblage of Teotihuacán derivation. However, the Teotihuacán ceramic forms (cylindrical tripods, candeleros, triangular-faced figurines, braziers, censers, and effigy vessels) appear to have been produced locally with local resources (P. J. Arnold and Santley 1993:235). Only imported Thin Orange sherds are identified as ceramics originating from central Mexico (Pool and Santley 1992:210).

The Matacapan situation somewhat parallels the Teotihuacán influence documented at Tikal on a ca. A.D. 300 temporal horizon where foreign patterns appear as intrusive elements in elite imagery, architectural traits, and imported goods. This foreign interest appears to have exerted a strong influence on the style and forms of certain wares produced by the local ceramic industry at Matacapan during the Classic period. Aztec styles become more prevalent in Veracruz during the Postclassic period (Garrety and Stark 2002) though these are largely mimickry, imitations made locally with local resources (Skoglund et al. 2006; Stark 2007:148). It appears that Veracruz was not isolated from influence from central Mexico, although the long-term trend documented for the area involved mostly local manufacture of ceramics, even of foreign-influenced forms.

Although the volcanic origins of the Tuxla Mountains makes them a source of abundant, excellent quality basalt for ground stone implements, there are no obsidians sources within the range; all obsidian imported into Matacapan originated from the north, from central Mexico. Green obsidian from Pachuca and grey obsidian of Zaragoza-oyameles origin have been recovered from the area, but trade networks evidently did not involve much obsidian from the highland Guatemalan sources exploited by the lowland Maya (Arnold and Santley 2008).
Matacapan was a major consumer of Teotihuacán and Toltec obsidian (Santley and Ortiz 1983; Santley et al. 1984). The center received already prepared cores, almost ready for blade production, allegedly from workshops in Teotihuacán (Santley et al. 1986:119). These prepared cores may also have been procured from other networks with access to the obsidian sources allegedly controlled by Teotihuacán. In fact, Clark (1986) is unconvinced that the workshops at Teotihuacán were producing for an external market at all (contra Santley or Spence). The absence of irregular initial series blades and the abundance of later reduction stage fine pressure blades (Spence 1981) at Teotihuacán indicate to him that cores could have been exported directly from the Pachuca mines to outside markets without direct intervention from the Teotihuacán state (Clark 1986:37).

Santley et al.’s (1986) model of Matacapan supplied with prepared obsidian cores by long-distance merchants from Teotihuacán (or, at least, from central Mexico) is still valid, however. Survey of Matacapan supports the idea that the obsidian industry there was wholly “urban,” as no “hinterland” workshops have been identified (Santley et al. 1986:124). Perhaps Clark’s hypothesis that the majority of obsidian exported from Teotihuacán was elite trade can be augmented to include the exportation of some cores for blade production, even if this was not a large-scale industry – given the low consumption rate of the material and the ability to produce 100-150 blades from a single core. The organization of ceramic production in the Matacapan area was quite different from the organization of obsidian production. Ceramic production units were almost always domestic based and not a solely urban manifestation. The raw materials used to manufacture pottery in the Tuxtla Mountains were not collected (or received) from far off; the pottery produced was consumed locally and did not enter widespread distribution networks.

Survey and Excavation in Veracruz

Some of the most detailed surveys in Mesoamerica have been conducted in the Gulf lowlands and the ceramic industry of this area is one of the most thoroughly
analyzed for Mesoamerica (Stark and Garrety 2004:126, 127). The earliest evidence for specialized pottery production in the Gulf lowlands of southern Veracruz comes from Late Preclassic Papayal and Terminal Preclassic Tres Zapotes, though neither site appears to have ceramic production facilities at the same scale as the Comoapan production unit from Matacapan in the central Tuxtla Mountains (Stark 2007:156, 161). Nonetheless, it is suspected that specialist ceramic production of utilitarian pottery and common serving ware forms was attached to, or patronized by, elites at Tres Zapotes (Pool and Bey 2007:10-11, 35). Ceramic production at Papayal and Tres Zapotes in the Preclassic does exceed simple household use and was “distributed to some of the surrounding area” (Stark 2007:171). Specialized pottery produced at Matacapan, on an Early Classic horizon, appears to have been distributed well beyond the household replacement level, though not for interregional exchange (Pool and Britt 2000).

The fine textured clays from the Concepción formation used in the production of Fine Orange pottery in the Tuxtla Mountains were used without removing aplastics or adding temper. The production of thinner walled vessels in this Fine Orange paste is viewed as a response to open-firing breakage rates and cost savings in paste preparation. These vessels are also associated with the simple updraft kiln that can be slowly heated to water-smoke the untempered fine paste pottery, alleviating kiln breakage losses from rapidly expanding fine paste pottery (Pool and Britt 2000:153). The percentage of oxidizing Fine Orange pottery in the ceramic assemblages from Matacapan and Bezuapan rises from around 10% in A.D. 200 to over 40% after A.D. 400 (Pool and Britt 2000:156, Figure 13). The initial adoption of oxidizing fine paste pottery has been described as a prestige technology which consequently became widespread throughout the region (Pool and Britt 2000:153).

The research program at Matacapan, initiated in 1982, uncovered actual ceramic production areas with kilns, waster piles, and manufacturing tools. Thirty-six kilns were located within one large workshop or nucleated industry zone of Matacapan, area 411 or Comoapan, which covers four hectares of the site (Pool and Santley 1992:212-215).
Encouraged by this unequivocal evidence of pottery production, the Matacapan Project continued transect surveying in hopes of identifying other production loci on the basis of “cracked, warped, and vitrified ‘waster’ sherds, kiln construction material (fired fiber-tempered mud), and high densities of ceramics.” Production areas were identified with a “polythetic set of criteria,” including a high density of ceramics (more than 20 sherds per 3 x 3 m collection unit – the upper tercile), misfired sherds (i.e., wasters), and kiln debris (i.e., fire hardened adobe, often vitrified on one side) (P. J. Arnold and Santley 1993:235-236; see Stark and Garrety 2004 and Stark 2007 for reviews of pottery production evidence employed by various Veracruz survey projects). The 41 production areas identified through this procedure were assigned to three general categories or scales of production: household production-household industry, household industry-workshop industry, nucleated industry-manufactory.

“Using this polythetic set we have identified 41 production localities at Matacapan. In 1986, we tested the accuracy of our identification criteria by excavating three additional production localities (Pool et al. 1987). Excavations in two of these localities yielded kilns, waster dumps, and manufacturing implements in the form of polishing stones. Excavations in the third locality, originally thought to be an area of open firing of coarse jars, failed to produce unambiguous indications of production.” (Pool and Santley 1992:212)

Most ceramic production units at Matacapan were small and residential; excavated household middens contained a combination of production residue and domestic debris (Santley and Kneebone 1993:50; Santley et al. 1989). Fine Orange ceramic production was generally conducted on a small-scale household industry level throughout the Middle Classic period, although some larger, more specialized production units coexisted within the overall household-level production system. These include “large-scale, highly specialized production [units] of Coarse Orange jars” at the Comoapan complex and in Area 199, as well as more intensive production levels of Fine Orange ware in Area 149, and Mound 3. These latter two production areas were characterized by “more specialized ceramic dumps containing proportionately fewer residues of domestic activity.” The production of Brown Slipped Fine Orange at the
Mound 3 locus appears to signal increased differentiation of production within the Fine Orange ware (Pool and Santley 1992:215).

“Matacapan’s ceramic industry was differentiated, with several kinds of production entities present. The larger of these production areas emphasized a limited number of ceramic wares, but most appear to have produced the full suite of wares and vessel forms in use at the time. (Santley and P. J. Arnold 1996:236)

Taken in their entirety, the production loci for Fine Orange ceramics at Matacapan suggest that production of the ware (Fine Orange) was duplicated at multiple household level production units simultaneously with the more specialized production of a specific type or variety (Brown Slipped Fine Orange) within a possible workshop or nucleated industry context. Evidence for a parallel production scheme for Fine Grey ware is also evident from excavation and survey data. Surface evidence for Fine Grey production was documented from a multitude of probable household level production units throughout the area, while a more specialized workshop unit producing serving vessels in a fine grey paste was excavated immediately overlying the Fine Orange production unit in Area 149 (Pool and Santley 1992:215).

Even when material remains from pottery firing are regularly removed from the immediate vicinity of the kiln, the repeated use of the kiln will generate an elevated amount of production residue, especially when misfired and broken ‘wasters’ are subsequently used for kiln furniture as ‘saggers,’ ‘spacers,’ or to cover the firebox entrance or top of an updraft kiln when controlling temperature and firing environment during the firing process. Significantly larger sherd middens are associated with contemporary Tuxtla households using kilns than those households where open firing is the norm (Arnold and Santley 1993:230). The distribution of large dense deposits of pottery production debris certainly suggests a redundancy of production units and the maintenance of pottery kilns.
Simple updraft kilns have been found in Classic period contexts at Matacapan (Pool 1990; Santley et al. 1989) and La Mojarra (Diehl 1997; Diehl et al. 1997) and kiln fragments have been recovered from La Mixtequilla (Stark 1992) and Tres Zapotes (Hoag 1997; Pool and Britt 2000:153). Three kilns from the main plaza at La Mojarra have been described as “pit kilns” with fired clay walls and associated with deformed wasters (Stark and Garrety 2004:129). Noting that one of the kilns from La Mojarra was filled with painted plaster chunks (Vargas 1998:84-85), Stark and Garrety suspect that this concentration of kilns at La Mojarra represents reclamation of lime from plaster as well as ceramic production or other uses (2004:129). These authors warn against interpreting multiple kilns grouped together as a clear indication of workshop or manufactory level production at La Mojarra, Matacapan, or elsewhere. Although the concentration of kilns and production emphasis on a limited number of wares at Comoapan is certainly evidence of specialized production, Stark and Garrety (2004) and Feinman (1999) are hesitant to accept the interpretation that this represents a nucleated industry.

“Multiple kilns may represent simultaneous use but could also result from disrepair and subsequent new construction. A nucleated industry at Comoapan remains a strong possibility but a more parsimonious interpretation is that Comoapan housed a cooperative firing area used by specialists (a manufactory interpretation is too speculative to warrant continued use [Pool 1990:324]).” (Stark and Garrety 2004:127)

Stark notes that multiple kilns could have been used simultaneously. Alternately, this accumulation of kilns may represent disrepair and new construction over time. Likewise, the kilns may have been conveniently placed together, away from residential occupations that would be molested by the toxic firing process, and still owned and/or used by independent production groups at different times (Stark 2007:160). Balkansky et al. (1997) address the chronological problem associated with the group of pit kilns excavated near a residential structure at Ejutla.

“The presence of multiple firing features in the vicinity of the structure suggests the frequent movement of specific firing locations, or the simultaneous use of multiple kilns. Contemporary pottery-
making families at Atzompa move kilns around their houselots as older kilns fall into ruin and the spatial needs of the household change…The time frame of these changing configurations is typically from 5 to 30 years, too short a span in most cases to be distinguished archaeologically.” (Balkansky et al. 1997:151)

Santley and colleagues have argued that the concentration of 36 kilns at Comoapan represents a corporate firing area, probably indicative of a manufactory or nucleated industry level of production. The two possible explanations favored are that independent potters traveled to the kiln location [a nucleated industry] (Feinman 1999), or that a single workshop or manufactory where all potters who utilized the kilns worked simultaneously is located nearby (Santley et al. 1989:119). No manufacturing implements, such as polishing stones or molds, were located in direct association with the thirty-six kilns at Comoapan. Either of these possibilities rests on the assumption of architecture nearby, which has not been established (see Stark 2007:156). The implication has always been that the concentration of kilns represents deliberate intensification for greater output, that all kilns were fired simultaneously as a full-time facility producing expressly for higher output and wider exchange.

**Shifts in Production Intensity over Time**

A dynamic shifting settlement pattern has been reconstructed for Matacapan over time. In the early Middle Classic period (A.D. 300 – 450) a small community emerged centered on a Teotihuacán enclave or barrio. Middle and late Middle Classic times (A.D. 450 – 550 and A.D. 550 – 650) witnessed explosive growth into the hinterlands. Matacapan became the primate center within a five-tiered settlement hierarchy including secondary centers (Ranchoapan and Teotepec), small centers, villages and hamlets (Santley and P. J. Arnold 1996:242). The Terminal Middle Classic period (A.D. 650 – 800) witnessed a contraction into a more densely nucleated and slightly smaller overall population at Matacapan (P. J. Arnold and Santley 1993:235). These temporal fluctuations in the overall settlement pattern coincide with shifts in the organization of ceramic production.
“Our regional data indicate that the Teotihuacán presence at Matacapan began within the sociopolitical vacuum fostered by this [ca. A.D. 250-300 volcanic] eruption. The site became a small center sometime after A.D. 300; coincident with the growth was the appearance of Teotihuacán-related artifacts and iconography within the region. Over the next century, Matacapan developed into the largest community within our [central Tuxtla] survey area. Nonetheless, the regional population remained sparse and, by the end of the Early Classic (A.D. 450), is estimated at no more than two thousand persons.” (Arnold and Santley 2008:298-299)

Arnold and Santley (2008:308-310) cite the evidence for social turmoil at Teotihuacán apparent in episodes of desecration or termination of central architectural complexes at the central Mexican capital around A.D. 250. Given newer archaeological evidence of perturbation events at Teotihuacán on a ca. A.D. 250 – 300 temporal horizon (see Cowgill 2003; Manzanilla 2003; Sugiyama 1998), Arnold and Santley favor a scenario of immigrants voluntarily leaving (or expelled) from Teotihuacán to resettle the resource rich Tuxtla Mountain area of Veracruz over the previously emphasized supposition that the influx of Teotihuacán cultural affiliation in the region represented a political entrada based on economic concerns of the Teotihuacán state – the acquisition of local resources in exchange for obsidian. They also note that years of survey and excavation at Matacapan and the entire central Tuxtlas survey area have verified the widespread evidence of Teotihuacán-related cultural artifacts throughout the survey zone, as well as in the ceremonial core of Matacapan.

According to survey data, by A.D. 450 the west-central Tuxtlas saw an incredible population increase. One hundred and seven residential sites are registered for the first half of the Middle Classic Period, up from seventeen in the preceding period (Santley and Arnold 1996). P. J. Arnold and Santley (2008:301) view this population increase as evidence of large-scale migration into the area. At the same time, the recovered frequencies of Teotihuacán-affiliated candeleros and tripods indicate that these materials were not restricted to the largest sites in the region, and that they become increasingly widespread across the social hierarchy during the first half of the Middle Classic period.

“Data from surface collections and excavations indicate that pottery production at Matacapan in the Middle Classic ranged in scale, context and organization from household production entities or small household industries to large-scale nucleated industries or manufactories [as defined by van der Leeuw (1976) and Peacock (1982)] (Santley, Arnold, and Pool 1989).” (Pool and Santley 1992:213)

A ceramic production unit with at least one kiln at Mound 61 was evidently constructed directly upon the volcanic ash layer from the pre-A.D. 300 eruption, and focused on producing Fine Buff and Fine Orange pottery (P. J. Arnold and Santley 2008:299). A Teotihuacán social affiliation is also evident in the mortuary patterns recovered at Mound 61 (P. J. Arnold and Santley 2008:300-301, contra Daneels 2002). Cylindrical tripod vessels, a Teotihuacán form, recovered from Mound 61 as well as the entire survey zone of the central Tuxtlas were manufactured in a Fine Buff paste (Ortiz C. and Santley 1998). It is therefore tempting to see a pioneering Teotihuacán population entering into the region and setting up ceramic production at this locale in order to provide cylinder tripods to the modest-sized population of the area, using local clay and temper resources to reproduce this central Mexican form. Although this production area is situated within the ceremonial core of Matacapan, Pool (1990:244-245) has interpreted this particular production unit as representing low-intensity household level ceramic production, occurring in a residential setting, and not an instance of specialists producers attached to an elite institution.

“Locational evidence for administrative control must be used with caution, however, since political centers are also centers of population that contain concentrations of consumers, pools of labor, and markets or redistributional facilities. Each of these characteristics alone, or in combination with one another and the political functions of the center, may provide powerful incentives for the location of specialized production in and around the center.” (Pool 1992:310)
**Intensification of Ceramic Production**

The alleged manufactory-level production complex at Comoapan dates primarily to the terminal Middle Classic period (Santley et al. 1989; P. J. Arnold and Santley 1993:238). Located away from residences but near to raw materials and fuel, Santley and Kneebone suspect that production at Comoapan was in the millions of vessels (1993:54-56).

“The overall area devoted to ceramics production appears to decrease over time, but firing in production areas was apparently more nucleated, with the same number of dumps serving a larger number of kilns.” (P. J. Arnold and Santley 1993:238)

Of course, this may indicate the construction of new kilns as older ones fell into disrepair, a highly reasonable assumption. Although counting the number of kilns present in an area gives an indication of the scale of production, assessing the actual number of working kilns on any given day is largely beyond the limits of archaeological dating. As Stark and Garrety (2004) and Feinman (1999) have pointed out, this concentration of kilns may represent several different production arrangements. While residential architecture has not been excavated in close proximity to the kilns, neither has any manufacturing facility for the forming of the pottery fired in these kilns; current interpretation rely on unsubstantiated assumptions. During the terminal Middle Classic period, greater evidence does exist for firing and production mistakes and waster dumps are increasingly comprised of denser amounts of material at the workshops or nucleated industries located to the southern and southwestern portions of Matacapan (Arnold and Santley 1993:238-239).

Aside from the one complex “emphasizing” the production of course orange jars at Comoapan, none of the production units are described as specializing in a narrow range of forms or pastes (i.e., types or wares). This belies the notion that specialized ceramic production would develop to the degree where production units would only
produce one or a couple forms in the same paste; indicating a more generalized industry than has been expected at Mesoamerican, and especially lowland Maya, centers.

At the onset of the Late Classic, the population of Matacapan fell by approximately 30%, as settlement shifted to the east-southeast, away from the ceremonial core. This period witnessed a less nucleated settlement pattern with residences increasing spaced further apart. Ceramic production became relatively more nucleated at residential compounds and at the ‘workshop’ located at Comoapan (Arnold and Santley 2008:304). Virtually abandoned by the end of the Late Classic, Matacapan was superseded as the primary center in the region by nearby Ranchoapan (Santley and P. J. Arnold 1996:242).

**Regional Analysis of Sherd Compositions: a Distributional Study**

Pool has used compositional analysis to identify groups of related sherds and the probable clay sources used in Classic times to gauge the degree of pottery exchange. Assuming that the compositional uniformity within groups of sherds indicates their production from specific clay sources, Pool hypothesized that the clay source would be identified through clay sampling. Following D. Arnold’s work (1985), he assumes a 7 km average distance to procure clays and 9 km to procure temper. Given the geographic distribution of sherds and the law of abundance (see Bishop, Rands, and Holley 1982), sherds from different centers were used to form compositional reference groups which have been used to argue for provenience of manufacture (Pool 1992:297).

“The use of spectrographic and mineralogical techniques to discriminate among artifacts from different sources relies on the provenience postulate of Weigand et al. (1977:24) that ‘identifiable chemical differences exist between sources of a raw material, and the analytical approach can recognize these differences’ (Bishop, Rands and Holley 1982:301). The identification of this concept as a postulate is apt, since it is less an assumption about the nature of source variability than it is a requirement for the selected approach to work. An additional assumption of compositional analysis is that variation in the composition of artifacts reflects variation in the raw materials from which they are made (Rands and Bishop 1980:19).” (Pool 1992:296)
Following the identification of production loci, researchers at Matacapan proceeded to analyze clay deposits and ceramic sherds from the region at a fine-grained compositional level. Elemental concentrations of 128 clay samples and 185 sherds were determined by X-ray fluorescence spectrometry at Tulane University. The calculated elemental concentrations were first used to identify the most likely clay deposits used in Matacapan to produce fine orange (and fine grey) pottery at that site. The initial construction of Chemical Paste Compositional Reference Units (CPCRU) found 97% (180 sherds) of Matacapan ceramics assigned to a single CPCRU, along with clays from the concepcion clay deposits. Matacapan potters evidently favored Concepcion clays for the production of fine paste ceramics at that site (Pool and Santley 1992:220, 227).

Upon completion of this provenience study of Matacapan clays and sherds, researchers expanded to a regional provenience study examining pottery from three centers in the Tuxtla Mountains: Matacapan, El Picayo, and Matalapan. El Picayo is situated approximately 15 km northwest of Matacapan, Matalapan is situated approximately 16 km southwest of Matacapan. Utilizing elemental concentrations determined by Instrumental Neutron Activation Analysis (INAA) at Brookhaven National Laboratories, these researchers compared sherd compositions from all three sites with the Matacapan Fine Orange CPCRU. In combination with the geological survey of clay deposits in the study area, and assuming a 7 km maximum radius procurement strategy (see D. Arnold 1985), the compositional data was subjected to further statistical examination in order to compare and contrast the distribution of pottery assumed to have been made from distinctive clay deposits. A pattern of local, non-overlapping compositional signatures emerged, a situation which accords well with D. Arnold’s (1985) ceramic ecology model of resource procurement, and suggests a lack of ceramic exchange among sites spaced about 15 km from one another. Overall, Pool and Santley do not see evidence of the Matacapan ceramic industry connected to a larger interregional exchange system, or any great degree of exchange between the surveyed sites of the Tuxla Mountains (Pool and Santley 1992:230).
The overall trend for all three centers consists of producers utilizing local clays to manufacture their pottery and then distributing their products to an immediate local population, with little pottery crossing from the territorial limits of one center into the next center’s area and only occasionally moving farther afield. The mechanisms or institutions responsible for the limited long-distance movement of Matacapan pottery remain open to debate.

“It therefore appears that major sites in the Tuxtlas relied on clay sources situated immediately around them and that there was little exchange of Fine Orange pottery between different production nodes. Fine Orange pottery and other Tuxtla ceramics, however, do occur in the Merchant’s Barrio at Teotihuacan, indicating that at least in this one case pottery from Matacapan was traded long distances (Rattray 1987; Ortiz, personal communication). This evidence suggests that some of the output of Matacapan’s Fine Orange ceramics production areas was for export beyond the boundaries of the local system.” (Pool and Santley 1992:231)

It should be noted that pottery produced at Matacapan and recovered from the “merchants’ barrio” at Teotihuacán could have arrived through a number of mechanisms, and not necessarily through trade or exchange. The presence of Matacapan produced pottery at Teotihuacán just as likely represents the movement of peoples as the exchange of vessels through economic institutions; the actual vessels may not have changed hands at all.

**Pottery Production in La Mixtequilla**

Settlement studies in the La Mixtequilla region of Veracruz, Mexico suggest people living in communities not unlike those of the Classic Maya lowlands despite the divergent environments. In this region a dispersed settlement pattern developed along with household specialization in pottery production. Archaeology of the La Mixtequilla region documents Classic period cultural contact with neighboring societies, while the region generally appears to have developed a fairly unique cultural expression in situ. This cultural pattern is characterized by a dispersed settlement of mostly rural
agriculturalists punctuated by larger architectural compounds presumably representing community centers and some level of political administration.

“Settlement in La Mixtequilla is relatively dense, yet for the most part nonnucleated. Scattered, presumed domestic mounds are interspersed with varied sizes of centers with formal architecture. While in some respects this settlement pattern resembles that of the southern Maya lowlands, the environment is distinct. La Mixtequilla settlement is concentrated on rich alluvium soils near estuarine mangrove swamps.” (Stark and Hall 1993:254)

Within the La Mixtequilla region, at the site of Cerro de las Mesas, Classic Maya-style stelae portraying elites accompanied by Maya Long Count dates falling in the fifth and sixth centuries A.D. suggest that dynastic rulership was a feature of a hierarchically ranked socio-political organization in the region. Teotihuacán style pottery recovered from the region attests to cultural influence from the Basin of Mexico (Stark and Hall 1993:254). La Mixtequilla was certainly not an isolated cultural area in Classic times, but does evince its own peculiar set of cultural traits which were certainly influenced by the ecology of the area, contact with other societies, and the internal process of demographic growth and concomitant increasing societal complexity.

The ‘household’ has been identified at La Mixtequilla from settlement survey and is represented mostly by large mounds thought to be the remains of consecutively deposited cultural layers from continuous habitation. These domestic mounds cover roughly the same space on average as Classic Maya household plaza groups do in the lowlands. Variable mound sizes indicate some social or rank differences among mounds.

“The great majority of La Mixtequilla mounds were low and broad, likely to have had a residential function on the basis of associated artifacts and the ‘principle of abundance’ (Willey et al. 1965:572; Ashmore 1981:40-41). The mean length and width of individual mounds is 42 x 34m (medians are 40 x 32m). The average dimensions of these mounds are approximately those of lowland Maya plaza groups rather than structures...Many La Mixtequilla ‘house mounds’ could have supported several houses or an extended family compound. For this reason, it is better to refer to them as domestic mounds, as the term ‘house mound’ has been associated with the individual structures of the Maya lowlands.” (Stark and Hall 1993:260)
Isolated small, low mounds are also a feature of the La Mixtequilla settlement pattern (Stark and Hall 1993:268), again paralleling the pattern documented for the Maya lowlands. It is reasonable to infer that these structures represent poorer people or newly established households in a hierarchical settlement pattern conditioned by wealth accumulation and the domestic household cycle (e.g., Goody 1972; Lasslett 1972). Stark and Hall view these small, low mounds as representing “occupations of smaller, poorer, less stable households,” lamenting the paucity of datable ceramics from the excavation of these structures (1993:269). Given the lack of sufficient ceramic samples from this important subset of the settlement pattern, they are concerned that a specific segment of society in the La Mixtequilla region has been underrepresented in their studies. This is a common theme in lowland Maya settlement studies as well, and while some researchers have tried to correct for ‘invisible’ structures when constructing population estimates, the sampling skew created by the lack of recovered ceramics from these ephemeral structures does leave a portion of Classic society missing from our reconstructions.

“Production does not especially congregate at or in the immediate proximity of centers, just as is true of the La Mixtequilla population in general. As noted previously, dispersed, more numerous, but less specialized producers have an advantage regarding transport costs in reaching dispersed consumers when they are compared with less numerous but more specialized producers. Dispersed occupation in La Mixtequilla accords well with the modest degree of rather dispersed specialization that was detected archaeologically.” (Stark 1992:203)

Prudence Rice (1981, 1987b) has suggested that resource diversity is the greatest factor shaping a dispersed pattern of pottery production (especially in the Maya lowlands). In contrast, Barbara Stark (1992) has argued that potting households engaged in primary production, as well as their consumers, are responsible for this dispersed pattern in the La Mixtequilla region; suggesting this as an analogy of sorts with the Maya lowlands.

“The current evidence suggests that some households in the La Mixtequilla survey area supplemented their livelihood by specialized pottery production. The pattern seems little different from that tentatively suggested for the Maya lowlands by P. Rice (1987b) and Ashmore (1988). If so, the
organization of ceramic production, settlement patterns, and social hierarchies found in La Mixtequilla had interesting resemblances to those of the Maya, but the pattern occurred in an ecological setting that was distinct, one which lacked the more marked microtopographic and drainage diversity found in much of the Maya lowlands.” (Stark 1992:203)

The distribution of decorated serving vessels across the La Mixtequilla region is not strongly correlated with status differences assessed by mound size. This parallels the pattern dominating the Maya lowlands, where the distribution of decorated serving vessels (i.e., non-figural polychrome pottery) does not appear to have been highly restricted by wealth or status differentials (Stark and Hall 1993:267-268).

“There is no reason at present to suspect that decorated bowls should not have figured in status differentiation in La Mixtequilla, and the very modest relationships detected with mound size warrant careful evaluation.” (Stark and Hall 1993:268)

Some highly decorated serving vessels may differ in quality and represent a distinctive set of high-order goods. In the Petexbatun region of the Classic Maya lowlands, Foias and Bishop (2007) have argued that a very small percentage of figural painted vases with glyphic inscriptions were highly restricted to elite contexts and represent a distinctive class of trade (or exchange) item. They believe that these elite status goods were circulated through an elite exchange network and do not represent the same type of commodity as other decorated pottery.

At Tikal, the PST Project data indicate that decorated serving wares were not restricted to any specific status level indicated by architectural size or complexity, although these fancier serving wares are certainly more abundant at a couple of larger ‘estates’ along the northern survey corridor. It is difficult to judge the influence of greater concentrations of people living in larger compounds on the density of decorated serving wares from test-pit excavations alone. I suspect that some elaborately decorated (i.e., glyphic or figural polychrome) ceramic serving wares at Tikal represent status items exchanged by elites, as Foias and Bishop (2007) have argued for the Petexbatun region,
but these are very few in number. At Xunantunich, LeCount (1999) found only ten sherds from exceptionally elaborate polychrome vessels though to have been exchanged by elites through gift-giving. Other factors that may have influenced the recovered decorated ceramic percentages include feasting, gift-giving, and household production of the wares.

“Although the identification of specialized pottery production at the household level in archaeological contexts is difficult and problematic (Stark 1985), evidence from La Mixtequilla, likely represents household-level specialization, sometimes grouped into small clusters and sometimes more dispersed...ceramic production generally appears not to represent very intensive specialization.” (Stark 1992:187)

Within a settlement dominated by mostly self-sufficient autonomous households without recourse to highly effective circulation institutions, production of ceramic commodities for exchange remained underdeveloped in La Mixtequilla. The dispersed settlement pattern combined with household-level production at low volumes suggests that the agrarian lifestyle conditioned the adoption of specialized pottery production.

“Stark therefore argues that the subsistence self-sufficiency of households, more than the geographical distribution of resources, created a dispersed pattern of ceramic production.” (Pool 1992:310)

Whether or not the geographic distribution of raw materials and resources was also a factor in the development of the dispersed settlement pattern, ceramic production evidently never (or rarely) developed into a workshop industry, nucleated industry, or manufactory level or production, but remained a household-level pursuit. The duplication of pottery production at a number of these largely self-sufficient households evidently covered the community’s consumption needs without a more complex workshop industry developing. Archaeological survey has not uncovered evidence of discreet production facilities or an assembly-line fashion segregation of tasks aimed at producing more commodities quicker as if destined for the market.
“Under La Mixtequilla environmental conditions, ceramic specialization does not appear to have developed to a marked degree, but to have retained a rather dispersed, household-level organization,” (Stark 1992:188)

The organization of pottery production at La Mixtequilla does not differ greatly from that of Matacapan or other centers of the Tuxtlas. Even production specializing in a specific type was accomplished at the household level. There were some larger production units encountered in the Matacapan survey, although the centralized location of these has been discussed in terms of access to consumers more so than centralized control (Pool 1990:244-245, 1992:310).

“The substantive results of our research support the conclusion that the majority of Fine Orange pottery produced in the southwestern Tuxtlas Mountains was manufactured at relatively low volumes by potters who worked within domestic contexts, selectively procured their clay from nearby outcrops…and distributed their products to local populations, possibly through intervening individuals or institutions.” (Pool and Santley 1992:232)

Nonetheless, survey in south central Veracruz (Mixtequilla) did not produce equivalent evidence of the same level of specialized pottery production as researchers have documented at Comoapan and Tres Zapotes (Stark 2007:156). Archaeologically, specialized workshops outside of domestic contexts are rare in Mesoamerica (Stark 1985:164). Ethnographic research suggests that occasionally a work hut or one or two rooms of a house within a houselot will be dedicated to production, yet production remains embedded in the household domestic context. Materials processing and manufacture are often accomplished outside of any physical structure, along structure walls or in open porch or plaza spaces (e.g., P. J. Arnold 1991; Deal 2007). In fact, specialist ceramic producers using pit firing may be indistinguishable from non-specialists using similar or identical open firing facilities (Lange and Rydberg 1972; Stark 1985:167).

Region-wide survey data is imperative to test alternate hypotheses of pottery production and distribution, even if this alone is inadequate to provide a total picture.
Production facilities (i.e.: kilns) are often located on or in close proximity to the houselot, but often several meters from any significant ‘residential’ structures. Archaeologically, such facilities are usually beyond the excavation limits set by investigators (Stark 1985:173). The regional survey approach favored by multiple investigators working in Veracruz has been productive in isolating specific production loci; however, slightly different survey and analytical procedures may be responsible for the identification of different modes of pottery production organization.

Stark and Garetty (2004) have suggested employing a high overall sherd density combined with a high percentage of a distinct type in relation to that type’s general percentage in household assemblages in lieu of direct production evidence such as wasters, kiln debris, or manufacturing implements to identify production loci. They judge a significant correlation with pottery production when a specific type is represented at the upper decile of ceramic density for the survey zone overall. This procedure did identify two additional likely pottery production loci from the Lower Papaloapan Basin survey zone. One was at the site of Los Azuzules, with evidence of orange bowl production in the Late Classic (Acula Red-Orange, Monochrome Variant – a simple slipped mono bowl), the other was a bichrome bowl production unit at a Middle Postclassic “village-like cluster of residential mounds.”

There may also be a temporal component to increasing specialized production in the western lower Papaloapan Basin, although the reason(s) for increased specialized production appearing earlier in the Tuxtlas has yet to be explained. The Late Classic shift to greater specialization in the production of orange bowls at Los Azuzules is supported by a higher concentration of kilns as opposed to the general pattern of infrequent residential production loci probably indicative of household production or household industry (Stark 2007:157). This production locus is also associated with a center; it is not a peripheral production locus. The Late Classic Fine Orange production unit at Patarata 52, a Late Classic mangrove community centered at Tio Porciliano (Stark 2007:157), consisted of one domestic mound dated to the Late Classic period that produced
concentrations of deformed wasters, clay pounding instruments, and large amounts of Fine Orange sherds (Stark 1985).

In the Mixtequilla region, 2.5 km southeast of the nucleated Postclassic center of El Sauce, a group of three adjacent mounds situated on high ground in close proximity to a seasonal drainage produced evidence of buffware comal production. Buffware comals most likely were added to the regional ceramic assemblage during the Middle Postclassic period (ca. A.D. 1200 – 1300), a time when the adoption of highland derived ceramic forms is common (Curet 1993:431). Sixty percent of the recovered surface collection of pottery sherds from this suspected production unit consisted of comal sherds and the seasonal drainage, just thirty meters away, would have provided convenient opportunities for the disposal of production waste (and domestic debris) as well as source of potting clay (Curet 1993:431-434). The location of this comal production area, several kilometers away from any nucleated center, suggests that this was an independent production unit outside of direct elite control; the production unit is described as an instance of either household or household industry production (Curet 1993:437-438).

Survey of the western lower Papoloapan Basin strongly suggests that ceramic production was not concentrated in barrios or districts (except for comal production in the Postclassic) and that it was consistently associated with domestic contexts (Stark and Garrety 2004:129). Survey of the La Mixtequilla region did produce kiln fragments which Stark and Garrety associate with more intensive production beyond the household level, or possibly quite large extended households (2004:129); however, they do not seem to envision the same level of household industry as researchers have posited for Comoapan. The degree to which adjacent regions witnessed differential increases in pottery production intensity may be partially obscured by different investigation procedures as well as different researchers’ opinions concerning how to interpret the data. Advocating greater standardization in the analysis of regional data, Stark and Garrety (2004) believe that the production intensity in the western lower Papoloapan Basin may
appear lower than at Matacapan due to differential survey collection techniques as well as different analytical techniques and criteria.

Pool and Santley do a good job delimiting exchange spheres and the organization of production, but admit that they do not yet know the mechanism(s) or institution(s) responsible for the distribution patterns identified through their compositional provenience study (1992:232). They do reject the hypotheses that Matacapan was the sole producer and distribution center of Fine Orange ceramics for the southwestern Tuxtla Mountains or that Matacapan served as a regional redistribution center for Fine Orange ceramics produced by widely dispersed production units. They also doubt that itinerant traders linked dispersed small-scale producers to consumers, at least at the three sites from their survey zone (Pool and Santley 1992:230).

In general, the scale of pottery exchange in Veracruz does not appear to change greatly from the Classic into the Postclassic period, even though marketing institutions developed during this transition (Stark 2007:148). Of course production and distribution systems may each change without affecting the other (Bey 1992:3), although increased production is usually associated with greater output for wider distribution. One factor which may account for the seeming discrepancy between the perceived greater intensity of production and lack of ensuing widespread distribution is demographic growth. This would imply that production units were duplicated as population rose, and the Matacapan data suggest that pottery production became more nucleated over time, implying greater intensity of production at a few locations.

7.6 – Concluding Remarks to Chapter 7

Chapter 7 began with reviews of documented craft production at the Classic lowland Maya centers of Aguateca and Copán. At both these centers fairly unique preservation contexts facilitated the recovery of exceptional evidence for the organization of craft production. In the case of Copán, it is presumed that a natural disaster
(earthquake) prompted an evacuation of several structures within the 9N-8 elite residential compound. The sudden collapse of structure roofs preserved a snap-shot of household production frozen in time. At Aguateca, rapid abandonment following the sacking of the core of the center left equally pristine in situ artifact assemblages intact on the house floors of burned residential structures. In both instances, archaeologists documented small-scale, low-intensity craft production of elite status items by individuals of high rank. In neither case was craft production oriented toward mass production for market exchange. Little division of labor or segregation of specialized tasks was involved and both males and females engaged in craft production. Craftpersons evidently worked in several media and are more accurately characterized as skilled artisans than specialized commodity producers.

At both Aguateca and Copán, actual production took place within residential structures likely inhabited by nuclear families. Evidence does suggest that people of lesser rank resided within the same patio groups or extended residential compounds alongside residents of higher rank or elite status. This residential pattern, with families of lower rank co-residing within elite compounds has been documented at several Classic Maya centers, in the elite residential architectural core of Aguateca (Aoyama 2007, 2009; Inomata et al. 2002), within Group 9N-8 at Copán (Hendon 1991; Webster 1989; Webster et al. 1998; Widmer 1997, 2009) and at Group 7H-1 at Tikal (Haviland 1981, 1992, 2003) as well as within apartment compounds at Teotihuacán (e.g., Cabrera Castro and Gómez Chávez 2008).

At Aguateca producing households tended to focus on particular raw materials and goods, but the system is also characterized by a considerable overlap in the capacities of different production units. At Aguateca and at Copán elite artisans produced badges of rank for themselves and/or for higher status elites living in close proximity. Attached specialization or client-patron production is implied. Independent production has also been documented at Aguateca, but all evidence of craftwork there supports a model of part-time production. At both centers craft production was embedded within the
household unit and generally practiced alongside a range of domestic activities. The production of elite status artifacts within Copán Group 9N-8 was conducted inside the interior rooms of a multi-room structure, likely with artificial light, and represents a more ‘secret’ or isolated crafting situation.

Obsidian blade production and distribution at Copán was evaluated using two studies providing evidence that the production of prismatic obsidian blades was not under centralized control or concentrated in one area of the center. Only one large workshop has been partially excavated and evidence suggests that the production of blades at Copán was not profit-motivated or oriented towards widespread (or any) exchange. All inhabitants of all social ranks had access to obsidian blades; Mallory (1984) finds the distribution equitable for all social ranks, Aoyama (1995, 1999) sees a skewed distribution with elites maintaining greater access. Some residents of the lowest economic standing did use flakes produced from small obsidian nodules, probably collected locally from rivers. Mallory prefers a model of independent procurement of obsidian while Aoyama speculates that the Copán dynastic elites controlled the Ixtepeque obsidian source, some 80 km away, and that distribution of Ixtepeque obsidian cores for blade production was an important source of power for them. Mallory suggests that obsidian blades were not exchanged at all, as all inhabitants had equal access to the raw material. Aoyama suggest that circulation of obsidian was decentralized; the distribution of obsidian cores was elite controlled, but the distribution of blades was not. Both Mallory’s and Aoyama’s reconstructions of the obsidian blade industry at Copán do not support a commercial exchange model and both expressly deny any marketplace exchange of obsidian blades. Aoyama’s reconstruction does support a redistributive exchange model (i.e., redistribution along kinship lines).

The review of obsidian blade production in the Classic Maya lowlands concluded with a short review of studies reporting on access to this imported material in the Peten region of Guatemala, just south of Tikal. While obsidian was available to rural residents living in the area between Tikal and the lakes area to the south, access is characterized as
unrestricted, though obsidian consumption was highest for residents living in closest proximity to major political centers.

Craft production at the Classic central Mexican center of Teotihuacán also bears on the significance of the obsidian blade manufacturing industry. Researchers continue to debate the scale, organization, and distribution range of this industry, and whether or not it was state controlled or more commercially organized by non-state agents (see Clark 1986, Spence 1981, 1986, 1996; Santley 1983, 1984, Santley et al. 1986). Although at least one hundred core/blade ‘workshops’ have been identified from surface concentrations of obsidian debitage, these have yet to be excavated. The Epiclassic centers of Tula and Xochicalco were discussed in order to evaluate actual obsidian workshop excavations. Obsidian blade production at these centers occurred within domestic settings alongside other domestic chores, similar to the organization of craft production at Aguateca and Copán, although at greater intensity for more widespread exchange. Hirth (2009) has emphasized the lack of specialization in a single occupation, the lack of any segregation of tasks, and the tendency of pre-Columbian Mesoamerican craft workers to multi-craft. Multi-crafting is not restricted to Mesoamerica, this tendency has been reported from numerous societies in both the New World and Old World (e.g., Shimada 2007).

Evidence from the excavation of several of Teotihuacán’s apartment compounds also supports this multi-crafting hypothesis. The apartment compounds of Teotihuacán evidently housed larger corporate groups than the households of Classic Maya at Aguateca or the Epiclassic house compounds of Tula or Xochicalco, likely along kinship lines (i.e., segmented lineages) but also featuring immigrants and non-related individuals and segments. The large Copán compound 9N-8 is not drastically different than similarly large compounds found at various Classic Maya centers of the lowlands and probably housed related individuals of a maximal lineage, though with greater physical separation of residences. The ‘international’ character of Teotihuacán’s population has been well documented through the study of imported artifact distributions, mortuary studies, and bone isotope analysis. The fixed dimensions of the apartment compounds were likely
inhabited by social groups with less rigid co-residential rules and pragmatic living arrangements.

Craft production within the various apartment compounds included lapidary work, textile and costume manufacturing, and the firing of ceramic vessels. These compounds range from the typical low status residence of Tlajinga 33 to very large neighborhood or barrio complexes, such as La Ventilla. Cabrera Castro and Gómez Chávez (2008) interpret residence within the La Ventilla compound conforming to a hierarchical organization with production by lower status cadet lineage members or retainers likely pooled by managerial heads for tribute to the state or exchange beyond the compound. Though Copán Group 9N-8 was also organized as an extended compound housing a related group of individuals, La Ventilla is not only an enormous compound, but one with specialized architecture for different functions, including a barrio temple, an administrative building, a residential apartment, and a large, open plaza for community activities including ballgames and exchange (Chávez et al. 2004:175-176).

Manzanilla (2009b) suspects that these very large neighborhood compounds at Teotihuacán, such as La Ventilla, Tepantitla, and Teopancazco, represent corporate landholding groups or “noble houses” that organized production for redistribution within the compound and for the effective appropriation of goods for tribute to the state. While some attached workshops have been documented at Teotihuacán, these do not indicate monopolistic control over any specific commodity; rather they suggest state sponsorship of production for state needs. A hierarchical appropriation model finds support in the archaeological data at Teotihuacán; the Classic lowland cases discussed evidence a near complete lack of such mechanisms or institutions. While the Xochicalco craft producers were also multi-crafters working within domestic settings, obsidian blade production was both smaller in scale than at Teotihuacán or Tula, and organized along commercial lines without sponsorship or interference from a centralized authority. Ward or guild organization is likewise discredited and the individual workshop was the highest level of cooperative organization. The obsidian industry of Xochicalco was supported by
itinerant merchants bringing obsidian cores into the center where local craftsman produced blades and circulated these to a local consumer population.

Following these discussions of the organization of production at various Mesoamerican centers, the topic of ceramic production was singled out for further investigation. The discussion of the average size of household ceramic vessel assemblages began with ethnographic case studies documenting the range in number of vessels kept within agrarian households in the New World. This discussion continued to review two instances of exceptional preservation that facilitated rather complete archaeological recovery – Aguateca, in the Classic Maya lowlands, and Ceren in El Salvador. Although it was acknowledged that ceramic vessels were not the only containers utilized by pre-Columbian inhabitants, ceramics vessels for food and water storage, cooking, and ritual activity were unexpectedly abundant in the ancient households at these two sites. Comparison of the large numbers of ceramic vessels recovered from the excavations of households in Central America with the cross-culturally identified ceramic vessel inventories reported archaeologically and ethnographically from Mesoamerica and South America, places the Aguateca and Ceren (and Xochicalco) assemblages at the extreme high end of the continuum. It is reasonable to assume that households at Tikal and other lowland Maya centers maintained scores of vessels per household.

Leaving the subject of ceramic vessel assemblage size, I reviewed the archaeological recovery of pottery firing facilities in Mesoamerica. While simple kilns have been reported from central Mexico to El Salvador, more ephemeral open or pit firing features have also been documented at Teotihuacán, in the Valley of Oaxaca, and occasionally in the Maya lowlands. The archaeological recovery of pottery kilns from the Maya lowlands is exceedingly rare; no kilns have been securely identified at Tikal or elsewhere in the Peten. Excellent evidence for the use of simple updraft kilns was recovered during archaeological investigations at Matacapan in the Tuxtla Mountains of Veracruz, Mexico.
The Matacapan survey located one concentration of 36 kilns grouped together at a site named Comoapan (Santley et al. 1989). Subsequent excavation of these features revealed the size and configuration of these simple updraft kilns. The Comoapan kilns are nearly identical to kilns still constructed by potters living in the Tuxtla Mountains today (P. J. Arnold 1991; Pool 1992, 2000). Further evidence of possible kilns or less formal pottery firing areas was encountered during the archaeological survey of other portions of Veracruz, at La Mixtequilla and throughout the western lower Papaloapan Basin (Stark 1992; Stark and Garrety 2004). Ethnographic studies suggest that the adoption of the kiln is correlated with available space on a potter’s houselot (P. J. Arnold 1991), the greater control over firing conditions (D. Arnold 1985; Rye 1981), and the mechanical properties of the source clay used for pottery manufacture (Pool and Britt 2000). A general, but not absolute, tendency to adopt kilns correlates with greater production output (see Sheehy 1992). Ephemeral pit kilns were recovered at Ejutla, Oaxaca not far from Monte Alban where true updraft kilns have been excavated archaeologically. Ethnographically studied communities in Veracruz use updraft kilns within 30 km of neighboring communities of potters employing only open or pit firing. It is difficult to predict the firing method or combination of methods that any archeological community may have used. The pit kilns of Ejutla were not initially recognized as pottery firing features, largely because the archaeological recovery of true kilns in the Valley of Oaxaca suggested that kiln firing was the norm to be expected from ancient communities.

Stark and Garrety (2004) have reviewed the survey procedures employed by the different projects working in Veracruz and upon evaluation of the evidence have come to the conclusion that pottery production was more intense at Matacapan (specifically at Comoapan) in the Tuxtla Mountains than in the other portions of Veracruz. The large number of kilns at Comoapan initially suggested a large workshop or manufactory, but this assessment has been re-evaluated and the complex downgraded to a nucleated household industry, or a “cooperative firing area used by specialists,” following Stark’s
cautious assessment (2007:160). Santley et al. (1989) initially assumed that Matacapan was a regional production center providing pottery for widespread distribution to all ancient communities of the Tuxtlas Mountains. After an extensive compositional analysis of pottery recovered archaeologically from the three dominant Classic centers of the Tuxtlas it became apparent that different communities produced similar pottery (at the ware or type level) and that distributions were confined to about a seven kilometer radius around each single center. The researchers do not know the mechanisms responsible for the circulation of pottery, but feel confident that itinerant peddlers were not involved.

Pottery production sites in ancient Veracruz were identified from surface survey. Some clusters of kilns were obtrusive and easily isolated, other production sites were only recognized after statistical examination of the survey data (see Stark 2007; Stark and Garrety 2004). Dispersed household production of pottery was dominant, although some attached producers and some larger production units (i.e., Comoapan) have been documented.

The totality of craft production evidence discussed suggests that lapidary work, the manufacture of status ornaments and costumes, and obsidian blade and pottery production were usually conducted within households. Centralized control over production was restricted to some workshops at Teotihuacán, and these were no monopolies exclusively producing unique items. The extent of centralized control over the obsidian blade export industry at Teotihuacán is still debated and an evaluation of this industry is hampered by the lack of direct archaeological investigation of the workshops themselves. Kenneth Hirth’s well-developed commercial model of obsidian production at Xochicalco is a stark warning that the organization of production need not be state controlled. While not denying the centralized appropriation of craft goods, Linda Manzanilla (2009b) and Cabrera Castro and Gómez Chávez (2008; Gómez Chávez et al. 2004) suspect that the largest elite neighborhoods or barrio compounds at Teotihuacán were internally structured to effectively channel estate production. Of course, the apartment compounds of Teotihuacán varied in size, ethnicity, and internal structure as
well as degree of wealth or status of residents. Evidence from Tlajinga 33 suggests that lapidary production was conducted by smaller units within the compound at the same time that the entire resident group (i.e., maximal lineage) cooperated in the production of ceramics. Even this ceramic production was not very specialized or for high output (Sheehy 1992; Sullivan 2006).

Mesoamerican craft workers tended not to be highly specialized; the segregation of specific tasks within the production chain has rarely been documented. Instead, the preponderance of evidence indicates that skilled craft workers or artisans tended to be multi-taskers, working at more than one specialty and in several media simultaneously. Non-specialized production at the nuclear-family household level at Aguateca and Copán was geared toward the production of unique status artifacts. The actual organization of this production is similar to the extended-family production units producing utilitarian obsidian blades within the house compounds of Tula and Xochicalco. Larger residential compounds at Teotihuacán certainly housed larger and more complex extended households, but craft production was still quite unspecialized and not likely organized as specialized workshops or manufactories. Control over craft production may have been exerted by higher status elites, either living within the same compound (i.e., Copán’s 9N-8 or at Teotihuacán’s La Ventilla) or control may have been exerted by non-residents, as is likely among Aguateca’s craft producing households.

Ancient craft production throughout Mesoamerica was dominantly household-based and conducted on a part-time basis so as not to interfere with domestic chores and the rhythm of daily activities. The Classic Maya were an agrarian society, not an urban one with densely nucleated cities with manufacturing districts. The archaeological documentation of craft production provides a solid base-line for the evaluation of the organization of production. The next chapter deals with a more difficult subject, the mechanisms of distribution for craft items, especially pottery.
Chapter 8– Pottery Distribution Systems

8.1 – Interpreting Distribution Patterns

“General considerations suggest that pottery would not be traded extensively among people with a simple system of transport. It is fragile and bulky, it is not a necessity, and it is not likely to be as highly prized as stones or metals that serve for ornaments. It might be a wonder to people who had never seen it before, but among people who had learned the craft, there would not seem to be sufficient demand to establish trade. Yet conditions among present-day pottery-making people belie seemingly reasonable deductions.” (Shepard 1995[1956]:352)

This quote from the notable ceramic analyst, Anna O. Shepard, reminds us that ceramic vessels were circulated, traded, gifted, or exchanged in ancient times in spite of the difficulties in transporting them. Also, pottery is not always a utilitarian item to be acquired from the nearest source at the lowest cost. Pottery vessels were often used to display rank and wealth and to reinforce social connections. Pottery is a fascinating substance, one that has never been made completely obsolete. While metal tools have almost completely replaced stone tools across the planet, ceramics have been adapted to modern life. From ceramic tiles on the space shuttle to ceramic coffee cups on office desks, fired clay remains a valuable and commonly utilized material. Ceramic kitchen knives are claimed to hold superior edges without microscopic metal debris entering your food. Even the drafting lead I use to draw ceramic sherd profiles is tempered with fine ceramic powder to maintain consistency and form.

Modern archaeologists have a range of investigation techniques at their disposal. By consulting environmental data, constructing chronologies using radiocarbon dating, or identifying trace substances through chemical analysis, archaeologists attempt to reconstruct a larger picture from multiple lines of evidence. They also still largely deal with hard artifacts that were made and used by the ancient peoples they study. The widespread recovery of pottery sherds from archaeological sites makes them one of the few artifact classes that archaeologists can readily use to infer social, political, and
economic relationships. At an even more fundamental level, site chronologies are based on the temporal assignments of different pottery forms and types. The form a pottery vessel takes can indicate its function and designs painted or engraved on pots encode information concerning social group inclusion or rank distinctions. Pottery is sometime stamped with the manufacturer’s makers-mark, or can have a person’s name-tag identifying it as the private possession of an individual in life (or death). The great variability seen in ceramic form and decoration give archaeologists something to work with. Fortunate for the analyst, pottery was typically used by all segments of society and ceramics are recovered from the full range of contexts, from the most humble of household middens to the royal dynastic palace. The myriad combinations of paste, form and design imbue pots with considerable comparability. Analysts are typically so overwhelmed with the great variation in ceramic assemblages that they devise classificatory systems to group related pots into larger analytical units (i.e., Type-Variety classification).

Occasionally, a spectacular find under conditions of superior preservation reminds us that pottery vessels were only one form of container decorated and used by ancient peoples. Gourds, wooden bowls, baskets, and bags were probably used in similar quantities as ceramic pots and have simply not survived over time. Perishable items (i.e., feathers and flowers) were certainly used in displays of rank and wealth and to instigate and enforce social relationships. Perishables were certainly important in economic transactions as well. Pottery’s resistance to decay, ubiquitous use, and potential for comparison lend ceramics a position of importance in archaeological studies, especially in reconstructing exchange networks. This exalted position may be unwarranted.

“All anyone dealing with archaeological materials realizes that the near indestructibility of potsherds gives a false impression of the importance of ceramics in the overall picture of crafts and commerce.” (Shepard 1995[1956]:353)

Indeed, pottery was just one of many goods produced, circulated, and used by the Classic Maya and other ancient civilizations. Even with the high degree of
manufacturing skill and artistic expression characteristic of much Maya pottery, the recovery of more fantastic artifacts painstakingly fashioned from exotic materials often overshadows the recovery of ubiquitous pottery and the potential to use large ceramic collections to analyze distribution patterns and reconstruct exchange systems.

Archaeologists are often taken aback by the presence of foreign or imported goods within ancient contexts. Wealth goods manufactured from exotic, non-local materials often found their way into the central precincts of archaeological sites where they were consumed in non-domestic or ‘ritual’ contexts and eventually placed in tombs or cached in mounds never to be seen by human eyes again – until unearthed by archaeologists. In North America, non-local, exotic trade-goods have been recovered in concentrations at Chaco Canyon (Cameron and Toll 2001); Adena and Hopewell sites (Snow 2010:98-107), and Cahokia (Milner 1998:162). Cameron and Toll referred to Chaco as a “magnet” for unusual goods (2001:10). Likewise, Classic Maya centers are famous for the exotic artifacts recovered from elite tombs and caches within structure platforms or beneath stelae. Tikal could certainly be considered a “magnet” site attracting long-distance trade goods, or at least the raw materials to produce them. The presence of abundant exotic goods at the North American centers mentioned have classically been considered ‘trade’ items that never entered a market system, although marketplace exchange at North American centers has become a more speculated upon possibility in recent years. In contrast, exotic goods recovered from Mesoamerican centers are often linked immediately to market exchange. Likewise, large open plazas in the epicentral districts of South American centers have more often been interpreted as redistribution points while similar central plazas at Classic Maya lowland centers are now frequently assumed to have been marketplaces. The take-home point here is that similar contextual situations are often interpreted within the currently dominant theoretic framework for an entire region without objective hypothesis testing.

Objects fashioned from marine shell or jade have been recovered from the central precinct of Tikal (and other Classic Maya centers) and certainly represent the ability of
elites to acquire artifacts associated with rank. In fact, the presence of such status or wealth items is commonly assumed to reflect elite rank. Of course, the high social status of Classic Maya elites was prominently displayed through a suite of material signs, including status goods, fancy costumes, large and elaborate architecture, and carved monuments. It has been argued that the presence and distribution of elite goods made from marine shell, jade, obsidian, and even local chert at Tikal support a central marketplace exchange model (Moholy-Nagy 2008:23-34). These elite goods have a highly restricted pattern, with the overwhelming majority recovered from epicentral and central excavations. Beyond a 2 km radius from the Central Acropolis these items are almost completely absent, and then mainly occur at minor centers, not common households (Moholy-Nagy 2003a:109). Although this pattern certainly reflects the emphasis on central excavations to the exclusion of peripheral excavations, it is clear that some goods were just not readily available in quantity to peripheral inhabitants, either because of sumptuary law, exorbitant “price,” or other factors.

Some ceramic vessels recovered from Maya centers were imported from other regions. Trade wares, such as Plumbate, Thin Orange, Fine Orange and Fine Grey pottery were circulated more widely than the majority of locally made and consumed pottery at any given center. Recovery of these highly recognizable trade wares or types outside their presumed production area indicates that Maya did sometimes move pottery over long distances. These long-distance trade wares usually constitute a very small percentage of the ceramic assemblage of any center outside their area of production. Some highly elaborate painted ceramics also have restricted distribution patterns, and have been considered as a special category of good. These figural polychrome vessels were painted by skilled and literate artisans and boast complex iconographic programs including glyphic passages. Some researchers place these vessels in a class all by themselves and believe that their production, especially painting, was monitored by elites and the vessels themselves circulated through elite gift-giving networks, not through open market exchange (i.e., Ball 1993; P. Rice 2009).
Utilitarian goods, such as prismatic obsidian blades, chert bifaces, and pottery vessels were available in varying degrees to the peripheral inhabitants of Tikal. The presence and distribution of these items have also been cited in support of a more widespread market-system model with local markets serving the majority of residents living in the peripheral areas of the center (Moholy-Nagy 2003a:109; Fry 1979, 1980, 2003; Fry and Cox 1974). Obsidian blades appear to have a widespread distribution pattern and were available to all residents of Tikal in low volume. Prismatic blades and flake blades are ubiquitous in peripheral excavations, as are bifacial tools made from local chert.

The quantity and variety of pottery used by peripheral and central residents has left an impressive archaeological record reflecting exchange patterns at Tikal. In addition to the visibly distinguishable ceramic types and varieties of pottery consumed, INAA of recovered vessels and sherds has facilitated the identification of the products of different production groups or units. Keeping in mind the ultimate goal of investigating the social mechanisms or institutions responsible for the recovered distributions of ceramics, I will review the theoretical background relating artifact distributions to the economic and social arrangements responsible for them. The chapter then continues to discuss ceramic production and distribution in ethnographic case studies before evaluating archaeological reconstructions of ceramic production/distribution systems proposed for various Mesoamerican sites or regions.

“By understanding of distribution systems, I do not mean distribution patterns. The amount of research energy devoted to defining the distributional patterns of ceramic types does remain far greater than that devoted to the identification and analysis of production loci. But very little of this research involves attempts to learn what kind of distributional forces produced the pattern.” (Bey 1992:3)

Referencing the theoretical work of P. Rice (1987a) concerning modes of ceramic production, George Bey (1992:6) concurs that archaeologists have usually assumed that “the form or nature of a distribution system is correlated in some way with the form or
nature of the production system. It is this idea that conditions one of the basic underlying assumptions we make – the more complex the distribution system is, the more complex the production system will be.” Both Rice and Bey view this assumption as a dangerous starting point. Without denying some correlation between production and distribution, they warn of the logical pitfalls when putting too much weight on this basic assumption.

“Although perhaps generally true, no one-to-one correlation exists between the complexity of the distribution subsystem and the complexity of the production subsystem. (Bey 1992:6)

This is an important point for those studying ceramic production and distribution in the Classic Maya Lowlands for several reasons. First of all, specific production loci (i.e., workshops) have rarely if ever been identified, so the organization of production itself is largely inferred from indirect data (i.e., pottery distributions; technical and stylistic variability is the ceramics themselves). Second, studies have relied primarily on these indirect lines of evidence to infer distribution modes. Archaeologists rely on ceramic variability to infer patterns of economic organization (Pool 1992:306), and this is generally true of ceramic studies in the Palenque region (Bishop 1975; Bishop, Rands and Harbottle 1982; Rands 1967, 1969, 1987; Rands and Bishop 1980, 2003; Rands and Weimer 1992), at Tikal (Fry 1979, 1980, 2003; Fry and Cox 1974), and at Copán (Bill 1997), though not necessarily at the type level of analysis.

The Palenque regional ceramic investigation program focused primarily on determining the exchange of pottery among different regions characterized by different ecological conditions up to 50 km away from the center of Palenque (Bishop 1975; Bishop, Rands, and Harbottle 1982; Bishop, Rands, and Holley 1982; Rands 1967, 1969, 1987, 1988; Rands and Bishop 1980, 2003). Although it was often noted that peripheral markets or infrequent fairs or bazaars could have been responsible for the ceramic distributions, this long-term study concentrated on determining the areas of production for different classes of pottery that were then compared with the distribution of recovered pottery at the consumption loci. Fry’s study at Tikal was expressly formulated to determine the degree of market exchange and integration by measuring the dissimilarity
among the pottery collections of different geographic sub-regions up to 12 km north and south of the site center. At Copán, a collection of pottery, mostly recovered from the epicenter, was analyzed in terms of diversity measures (richness and evenness) in order to gauge the development of the ceramic production industry and infer degrees of specialization indicative of different modes of productions for groups of ceramics.

The point is taken that production and distribution are not completely correlated. Nonetheless, social factors (including consumer preferences) do condition production and distribution to some extent and these two systems are probably interdependent to a greater degree than they are independent of one another. Warning against making assumptions concerning the structure of distribution based solely on the organization of production is a caveat well worth heeding, especially when inferring a specific community-wide distribution mode based solely on information concerning the organization of production. In the absence of physical ceramic production loci (i.e., workshops), the ceramics themselves may provide information concerning the number of production units producing a specific type, form, or class of pottery which can then be compared with the distribution pattern from consumption contexts. Ideally, knowing the precise locations of ceramic production and the distribution of the products of that production unit is the most secure means of evaluating distribution patterns. Knowing exactly where a pot was made and where it was consumed defines the range of circulation from the point of manufacture. Of course, pots do not necessarily follow a straight-line path from producer to consumer; pots may change hands several times in the intervening distance. Ethnographic examples of pottery distribution demonstrate how middle traders move pottery farther away from the point of production and how these itinerant agents connect the regional and interregional exchange networks crossing linguistic, social, and even political boundaries.
Consumer Demand

Based on his own longitudinal ethnographic study of ceramic production, Dean Arnold (1985, 1991, 2007) has concluded that distribution *does* condition production in several ways. Potters in Ticul, Mexico generally enjoy the security of filling large orders for middlemen who move these quantities of pottery to more distant locales. Changes in the distribution system which reflect shifting consumer demands have directly influenced the range of vessel ‘types’ produced. Initially a ‘traditional’ potting community supplying utilitarian vessels for domestic consumption, the Ticul pottery industry has rapidly adapted to changing economic conditions. Increased availability of cheap alternatives to ceramic vessels for cooking and storage (i.e., plastic and metal) and the introduction of a modern water delivery system have all but eliminated the demand for traditional pottery vessels over the last four decades. The expansion of the tourist industry has created demand for pottery produced in the traditional manner, mainly large floral planters for hotel lobbies. The demand side of the Ticul pottery industry is unlikely to reflect an analogous situation in Classic Maya times, but does emphasize the ability of potters to rapidly shift their production by changing vessel form in response to consumer demand.

Other aspects of the Ticul pottery production system provide excellent comparative data for the ceramic analyst working with archaeological specimens. The procurement of clay and temper, the preparation of paste, and vessel forming, drying, and firing by Ticul potters are largely completed by hand or with simple technology. The industry has been influenced by transportation improvements, such as motorized vehicles and roads, but the pottery remains hand-made. The metric standardization of vessels produced by the Ticul potters is an appropriate analogy for any hand-made pottery of the pre-Columbian New World. George Bey notes that the standardization (i.e., uniformity of vessels) achieved by Ticul potters is largely determined by the demand market; distributors request specific vessel height and aperture dimensions (Bey 1992:15, 20). The Ticul potters not only produce requested forms, they produce quantities of vessels to
the specified height and aperture dimensions requested by retailers (middlemen) purchasing in bulk for resale (Arnold 2007; Arnold and Nieves 1992).

This well-documented example demonstrates how the demand market can influence product dimensions and facilitate increased production by providing a guaranteed market. Demand stimulating specialization in a single form and the standardization of metric attributes. In their study of potters from Deir el-Gharbi in Upper Egypt, Nicholson and Patterson (1992) found the degree of specialization in ceramic production inversely correlated with the variety of distribution mechanisms employed (Bey 1992:14). Firing large numbers of jars in permanent brick kilns, the Deir el-Gharbi potters often contract with middlemen for the disposal of their vessels as well.

**Analysis of Ceramic Production-Exchange Systems from Archaeological Materials**

In the two greatest empires of the pre-Columbian New World (Inka and Aztec), specific ‘national’ or ‘imperial’ styles of pottery were produced in quantity by a number of production units. Originally suspected to represent large centralized manufactory production because of their standardized forms and iconographic programs, these wares were actually produced at a number of settlements largely for regional, not interregional exchange. INAA of various specimens have indicated a greater redundancy of production units making these wares than initially expected in both regions (D’Altroy and Bishop 1990; Hodge et al. 1993). These studies serve as a warning that standardized appearance does not automatically equate with production from a single or limited number of production units. Mesoamerican archaeologists are beginning to realize that visual distinctions at the type level do not correlate with production units. Very similar pottery was likely made by a number of smaller production units in any given region using similar techniques following similar form and decorative conventions.

The complex interplay among consumer demand, social restriction, traditional inertia, distribution mechanisms, and specialized or standardized production is not easy to
sort out. The situation is further complicated by demographic growth, transportation improvements, and technological innovations, making ethnographic analogies difficult to apply to archaeological contexts. The proliferation of articles, books, and conference papers devoted to the discussion of terms and models used to interpret craft production and distribution is a reflection of the complex interrelations that exist among these topics (see Rice 1996). This is also why it is so important to keep the discussion of these topics alive while striving for better methods of analysis based on firmer theoretical grounds.

Taking the advice of Rice and Bey, I understand the dangers of assuming any direct correlation between any two subsystems. Deterministic calculations of fall-off curves cannot discriminate between separate distribution systems regardless of production organization. Even if a single mode of distribution is overwhelmingly dominant, fall-off curves cannot accurately distinguish between reciprocity and redistribution, or between complex redistribution and marketplace exchange (Blanton 1981; I. Hodder 1974; Hodder and Orton 1976; Renfrew 1977; P. Rice 1987a:198, 1987b:535). There is a degree of equifinality between mathematical expressions of product circulation decay and the actual mechanisms or institutional arrangements that produce them (Earle 1982:7). Reciprocity, redistribution, and marketplace exchange are certainly not monolithic categories, but rather broad general categories mostly of heuristic value.

In his essay entitled The Economy as Instituted Process, Karl Polanyi (1968[1957]) explained that the aggregate behavior of individuals does not, in itself, produce an economic system based in reciprocity, redistribution, or market exchange. These are modes of integration and may co-occur within the same society. It is the institutionalization of one dominant mode that has led to an almost tautological association between specific economic modes of integration and specific levels of societal complexity or organization (i.e., chiefdoms and redistribution; states and marketplace exchange) which has entered the cultural anthropology and archaeological literature.
Reciprocity as a form of integration gains greatly in power through its capacity of employing both redistribution and exchange as subordinate methods.” (Polanyi 1968[1957]:153)

Polanyi’s student and editor, George Dalton, put this sentence in italics “to emphasize that Polanyi was quite clear in regarding reciprocity, redistribution, and (market) exchange as modes of transaction, not as designations for entire economies or economic systems” (1968[1957]:153, Footnote 3). In practice, anthropologists have tended to emphasize one mode of transaction as the dominant society-wide instituted process. Reviews of ethnohistoric or archaeological data have cited any marketplace exchange as evidence of a market economy, and the presence of centralized redistribution as evidence that market exchange was unimportant. Far from claiming that the economies of ancient societies were each dominated by a single all-encompassing transaction mode, Polanyi reminded us that ancient societies were characterized by multicentric economies with a mix of transactional modes. It was his contention that the instituted market economy of the late nineteenth century on was an historical exception, one that weighed heavily on the thoughts of academics and laypersons alike.

Just as many different potters’ hands or multitudes of production events can cause “cumulative blurring” of uniformity measures (i.e., CV values), multiple distribution modes represented concurrently in a given archaeological context may cause some ‘blurring’ of individual distributional patterns for different artifact classes. Archaeological artifact distribution patterns may be the result of numerous distinct or overlapping distribution mechanisms, confounding the association of the distribution pattern with any specific kind of all-encompassing production or distribution system (Bey 1992:13; Chávez 1992). The following examples examine the variable organization of pottery production and distribution in different ethnographic and archaeological contexts. The archaeological examples highlight the use of INAA to investigate the pre-Columbian production and distribution of pottery in the Basin of Mexico, Valley of Oaxaca, and Petexbatun regions of Mesoamerica.
8.2 – Ethnographically Reported Pottery Production and Distribution Systems

Pottery Circulation among the Raqch’i of Peru

The production of ceramic containers in the settlement of Raqch’i, Peru and the exchange of these vessels with neighboring provinces, were mentioned ethnohistorically in 1769; the system has been in place for well over two hundred years. Occupation of the region around Raqch’i has been continuous for three thousand years according to archaeological documentation (Chávez 1992:84). The Raqch’i often exchanged ceramic vessels through barter for amounts of agricultural products equal to the capacity of the vessel bartered. While the basic quantity of product bartered for any given vessel is set by that vessel’s volume, those bartering vessels for agricultural staples are concerned about the quality of product accepted in these exchanges. Product of perceived inferior quality will often be refused, in any amount. In addition to the capacity of the vessel in product, a small ‘bonus,’ called the *yapa* is expected as well. Within the Raqch’i system of ‘vertical integration’ people living in higher elevations prefer to barter for maize grown at lower elevations, while those living at lower elevations prefer to barter for the highland crops of potato or quinoa (Chávez 1992:77). In this manner, a degree of complementary exchange in both pottery and staple agricultural products is maintained through simple bartering, often in marketplaces but not exclusively. Chávez (1992:86) contrasts this vertical zone interdependency or integration through direct barter with the model of vertical integration proposed by Murra (1980[1956]) whereby kinship ties among related groups living at different elevations facilitated integration through redistribution.

A pattern of village-level specialization in pottery production generally characterizes the southern highlands of Peru. This pattern creates both horizontal and vertical interdependencies among communities in the region. Within a given ecozone (i.e., low valley or high *puna/altiplano*) potters can barter or sell their wares to agriculturalists, thus receiving subsistence for their craftwork while providing vessels to
non-potters. There also exists a complementarity in the production of certain vessels forms between the higher elevation puna or altiplano communities and those of lower elevations. Potters in the higher elevation zones specialize in the production of cooking pots (*ollas*), grain toasters, or incense burners, while potters residing in lower elevations generally specialize in the production of vessels for serving, storing, fermenting, and carrying (Chávez 1992:79).

“[T]his vertical interdependency is maintained by the perceived inability on the part of the major regional suppliers of containers (Raqch’i, Q’ea, Machaqmarka) to produce fire-resistant forms, due to differences in temper used, and by the fact that reputable and principal olla producing villages are located primarily in the *puna* and *altiplano*…Vertical interdependency is also involved when Raqch’i potters obtain some of the materials they use in production. So long as these materials are defined as essential, including red pigment, polishing stones, and llama dung, such interdependencies based on these items continues, but substitutes are already being obtained. (Chávez 1992:84)

Perception based in cultural norms affects the choices rural inhabitants make. The primacy and subsequent inertia in the establishment and growth of specialized production communities and the resulting reputation for this specialization are certainly difficult to detect archaeologically. It should be recognized that these are very real phenomena which influence specialized production in ethnographically known communities and probable acted within the cultural settings of archaeologically known communities as well. In regard to the specialist pottery production system in highland Peru,

“The skills, firing, or local availability of materials, I would argue, do not limit the production technology and organization to its current form, or preclude other alternatives. Nevertheless, the way technology has been modified within the socio-economic system has resulted in the production in each ecozone of reputable forms for certain functions, which are sought by consumers throughout the region.” (Chávez 1992:84)

Market exchange is down-the-line with potters moving their wares to nearby marketplaces and selling or bartering them to middlemen who then move them to more
distant markets for resale or re-barter (Chávez 1992:77). With the advent of the tourist market in Peru, direct procurement of Raqch’i vessels has become increasingly more common. Undecorated pots are directly purchased to be painted and resold by the painter (Chávez 1992:78).

The Kalinga Potters of the Philippines

The longitudinally-oriented Kalinga ethnoarchaeological project was initiated in the early 1970s (Longacre 1974) to evaluate the social means by which pottery production (and especially design), was transmitted from the potter to apprentice (see Hill 1970; Longarce 1970). Researchers wanted to study pottery production in a household setting where ethnographers could study potters in the process of transmitting the craft to the next generation. Based in the “ceramic sociology” model (see Hill 1968, 1970; Longacre 1963, 1964, 1968, 1970; Stanislawski 1973, 1977) their basic premise was that mothers taught daughters the craft at the household level. While Kalinga mothers do usually pass the craft of potting on to their daughters, other factors also tend to influence the potter’s production as an adult. Michael Graves (1981, 1985, 1991, 1994) found a weak correlation between pottery designs and mother-daughter transference of potting and learned that the most influential factor on a potter’s designs was the potter’s birth cohort (Longacre and Skibo 1994:8).

“Kalinga households usually consist of a husband, a wife, their unmarried children, and perhaps an aged parent, uncle, or aunt of one of the spouses. The mean household population in Dangtalan in 1987 – 1988 was 4.8 persons. This number does not include household members away at college or working outside Dangtalan.” (Trostel 1994:210-211)

Outmigration for wage labor or education opportunities is increasingly more common in the communities of the Pasil River Valley. Still, pottery production is an important economic pursuit for many women residing in the area. Pottery production is learned and practiced at home, even though vessels are circulated beyond the local region. Numerous aspects of Kalinga pottery production, use, circulation, and discard help archaeologists to interpret similar (or different) distribution patterns in archaeological contexts. The pottery made and circulated in the Pasil River Valley consists of a conservative utilitarian domestic inventory emphasizing food storage and preparation, water transport and storage, and basi (sugar cane wine) brewing. Metal vessels have begun replacing ceramic vessels for cooking rice (Skibo 1992, 1994), but ceramic meat/vegetable cooking pots are still the most common vessels in day-to-day use and ceramic water storage jars are still commonly used to fetch water within the villages. Vessel inventories consist of three major utilitarian classes of pottery: rice cooking jars (ittoyom), vegetable and meat cooking jars (oppaya), and water storage jars (immosso). In addition, since the 1970s, ay-ayam (“toys”) non-utilitarian forms have begun to be manufactured and sold (Stark 1991). Beginning with the civil unrest of the 1970s, soldiers needed gifts to take home and more frequent contact between the region and the capital has opened up a small market for non-traditional small ceramic gifts (Longacre and Skibo 1994).

Pottery Production and Distribution among the Kalinga

Peace pacts (bodong) involve a village or group of villages, each containing several kinship groups, forming supra-village pact-holding units prohibiting aggression. The villages studied were aligned with three different peace pact confederacies. Guina-
ang with Galdang, Pnong, and Malucsad of the Upper Pasil; Dangtalan basically by itself; and the Dalupa aligned with various groups of the Lower Pasil. Guina-ang is not a potting community and must import all pottery from other Kalinga settlements. Over 90% of the pots exported to Guina-ang village in 1988 came from Dangtalan and Dalupa (Aronson et al. 1994:96). Informants in Guina-ang village often said that they preferred Dangtalan pottery because of its strength. Nonetheless, since 1975 Dangtalan pottery production has declined while Dalupa has seen an increase in production. Consequently, there are more Dalupa pots in Guina-ang households in spite of the consumption preference (Aronson et al. 1994:99-101).

In Dalupa, clay is directly mined by female potters, often in small groups of two or three individuals. Clay sources are all within one kilometer distance and potters walk from five to thirty minutes to various specific mines in both Dalupa and Dangtalan (Aronson et al. 1994:86-89). Clay is mined from shallow deposits with an abundance of sand already present, obviating the need to add temper to the clay. Fresh clay is picked through for impurities and then carried home to be worked “as is” without being dry pounded and reconstituted in water or receiving addition temper material. The pottery produced would be considered course-grained with natural inclusions of quartz, biotite mica, and other siliceous minerals in the 2-4 mm size range (Aronson et al. 1994:91). Potters work with enough clay to make two or three vessels at a time. The clay is pounded and wedged before being formed into vessels using the coil-and-scrape and paddle-and-anvil methods. The globular vessels once made are left to dry for 2½ to 4 days before being firing (Aronson et al. 1994:86; Longacre 1981:57). Pottery is fired in the open for about 20 minutes; refiring experiments suggest that the fire reaches a temperature of 500-650° C (Aronson et al. 1994:105).

Vendors from Dangtalan and Dalupa visit other villages with their pots to barter for rice and other goods. The gifting of vessels during household or community-wide social events is also common practice. Households also keep extra vessels on hand for use and future exchange. While households stockpile cooking vessels and will replace a
broken one from stock on hand, they do not stockpile water vessels and the mean per household in Dangtalan was just over one; evidently all were in use (Aronson et al. 1994:101).

Informants say that rice cooks faster in metal pots than in clay pots, and that metal is more durable and less susceptible to breakage (Skibo 1994:119). Skibo (1994:Table 1) confirms that rice cooks faster in metal pots, but this is also size dependent. There is a five minute difference in rice cooking time between metal and clay pots when they are smaller, one chupa sized vessels. There is no appreciable different in rice cooking time between large metal and ceramic pots in the five chupa size class. Metal vessels also take more time and effort to clean, which is done daily. Skibo (1994) suggests that residents put additional effort into cleaning metal vessels to make them shine because they are openly displayed, usually suspended in the kitchen, and thus represent a form of wealth display. The demand for ceramic cooking pots was still high during the study, and these are still preferred over metal pots for cooking vegetables. Typical foods such as beans, peas, and potatoes need time to soften at a consistent boil in vessels placed on elongated hearth stones directly over the open cooking fire. Informants reported that metal vessels were susceptible to boiling over and dowsing the cooking fire (Kobayashi 1994:134-135), while clay vessels maintain a more steady temperature without boiling over. Clay cooking vessels are used by every household at every meal, although vessels are rotated and a specific vessel may not be used every night. The residents of the village of Balatoc have stopped using ceramic cooking pots and turned over to a more ‘wealthy’ assemblage of all metal vessels after receiving proceeds from gold deposits on their lands (Stark 1994:191).

In the Pasil River Valley, the dry season runs from November to April with typhoons and torrential rains from July to October. Life follows the intensive two-crop wet rice agricultural cycle. For potters, the three months prior to rice harvest, from March to June and August to October, is the peak exchange time when rice is most valuable before prices come down with the regional harvest influx. Potters will stockpile
vessels to barter during the rainy season, so while certain times of the year are characterized by a lack of pottery production, they are still active times of pottery circulation (Stark 1994:174). Pots are often bartered for the volume of the pot in dry rice (Stark 1994:179), and vendors may get a better exchange value for the pot in communities farther away. Many informants said that marginal agriculture lands and food stress were factors influencing their choice to go into potting. With demographic growth and increased pressure on agricultural lands, many residents view potting as a means of risk avoidance and expanding the productive capacity of the household, or what Brookfield (1973:49) has referred to as a program of “maximum participation consistent with minimum risk.”

In 1975, 70% of Dangtalan women made pottery at the household level. In 1980, only one-third still did. With greater competition from neighboring Dalupa, pottery production in Dangtalan appears slightly more intense with greater part-time specialization for exchange, in line with the marginalized peasant model positing that ceramic production provides an important buffer against economic lean times. This shift continued the trend of decreasing numbers of potting communities and greater output and exchange by fewer communities and fewer specialists already in motion.

The village of Dalupa is just two km distance from Dangtalan and has overtaken much of the pottery production and regional circulation largely because the settlement lies closer to the main interregional road. In 1988, Dalupa had about 400 residents living in a nucleated village settlement separated into five ‘lineage’ wards; 71% of households had at least one resident potter. Out of the 56 potters in the community, 39 were active in pottery production for exchange. Traditional hand-made pottery is fired in designated firing areas and several potters will pool their vessels together for a group firing, in what Miriam Stark refers to as “a variant of household industry” (1994:174).

Dalupa potters participate in two levels of distribution: walking to settlements within the Pasil River Valley settlements, and using truck transport to extend circulation
regionally. Pottery is typically bartered for food, livestock, raw materials, manufactured items, or field labor. Cash is becoming a more common medium of exchange. The primary mode of distribution is by direct barter trips to other communities where potters carry their own, or their household’s, vessels for face-to-face transfer to customers. In addition to carrying a typical domestic assemblage of vessels, potters also deliver prior orders. Usually two or three women travel together in a group on these trips, and these are often the same work groups who produce the pottery. Sisters or daughters of the potter may accompany her or take her place on trips to barter the household product, in accord with the life-cycles of both the potter and her household. This is the pattern for Yoruba women in Africa, with female kinship relations permitting flexible itinerant peddling within the market system while maintaining domestic households (Lloyd 1953; Sudarkasa 1973).

Dalupa pottery is sometimes directly procured from the potter’s home by immediate consumers or by middle traders who will continue to circulate the pottery throughout the region. Pottery vessels are also important within the gift-gifting system of the Kalinga, on personal and community-wide levels. Ceramic vessels are given to delegates during peace pact talks (bodong) and celebrations, ailing community members during visits to encourage recovery (ila), females starting a new household or for their first pregnancy (legading), or entire groups of women visiting during the holiday season. Villages intermarry and potters typically have relatives in other settlements visited on their bartering trips. This network of consumers and social arrangements is even inherited by the next generation of potter from her mother. Hence, pottery circulation is not characterized by impersonal marketplace exchange to the degree that it represents social and economic networking by numerous participants with a variety of kinship and other ties throughout the region going back generations (Stark 1994:178).

Beyond the local exchange in pottery, a secondary distribution system circulates pottery throughout the interconnected valley system. The bulk of this exchange involves merchants or middle traders from Dalupa moving vessels farther afield for resale.
Kalinga pottery circulation always involves some secondary distribution by barter to third parties and customers do purchase vessels indirectly from potters that they do not know (Graves 1991:123; Stark 1994:178). Large vessels are rarely carried on barter trips, unless requested previously. The number and variety of pots carried on a trip vary from a few vessels placed in a basket to more than a dozen cooking vessels wrapped in banana leaves and bound with rattan cord. For the 1988 season, 68.4% of the vessels that Kalinga potters bartered within the regional distribution were meat/vegetable cooking pots (Oppaya) with short life spans. Another 11.9% of the total export ceramic assemblage was represented by water jars (immossso). In deciding which vessels to carry on a bartering trip, the potter considers the barter equivalence of her goods in dry rice, the most likely commodity she will trade her pots for, and must consider the return trip distance with a heavy and cumbersome sack of dry rice. Nonetheless, the greater the distance traveled to barter, the more pots the vendor will typically carry. In general potters make more frequent trips to settlements in closest proximity to their own and fewer long distance trips to outlying areas.

“Kalinga tradition dictates that relatives or friends provide visitors to a village with food and lodging; potters are hosted by local residents during barter trips. Hosts may receive gifts of pots in return for their hospitality. In a community of strangers, a potter and her companions rely on customary Kalinga hospitality for meals, and she often barters all her vessels from her first customer’s house (Stark 1992).” (Stark 1994:186)

In all, during the year that vessel exchanges were monitored, 63.9% of all vessels bartered were circulated within a 5 to 6 km radius, or a three hours walk to the farthest community. For exchanges within this local area, potters do not make overnight trips. The remaining 36.1% of the ceramic vessel inventory was circulated outside the immediate community and into neighboring municipalities with the advent of road building and increased access to truck transportation. Beyond the Pasil River Valley, the regional exchange system connects Dalupa potters to four other regional municipalities (Stark 1994:190, Fig. 8). Prior to access to motorized vehicles, all pottery was circulated by human porters and was then restricted to the local system of the Pasil. Of the five
municipalities, only .6% of pottery from Dalupa was traded to the more distant Lubuagan and Pinokpot municipalities. The majority of ceramic exchange primarily links three municipalities. Communities in the municipality of Balabalan received 25.5% of the Dalupa production where vessels fetched twice their average exchange value in the year of the study. Another 10% of the Dalupa assemblage was circulated to the Tabuk Municipality.

The intensity and frequency of ceramic production and distribution documented in the Kalinga ethnographic study provide an analogy for archaeologically recovered pottery distributions. Although exchanges are often direct and impersonal, they are facilitated and structured through a complex social system including groups of aligned potters interacting with friends and family in other settlements.

“Potters in separate work groups have established sets of customers (who are often relatives and friends) in pottery-consuming settlements that span generations of site occupation. Clusters of morphological or stylistic categories in archaeological ceramic assemblages therefore need not reflect full-time specialization as is found in state-level societies. Instead, such patterning may reflect distribution in a less intensive form of ceramic production, as if found in the Dalupa network.” (Stark 1994:194)

Prudence Rice noted that Kalinga women producing pottery at the household level can distribute their wares themselves through balanced exchange relationships throughout a geographic area of about 75 m², or for about a 5 km radius. Rice estimates that, over a 100 year time period, up to 100,000 vessels could be circulated through this mechanism alone (Graves 1991:142; P. Rice 1996:176). And this is just for the local system; the wider regional Kalinga distribution, although dependent upon motorized transport, circulates Dalupa and Dangtalan pottery through communities up to 40 km away. If survey and excavation of archaeological sites in an area comparable in size to the Kalinga pottery exchange network reflected a similar distribution pattern, then a similar social structure emphasizing female pottery production and distribution may also have characterized the archaeological context. Likewise, the same distribution pattern in the past may reflect a different transactional system which produces the same overall
distribution pattern. The Kalinga pottery distribution system does provide a basic model of household level industry in terms of the numbers of producers and the extent of circulation of their pots, especially when considering the distribution of archaeologically recovered sherds, by analogy. Kalinga midden formation has also been studied (Beck 2006) specifically in terms of catchment areas and disposal practices directly applicable to archaeological reconstructions. Residents in Dalupa tended to have vessels break within the domestic compound and typically discarded them in the nearest refuse dump.

Production and Circulation of Traditional Pottery in Guatemala

In Guatemala, pottery production is largely in the hands of indigenous or “Indian” populations producing hand-made utilitarian vessels for domestic consumption (Reina and Hill 1978). Potters are dominantly female and work is done in a household setting with little infrastructure or capital investment beyond a few large ceramic vessels for soaking clay, grinding stones for preparing temper, molds for forming pots, and a simple wooden stool to sit on. Potters work alone or perhaps with a daughter learning the trade in open plazas, inside houses, or under simple thatched roofs constructed without walls on houselots.

Pottery forms reflect the utilitarian nature of vessels and the conservative system does not permit great experimentation or divergence from cultural norms. The use of either concave or convex molds is common, supplemented by coiling. Closed corporate Indian communities produce the most forms and the most high-quality, technologically superior pottery. All traditional pottery falls into five major functional classes: carrying vessels, storage vessels, cooking vessels, serving vessels, and ceremonial vessels. These vessel classes reflect the agrarian nature of Indian life and the need for transport and storage of water and foodstuffs.

After pots are formed, they are scraped to maintain consistent wall-thickness and burnished to compact the surface of the vessels to making them less porous. A coat of
resin is also added to either both the interior and exterior of a vessel or just the interior. These are important finishing procedures for crafting solid, quality products. Slipping also makes vessels less porous but slips are usually applied to already burnished vessels and the process is not widespread nor considered necessary. The same slip clays are used for painting over slipped or unslipped surfaces and the practice is not considered necessary for the integrity or function of the vessels, although it does slightly increase the value of the pot. Painted pottery is still considered utilitarian, just nicer (*mas linda*). All traditional pottery is fired in the open; no kilns or specially prepared firing structures are used by traditional potters (Reina and Hill 1978:17-28).

The sociopolitical system of highland Guatemala structures pottery production and circulation. Traditional potters living in communities outside the sprawling urban capital of Guatemala City practice a generally conservative agrarian lifestyle. Community solidarity is of utmost importance and consistently referred to as *costumbre*, or custom. It is simply *costumbre* to make vessels in the style and with the same techniques that have always been the practice in that area.

“A significant difference in the social concept of pottery emerges among the potters of Indian *pueblos* (corporate social system) and the potters of Ladino *pueblos* (open social system). Indian *pueblo* and *aldea* potters see their work as an economic activity specifically defined by their community culture. The profits are to be invested primarily in community ceremonies and also in private family ceremonies.” (Reina and Hill 1978:21)

Reina and Hill’s (1978) survey of traditional pottery making and marketing in highland Guatemala provides multiple examples of the practice from different regions. The Chinautla *pueblo* of the Central Region, about 12 km north of Guatemala City, is a Pokomam speaking *pueblo* that was home to 1273 Indian and 142 ladino residents according to the 1950 census. Kinship and marriage ties act to interconnect the residents of the *pueblo* with other more dispersed communities within the *municipio*, the basic political territory in Guatemala. Pottery production in the *municipio* is concentrated within the Chinautla *pueblo* and the *aldea*, or smaller, less nucleated settlement, of El
Durazno. The nucleated settlement of the town itself is inhabited by farmers who walk to their milpas, or swidden agricultural fields, and potters who walk to clay sources outside the pueblo. Clay mines are privately owned and worked by clay mining specialists; clay is purchased in cash directly by potters. The fine-grained clays used for potting in Chinautla fall into three basic types: white, red, and black. The color of the raw clay does not translate into the color of the fired pottery fabric; all these clays fire to buffs, reddish browns, and yellowish reds. Potting in this region has a seasonal fluctuation with rains and winds from May to November curtailing pottery production. The torrential rains and gusting winds of the wet-season make mining clay in the deep mines dangerous and make open air firing of pots risky.

A typical potter brings out about twenty-five pounds of clay for a day’s work. The clay is dry pounded and then soaked in a large vessel overnight. The next day, the clay is wedged, much like kneading dough for bread, and foreign matter (bits of wood or pebbles) is removed. The fine clay is either used without the addition of temper, or pumice is added to achieve the desired consistency. Convex basal molds are used exclusively by the Pokomam linguistic group; the concave basal mold is more widespread throughout Guatemala (Reina and Hill 1978:205-206). Clay is worked into a large disc which is formed over the convex mold to produce the base of a globular vessel. After the partial vessel has dried to a leather-hard state, it is removed and the upper portion of the vessel is formed by coiling lengths of clay and working them around to form a collar. The base and walls of the vessels are scraped to the desired thickness with a piece of gourd. Potters finish the exterior of their vessels by burnishing with a smooth river worn pebble or with an ancient stone celt. Potters work at several vessels simultaneously. Slips are made from imported red clay or white talc. The same slips are used to paint vessels after slipping to produce the characteristic red-on-white and white-on-red bichromes representative of the community. All decoration is added before firing and all vessels ready are fired together in a single open firing session.
Firing of vessels occurs sporadically whenever a sufficient number of vessels have been formed and are ready to be fired. A circular firing area about six feet in diameter is laid out and the vessels to be fired are carefully arranged and stacked with the largest vessels forming the base of the stack and smaller vessels placed on top. Broken sherds are used as spacers to keep the vessels propped up and separated from one another. The stack must be stable and not move during firing to avoid catastrophic firing losses. Fuel is interspersed with the vessels and consists of “well-rotted pine, pine cones, pine bark, and dried cow dung” (Reina and Hill 1978:40). After the stack is set and stable, it is set afire with burning coals from a starter fire and quickly goes up in open flame. After about fifteen minutes of blaze, the entire pile is covered with straw. The potter works quickly to add straw to different areas and keep the fire consistence for the duration of firing. She will occasional look inside the pile to see if the pottery is oxidizing and determines whether or not the pottery is fired by the change in fabric color.

The intermingling of fuel and pottery often causes fire-clouding, an indication of inferiority that lessens the value of the pot; nonetheless these vessels are still sold. The rapid expansion of vessel fabric causes some vessels to explode and Reina and Hill estimated firing losses at about 10%. A single firing will produce about twenty medium sized vessels or three to four very large ones. The vessels were then marketed at the central market, Mercado Colón, in Guatemala City. Vessels were transported by human porter and sold directly in the marketplace to consumers for immediate consumption and also to merchants purchasing for itinerant peddling and resale all over western Guatemala. In more recent times, foot travel has largely been replace by bus and truck transport. Patron-client relations have also developed along with the transportation improvements, with merchants making advanced orders and picking up *carga* (advanced orders) of vessels directly from the potters’ homes.

The marketplace at Rabinal is an important distribution point for the circulation of pottery throughout the Baja Verapaz region. In this marketplace, vendors sell to merchants (middlemen) who distribute to other town markets and settlements. In Rabinal
pottery production is likewise household-based and usually performed in the courtyard of the domestic residence of the potter. Rabinal potters obtain clay from a one mile distant source and use locally available sand for tempering. Production emphasis is on large vessels with handles for transport, storage, and cooking (batidores and jarros), although Rabinal potters do generally make the entire domestic inventory of vessel forms as other communities do. Of course, these forms are also particular to any region and so certain specific forms will not be circulated outside a certain cultural region because they do not precisely fit consumer expectation. Decoration is simple and restricted to a few wavy circumferential lines and dots. Perhaps 48 vessels will be produced per potter per week. Rabinal potters also maintain consistent patron-client relations with merchants visiting their settlement every few weeks in order to purchase pottery in bulk for trucking to other markets and resale in the Alta Verapaz region (Cobán, San Cristóbal Verapaz, San Juan Chamelco, and San Pedro Carchá). The cofradia sociopolitical system also stimulates pottery production for community and family events involving feasting. This is a particularly non-commercial transaction where vessels do not fluctuate greatly in price and the order is made for the benefit of the community more than it represents an economic transaction. Prices are generally set, not highly negotiable and the interaction is based in getting the supply of vessels made and delivered on time for the social event. Encargos are primarily social agreements transacted outside the marketplace and the market principle.

“Sometimes people will make an encargo – an oral contractual agreement for a specific amount of pottery to be ready at a designated time – of tamaleros or large ollas for a family celebration. There is little discussion of value, since everyone seems to know the expected price. The transaction, occurring among friends, relatives, or cogodparents, is not impersonal as in regional markets. Consequently, the vessels represent the potter’s best effort and the buyer’s best price.” (Reina and Hill 1978:209)

Merchants may also place more strictly economic-oriented encargo orders with potters of a village holding a local market, arranging to pick up the pottery from the potter’s home and truck it in bulk to a regional market. As transportation improvements have continued, commercially oriented pottery orders have as well. The local, socially
bound encargo order is still important because it is necessary to have vessels in the most local style available for community festivals, not vessels from another region trucked in.

The only example of pottery production in the lowlands of Guatemala in Reina and Hill’s sample came from the northwestern shore of Lake Peten Itza, twenty-five miles southwest of the Classic center of Tikal. The small pottery-producing pueblo of San José had only 465 inhabitants according to the 1950 census with only 935 total inhabitants in the entire municipio. Domestic pottery is dominantly produced in the peripheries, on ranchos, or homesteads, in the forest near milpa plots. In addition, once per year pottery is produced in the pueblo for the annual community festival held in October. San José is a lowland community and does not run on the cargo or cofradiá socio-religious system popular in the highlands where community festivals can number over one hundred per year.

Vessel shapes produced in San José reflect a mix of traditions that “bear a resemblance to forms produced in Late Postclassic Yucatán and El Petén, as well as modern Yucatán” (Reina and Hill 1978:142). Reflecting the scarcity of water in the area, two types of tinajas, locally referred to as cánteros, are commonly produced to store water. Narrow-mouthed ones are for pouring water directly and wide-mouthed versions are for storing water to be dipped out with a gourd. Large ‘basins’ and tamaleros produced are also reminiscent of Late Classic forms at Tikal; all vessels produced are utilitarian wares, not serving wares.

Between 1960 and 1962 potters traveled two and a half hours by dug-out canoe to obtain potting clay from Santa Elena. Vessels are tempered with hi, a rock with feldspar and quartz available locally within a half-hour walk (Reina and Hill 1978:142). Similar to pottery produced by the Chiautla potters, large globular shaped vessels are manufactured in two major steps. First, the top portion of the vessel is formed by hand on a flat stone ‘mold,’ and set to dry overnight. After hardening, the top portion of the vessel is inverted and the base is formed by coiling, finally, the the rim is added (Reina
and Hill 1978:144). Potters typically work on five to seven vessels simultaneously. These vessels are set on their sides with the open mouth facing a fire lit in the center of an open area, to water-smoke and gradually heat up. The potter uses a large branch to move the vessels around during the pre-firing procedure. Gradually, the potter moves vessels closer to the fire as they lose moisture. When the vessels have been water-smoked and arranged in a single pile, firewood is added in between and on top of the vessels to finish firing. Vessels are produced primarily for household use in San José, not for exchange. Vessels never make it to market although some surplus may be sold directly within the pueblo and at fairly high prices.

**Market System Exchange in Guatemala**

The market system encourages community specialization by facilitating exchange with other communities. *Costumbre* regulates conservative consumption; hence, conservative production has a guaranteed market. The market also gives potters an economic outlet for their products simply not available in their native communities. The bounded nature of mostly indigenous highland Maya communities suppresses economic gain and profiteering so markets provide a place (and time) for economic exchange outside these normal social constraints. Markets are bustling, but they are also organized and rules must be adhered to in order for diverse peoples to interact within the special order of the marketplace.

“The market is a central place where people meet in an organized fashion. Markets, contrary to communities, are not bounded socially – they are accessible to all. The people of the town, vendors from specialized communities, and buyers from other areas bring products according to their personal schedule of production. Their goal is to derive an economic profit from each transaction. Thus, the openness of the market permits anyone from any cultural or social background to interact and exchange commodities for cash.” (Reina and Hill 1978:207)

While indigenous folk people of Guatemala are connected to a cash economy, I did see exchange through bartering in the marketplace at Chichicastenango in 2009.
Visiting the pottery section of the marketplace in the early morning on the surge day, I saw a socio-economically depressed man who had brought in a bundle of firewood in on his back. He immediately went to the section of the market occupied by pottery sellers (they had arrived early with the pottery on their backs) and bargained the firewood load for one or two small ceramic vessels. The pottery sellers were carrying what appeared to be wheel thrown glazed vessels and may have been middlemen themselves. One porter had carefully bundled a load of pottery consisting of flats of six by six identical pots in four layers divided by cardboard and all wrapped in twine. With four layers of thirty-six pots, one porter carried 142 small vessels as a single load.

Reina and Hill describe three types of markets in the hierarchical market system of Guatemala: local, regional, and interregional. There are also three kinds of agents moving pottery through this system: vendors, *regetones*, and merchants. Vendors are the potters themselves or members of potting households that sell the product of the household. *Regatones* are either male or female middle-traders who rent permanent stalls at regional marketplaces and buy pottery in local markets for resale there. Merchants, or itinerant traders, travel between various markets and trade at all levels of the system. These merchants are often human porters with *cacastes*, the wooden backrack frames which are used to transport pottery vessels tied up for secure movement. This practice is rapidly changing but is still popular in rural areas, where inhabitants have little access to transportation improvements. Motorized vehicle transport and road building is increasingly opening up previously isolated areas and larger transactions involving the purchase of more vessels are moved through the system in the beds of trucks.

*Local Markets*

Local markets are held in pueblos, usually the heads of municipios, one or two times per week and with little possibility of economic growth (Reina and Hill 1978:215). At potting pueblos, vendors are the dominant economic agents servicing local consumption needs and also selling to middle traders for export beyond the community.
within the market system. In pueblos without potters the local market is frequented mostly by merchants and sale is geared toward supplying local demand, just like the local markets of potting pueblos. In the non-potting settlements’ markets there are few regatones, but owners of small shops (tiendas) buy from merchants to keep a steady supply of vessels on hand for times when the market has an absence of pottery sellers. The conservative vessel assemblage offered at the local markets reflects traditional water and food needs.

The basic domestic ceramic inventory is always available in and around local markets, supplied by different lines. Conservative cultural norms of food production means that merchants are comfortable that they have customers for the conservative ceramic inventory and they take little risk with innovative forms or un-tested pots that are unlikely to sell quickly. The system is thus self-perpetuating with little room for expansion of enterprise. Demand is fairly static and focused on replacement vessels of known function; production is not geared along commercial lines for increased or innovative output aimed at more widespread circulation. There are no new markets to be tapped, just a constant supply of dependable consumers living in the traditional way.

Vendors from San Cristóbal Totonicapán may sell their pottery to local tienda owners located at the convergence of major economic routes, who resell to passing merchants or itinerant traders who continue on to markets in the Pacific Coast and to the west and east. In this case, pottery produced in San Cristóbal Totonicapán has a more widespread distribution because of the location in proximity to trade routes. Wholesalers also maintain storage facilities where they store larger quantities of pottery purchased from the local market and traveling vendors for resale to itinerant merchants making their rounds through the region. In general, larger cargas are possible with truck transportation and merchants will arrange these for pick up on their future journeys. Chains of itinerant merchants connect the different regions and political centers. In the Verapaz region, before 1973 when roads were built, this was accomplished solely by walking itinerant merchants carrying pottery on their backs and heads.
Regional Markets

Regional markets are characterized by a lack of vendors and a proliferation of regetones and itinerant merchants. From three to six potting communities will be represented at the regional market although the basic utilitarian domestic inventory will be about the same. The service range for a regional market will encompass diverse ecological zones and contain several municipios, bringing together rural and urban inhabitants and varied craft and agricultural products from several specialized communities. Regional markets are usually open every day, at least partially, with surge days once or twice per week with a drastically increased influx of participants. Staggering periodic marketplaces allows itinerant traders to visit more markets on their peak day. In more recent times, these regional markets are increasingly serviced by bus transportation and most inhabitants can visit markets farther away from their home communities more easily and more regularly.

With no national restrictions on commerce, pottery moves over linguistic boundaries (Spanish is often the lingua franca), political boundaries, and class distinctions (Indian and ladino). However, costumbre limits exchange spheres. Forms don’t sell well outside their home regions because they are tailored to specific cultural norms of food preparation and domestic activities. Hence, conservative consumers limit economic growth and integration, keeping the system largely consistent for provisioning with necessities, not new and innovative products.

Interregional Markets

The Mercado Central in Guatemala City once served the entire city population and was basically a very large regional market. Demand in the rapidly growing urban capital city has increasingly shifted from an emphasis on traditional forms to demand for tourist forms. In the 1970s La Terminal market overtook the Mercado Central to become the only international market servicing the entire country. With demographic growth,
some regional markets (Quetzaltenango, Escuintla, Cobán) are developing to become interregional ones, economically tying two or three regions together in a single market system. This market centralized pottery distribution for the entire city, acting as a “super-middleman” with high product availability to facilitate all orders, small and large. It is also an urban market, largely devoid of the casual social atmosphere and functions of peripheral markets.

“The bustle of the place is not conducive to personal social interaction. This market is, after all, an urban institution, characterized by formal and impersonal interaction.” (Reina and Hill 1978:225)

The large interregional market also helps to buffer against seasonal availability of pottery and offers new avenues of consumption by supplying non-traditional urban residents with traditional forms slated for non-traditional usage. For instance, *tinajas* produced in Chinuatla are marketed to urban dwellers as planters (Reina and Hill 1978:221). Hundreds of vessels move through this market system, facilitated by middle traders, and pottery is distributed widely from this central hub. The consistent movement of goods in and out for wider distribution has created a formal market institution, one which operates close to equilibrium between demand and circulation. Growth in the number of middle traders moving pottery from production centers to customers influences the organization of production in specialized communities, by giving pottery access to a greater exchange market. Widespread demographic growth also acts to keep demand high for traditional pottery.

“Overall, the distribution of pottery vessels through the economic interdependence of the local, regional, and interregional market system constitutes an organization of fundamental importance for major and minor pottery-production centers. All levels are intimately interrelated, and together form a complex rural-urban economic system.” (Reina and Hill 1978:227)
8.3 – Regional Distribution Studies of Ceramic Vessels

The Regional Exchange of Ceramics in pre-Columbian Oaxaca

Several researchers believe that marketplace exchange and integrated market systems were prominent features of the Pre-Columbian economy of Mesoamerican societies well before the rise of the Aztec empire (Blanton et al. 1993; Dahlin et al. 2007; Feinman, Blanton, and Kowalewski 1984; Hirth 1998). Marketplace exchange and market systems were certainly important institutions in Oaxaca at contact (see Spores 1965, 1967, 1984) and persist to this day (see Cook and Diskin 1976). Researchers working in the Valley of Oaxaca have analyzed the distribution of ceramic paste classes and ceramic production loci in order to investigate the structure of the alleged Pre-Columbian market system in that region. Feinman, Blanton and Kowalewski assert that by Early Monte Albán I (500 – 350 B.C.) a “region-wide market system evolved” in the Valley of Oaxaca (1984:165).

“One indication that a market system developed in the Valley of Oaxaca during Monte Albán I is that this is the first period in which there is obvious and substantial evidence for specialized ceramic production (for example, concentrations of ‘kiln wasters’ and unusual concentrations of a ceramic type).” (Blanton et al. 1993:29)

These authors stress how specialized production in different portions of the valley was probably interdependent within a market system. They contrast this alleged market system economy with the model of a redistributive economy, in the classic sense (i.e., Polanyi 1968[1947], 1968[1957]). The conclusion that a market system developed in pre-Columbian Oaxaca to the exclusion of any kind of redistributive economy rests on the absence of large-scale centralized facilities for the pooling and redistribution of staple grain. The lack of centralized granaries within the epicenters of the Valley communities indicates that centralized redistribution was not present at any great scale (Appel 1986:381; Feinman and Nicholas 2007a:188-189). Feinman and colleagues (Feinman 1986; Feinman, Blanton and Kowalewski 1984; Feinman and Nicholas 2004, 2007a)
assert that the lack of evidence for substantial centralized redistribution facilities combined with the apparently unfettered access to ceramics manufactured from different clay sources suggests the existence of a market system in formative times.

During Monte Alban I times (500 – 350 B.C.), the Valley of Oaxaca was characterized by rapid demographic growth and the establishment of Monte Alban as the primary administrative center of the valley, with a nucleated population of approximately 5000 inhabitants (Blanton 1978). Agricultural intensification has been documented concurrent with population increases within the Valley at this time (Feinman 1986:351). There is also a shift from wattle-and-daub house construction to more permanent adobe-brick residences (Blanton et al. 1993:75). A rapidly growing population in the piedmont zones of the Valley suggests that a market system would have been necessary in order to provide agriculturalists living on marginal or unpredictable lands with a stable provisioning network (Blanton et al. 1993:79).

“A complex regional exchange network must have been in place to buffer the populations living in the piedmont from the erratic returns characteristic of farming in that zone (Kowalewski 1982).” (Feinman 1986:352)

This model predicts the development of an increasing division of labor and exchange concurrent with agricultural intensification, with fewer specialists producing at higher volumes to meet the demands of an increasing consumer population (Feinman 1986:353-354). Less standardized pottery from the Rosario phase (600 – 500 B.C.) is contrasted against the greater standardization of product in the subsequent Monte Alban I phase (500 – 350 B.C.). The Rosario phase pottery is described as having highly variable pastes with high variability in rim morphology and incised plastic designs (Feinman 1986:364). In contrast, there is a growing emphasis through time on plain utilitarian pottery, devoid of design and indicative of more streamlined production for greater output; comales (tortilla griddles) and sahumadores (hollow handled incense burners) make their first appearance in the ceramic assemblages of the valley around 300 B.C. (Feinman 1986:364-365). Specialized production is equated unambiguously with
marketplace exchange, as a reaction to market demand (Feinman and Nicholas 2007a:189). Feinman (1986) suspects that a system of household production for immediate consumption within the household during the Rosario phase was supplanted by a system of more specialized production for exchange by Early Monte Alban I.

The Oaxaca Survey Data

There are no restricted clay sources in the Valley of Oaxaca (Plog 1976; Shepard 1967); raw materials for pottery production were found to be ubiquitous, evenly spaced, and not consistently correlated with pottery production loci (Feinman, Blanton, and Kowalewski 1984:166). Ceramics were manufactured from three unrestricted clay sources (gris, café, crema) and ceramics from all three paste classes were consistently recovered together during the survey of the Valley. These collections, with three intermingled paste classes, have been interpreted as strongly indicating the market distribution of pottery from varied production units (Feinman, Blanton and Kowalewski 1984:169).

In the regional survey, a polythetic set of criteria was used to identify ceramic production loci from surface debris. The clearest indicator of ceramic production was the presence of waster sherds, followed by fired clay blocks and coils (kiln furniture?) and a high percentage of a single ceramic variety in the recovered assemblages (Feinman 1986:355). Feinman interprets the positive correlation of highly decorated ceramics with monumental architecture as an indicator of increasing social stratification and increasing wealth differences evident in greater access to the products of specialist producers. Between Early Monte Alban I and Late Monte Alban I, ceramic production loci are increasingly associated with substantial architectural compounds. In Early Monte Alban I, three out of seven ceramic production loci were associated with “administrative architecture,” while seven of eight ceramic production loci were associated with such architectural compounds by Late Monte Alban I (Blanton, Kowalewski, Fienman, and Finsten 1993:82; Feinman 1986:363-369). Rapid demographic growth is documented
from Early Monte Alban I to Late Monte Alban I, with the valley population rising from approximately 5000 inhabitants to around 17,000 inhabitants. At the same time, the Late Monte Alban I ceramic complex became more standardized with a decreased emphasis on decoration and becoming more evenly distributed throughout the valley than it had been in Early Monte Alban I (Blanton, Kowalewski, Fienman, and Finsten 1993:82).

Confirmation of a Market System in Ancient Oaxaca

Feinman and Nicholas (2004:172; 2007a:192) have clearly stated the archaeological evidence they expect would be generated under market system conditions.

“If a market-based system were present in Classic period Oaxaca, we would expect to see the following characteristics: (1) production for exchange (specialized production) of both utilitarian as well as luxury goods; (2) specialized production at the household, site, and even regional scales; (3) no direct or overarching administrative control of production/distribution; (4) widespread (and somewhat even) distribution of goods both geographically and between different houses at the site; (5) absence of large, centralized storage features or facilities; and (6) large open and highly accessible plazas, often situated near the edges of settlements and near major paths or roads, that could have served as marketplaces. The existence of a redistributive system would be supported by the alternatives of the characteristics outlined above.” (Feinman and Nicholas 2007a:192)

While these are logical expectations, they do not provide very exact or unambiguous criteria for distinguishing a dominantly redistributive economy from a market-based economic system. In fact, these authors present a fairly simplistic case of a centralized redistributive economy, apparently based on archaeological evidence from the Inka empire (see also Feinman and Nicholas 2004, 2010). They contrast the Valley of Oaxaca data to a hypothetical model of a redistribution economy characterized by bulk movements of goods into a centralized authority (and large centralized facilities) with limited craft production directly attached to elites and focused primarily on status or elite wealth goods (Feinman and Nicholas 2007a:188-189). I personally suspect that economies characterized by redistribution or market exchange share similar features that
would translate to similar archaeological signatures. Why is a centralized storage feature necessarily a sign of a redistributive economy? Aren’t storage areas also expected at market towns or ports of trade?

Feinman and Nicholas (2004, 2007a, 2010) have suggested that differences in production focus recovered from sites in the Valley of Oaxaca indicate considerable intraregional exchange. Data from the archaeological survey of the Valley of Oaxaca are generally interpreted within a market system model, without consideration of redistribution or other non-market forms of exchange, including tribute. The alleged market system of the Valley of Oaxaca is described in fairly abstract overarching terms and the precise structure of the ancient economic system is far from obvious.

“Just as there is no single relationship between food production and social complexity there is no single relationship between specialization, exchange and social complexity. Meaningful statements about specialization, exchange and social complexity can only be made if the variation covered by these general terms is explicitly recognized and taken as the object of study.” (Brumfiel and Earle 1987:4)

The rulers of powerful states may either encourage or suppress marketing activity. In general, Blanton et al. (1993:210-212) argue that the dynamic relationship between centralized states and market systems will be inversely correlated, with decentralized marketing suppressed by centralized state institutions, and that this is not exclusive to Mesoamerican societies. This position does not deny that marketing systems are always the focus of some elite or centralized regulation of production and exchange, to insure safe and efficient exchange, discourage hording, and punish thieves. Feinman and Nicholas clearly state that the mature Aztec market system operated alongside a widespread tribute system, and that this was not typical of Mesoamerican states in general (2007a:188). Their evaluation of the alleged Valley of Oaxaca market system does not sufficiently take account of possible competing or complementary systems of production and/or exchange. Relying on the identification of “workshops” for specialized craft production as the primary indicator of a market system, their analysis is
heavily weighted toward supporting a market system model and not designed to discriminate possible non-market-based patterns of exchange.

Specialized Workshop Production in Oaxaca

The assertion that a valley-wide hierarchical market system developed in Pre-Columbian Oaxaca is strengthened by regional data documenting the production of ceramics as well as shell and lithic artifacts (Feinman and Nicholas 2004, 2007a). Archaeological investigations have positively identified “workshops,” in the sense of production units manufacturing more craft items than could be consumed by the immediate producers, and exchange is certainly implied. However, the mechanisms or institutional arrangements that developed to facilitate the exchange of surplus product were likely varied; marketplace exchange is not the only option.

At Ejutla, a valley floor settlement at the southern end of the Valley of Oaxaca, residents produced both ceramics and shell artifacts, as well as engaging in other lapidary work. The production of a limited number of ceramic forms (comales, sahumadores, and figurines) suggests a degree of specialization, while the location of ceramic pit kilns in close proximity to a residential structure is suggestive of household or household industry level production (Balkansky et al. 1997; Feinman and Nicholas 2004). The presence of mixed deposits of domestic and craft production debris (Feinman and Nicholas 2007a:198-200) also indicate household production and suggest a limited degree of specialization. Microartifactual analysis (heavy fraction) of soil samples from the earthen house floor documented the working of shell, chert, greenstone, and rose quartz (Middleton 1998; Feinman and Nicholas 2007a:199-205), and confirmed that much of this shell and lapidary work was actually conducted within the house itself.

Approximately 20,000 pieces of imported marine shell (Spondylus, Strombus, Pinctada) were recovered from this production unit in various stages of preparation. However, only 1% of the recovered shell assemblage is represented by finished artifacts,
leading to the conclusion that finished objects left the production locus and entered an exchange system. Finished shell artifacts were uncommon in the household excavation and only one shell bead was recovered from a subfloor tomb, supporting the supposition that production was geared toward exchange and not consumption by the producers themselves. Cylindrical drills subsequently used to perforate shell adornments were manufactured within the household in addition to sundry lapidary work (Feinman and Nicholas 2007a:194-199).

At El Palmillo, a hilltop terraced site on the eastern edge of the Tlacolula arm of the Valley of Oaxaca, evidence of chert tool production was recovered from the horizontal stripping of seven residential terraces (Feinman and Nicholas 2004, 2007a, 2007b; Haines et al. 2004). The chert tool forms produced at this locus have been equated with maguey processing, which appears to have been a community specialization at the El Pamillo site in Classic times (as it is today). The El Palmillo artifact assemblage is also dominated by large spindle whorls (associated with maguey fiber spinning) and bone needles and perforators related to textile manufacture (Feinman and Nicholas 2007a:204-206). In sum, this hilltop center appears to have been home to a community dedicated to maguey production and the processing of maguey fiber into clothing.

These two valley communities were both involved in specialized production and their artifact inventories indicate the importation of raw materials as well as foreign ceramics (Feinman and Nicholas 2004). Both communities imported marine shell, chert and obsidian, and Thin Orange pottery; excavations at Ejuatl also document the importation of greenstone and onyx for lapidary production. While the archaeological investigation of these two communities supports the identification of some level of specialized production, this appears to have been conducted within domestic contexts. The distribution of the specific products of these production units has not been argued to conform to a market exchange pattern. Rather, the presence of specialized production has been argued to imply surplus for market exchange. This conclusion is strengthened
by the presence of imported materials and goods within the valley (Feinman and Nicholas 2004, 2007a).

A Central Place Analysis of the Settlement Hierarchy of the Valley of Oaxaca

Jill Appel also follows Blanton, Feinman, and others in setting a market system model in direct opposition to a redistributive economy.

“Once a market system is assumed for an archaeologically known society, we can explore its organization and its degree of integration. Renfrew’s (1975:10) observation on the futility of archaeological market research...is acceptable if qualified; some market systems deviate strongly from classical central place arrangements and instead resemble redistribution systems.” (Appel 1986:382)

Appel also take a diachronic approach to the investigation of marketing in the Valley of Oaxaca, comparing and contrasting the degree of competition indicative of free-market exchange between different time periods. She found that the lowest levels of competition occurred during the most centralized times while the highest levels of competition and commercialization occurred during the Late Postclassic period (ca. A.D. 1000-1522).

Evidence for marketing was judged through standardization measures for ceramic assemblages and their association with elite architecture. The degree of production for market exchange was assessed according to the formal economic principle that greater standardization indicates a greater streamlining of ceramic production for increased output and wider exchange. The basic premise of this study is that higher diversity in ceramic assemblages indicates greater commercialization while low assemblage diversity equates with greater centralized control. Other researchers have argued the opposite phenomenon, that high diversity is indicative of attached specialization for strictly elite consumption (see Chapter 6).
In general, Appel employs a rather abstract model to assess the level of agreement between settlement patterns at the site level and perfected Central Place locational models predicting the most economically efficient patterns of site distribution. Ethnohistoric documents were consulted to determine the market hierarchy at contact and then the total estimated population of a center was used as a proxy variable for the construction of a hierarchical ordering of market centers. Although a general agreement between population size and level in the market hierarchy is assumed in the study, a market center’s rank in a hierarchically ordered market system may not correlate with population size. In fact, in some market systems, highly popular marketplaces are associated with low permanent populations.

This complex analysis found a better fit between economic driven Central Place models (i.e., K=3, K=4) and the reconstructed market center hierarchy during period V (A.D. 1100 – 1300) more so than in period IIIA (A.D. 300 – 500), which is attributed to either high economic competition, indicative of widespread marketing, or its suppression by elites at times of low market integration (Appel 1986:415). Period II (200 B.C. – 300 A.D.) is characterized by a decrease in overall valley populations and the expansion of the Monte Albán state and increasing tribute influx from incorporated communities (Blanton et al. 1993:82-87).

During this period, cream ceramics (cremas) were used in a number of sites in the southern highland region of the valley, including the suspected military outpost of Cuicatlán about 100 km northeast of Monte Albán (Blanton et al. 1993:82-83). For over fifty years it has been suggested that cream (crema) ceramics were produced at Monte Albán based on the similarity of paste with pottery produced by the modern potters of Santa María Atzompa, a modern town located at the base of Monte Albán (Shepard 1967; Thieme 2001; Thieme and Neff 1993; Thieme et al. 2000). Compositional analysis of Period II cream ceramics from Oaxaca support the conclusion that the majority of these were made near Monte Albán (Sherman et al. 2004). The distribution of these cream ware ceramics suggests that any tribute influx to Monte Albán was accompanied by the
movement of ceramics out of Monte Albán to subordinate or lesser ranked centers. At the end of Period I, the previously antagonistic center of El Palenque, located outside the modern town of San Martín Tilcajete was apparently sacked, burned and abandoned (Sherman et al. 2004:1). In Period II, the center of Cerro Tilcajete became the dominant administrative center of the Ocotlán-Zimatlán subregion and was “well-integrated into the Monte Albán state” (Sherman et al. 2004:6). This shift in power from El Palenque to Cerro Tilcajete was accompanied by greater access to the crema ceramics allegedly produced at and controlled by Monte Albán. Excavations at El Palenque produced very few crema ceramics, an indication of this centers independence of Monte Albán.

“During the Monte Albán II Period, Cerro Tilcajete became the subregion’s secondary center. At Cerro Tilcajete, cremas are quite abundant in excavated elite contexts. For example, in the area A palace, cremas constitute 30% of all diagnostics while in the low status house cremas made up 12% of the diagnostics. The people of Cerro Tilcajete clearly had regular access to crema pottery, suggesting a much closer relationship between this site and Monte Albán.” (Sherman et al. 2004:3).

An extensive INAA study of 453 Late/Terminal Formative period (ca. 400 B.C. – A.D. 300) sherds from the Mixteca Alta, Mixteca Baja, lower Rio Verde Valley, Valley of Oaxaca, and Cuicatlán Cañada indicate widespread exchange of pottery throughout the Valley of Oaxaca at this time. Analyzed sherds come from the three major paste classes: greyware (gris), fine brownware (café fino), and creamware (crema). The sherd analyses were supplemented by 122 samples of clays, tempers, and sherds from four modern pottery producing towns in the Valley of Oaxaca: Santa María Atzompa, San Bartolo Coyotepec, Ocotlán de Morelos, and San Marcos Tlapazola. The combined analysis of archaeological specimens and raw materials make the designations of source regions for the analyzed pottery very robust (Joyce et al. 2006; Neff et al. 2006a:106).

“Although this study does not resolve the debate over Late/Terminal Formative period interaction in Oaxaca, our data shows that ceramics were widely traded at this time and that exchange was multidirectional. Our study adds to a growing body of research that shows that INAA is a highly effective technique for examining ceramic exchange and production (also see Neff et al. 2006a; Neff et al. 2006b).” (Joyce 2006:591)
The subsequent period IIIA (A.D. 300 – 500) for which Appel found a considerable divergence from the perfected Central Place settlement arrangements coincides with the expansion of the Teotihuacán state and a complementary contraction of the borders of the Monte Albán state (Blanton et al. 1993:104). By the subsequent IIB period (A.D. 500 – 750) local administrative units in the Valley of Oaxaca emerge as nearly autonomous political entities, ushering in an 800 year period of decentralized political authority (Blanton et al. 1993:104). Considering the statistically derived goodness of fit coefficient between her reconstructed market center hierarchy for Monte Albán IIIA and idealized Central Place models (closer to K=3 or K=4), Appel concludes that, “evidently the efficient movement of goods between large centers was not a predominant concern.” Nonetheless, she does posit that,

“the results suggest that the IIIA economic system was relatively free of noncompetitive administrative influence, because it was the population hierarchy rather than the administrative hierarchy that produced the best fit with an ideal central place arrangement.” (Appel 1986:415)

Concluding Remarks on the Distribution of Pottery in Oaxaca

Feinman and Nicholas (2010) continue to discuss archaeological investigations in the Valley of Oaxaca supporting a market exchange model for this region during the Classic period (A.D. 200 – 800). These authors consistently interpret the concepts of redistribution and market exchange as mutually exclusive principles. The argument in favor of embracing a market system model of basic economic organization asserts that there is no evidence for the centralized redistribution of maize or craft goods. No large centralized granaries have been located at the administrative centers of the valley so an economic system based in redistributive principles unlikely characterized the region, in the classic sense of provisioning the populace through pooling and redistribution by a central authority (Appel 1986:381; Feinman and Nicholas 2007a:188-189; Feinman and Nicholas 2010:91, 94).
“[I]f prehispanic Mesoamerican economies were dependent on redistribution instead of marketplace exchange, we would expect an economic system in which craft production was generally rare and centered on lightweight, high-value items. Most households would have manufactured the bulk of the goods they needed, as the long-distance movement of heavy bulk items in quantity to a central place and then back out again (see Drennen 1984) seems cumbersome for a region the size of the Valley of Oaxaca, covering more than 2,000 km².” (Feinman and Nicholas 2010:91)

Feinman and Nicholas (2010:91) slightly overestimate the centralized political power of Monte Albán and pigeonhole the concept of redistribution, suggesting instead that marketplace exchange must have been the dominant mechanism for the transference of goods throughout the entire Valley of Oaxaca. While it is true that the centralized pooling of all goods produced in the valley for redistribution back to the entire population is extremely unlikely, goods may have circulated through redistribution at a geographic scale less than the entire region and without market exchange. Centralized authorities do not need to physically move all goods in to and out of the central precinct, they need only maintain control over key goods and appropriate and redistribute these at specific times.

Drennen (1984) cited a 275 km maximum travel distance for human porters carrying grain (cf. Sluyter 1996; Malville 2001). Using this liberal estimate, human porters certainly could have moved a substantial amount of grain and other goods to any number of centralized or peripheral redistributive facilities or marketplaces. It is true that the mature Inka economy, commonly referenced as the principal example of a redistributive economy, maintained a network of roads, bridges, checkpoints, and storehouses which would be obtrusive archaeologically. But the Dahomey kingdom of west Africa in the eighteenth century maintained an extensive system of roads and perishable structure compounds to monitor the distribution of goods throughout the kingdom that might not leave such distinct signs of their existence in the archaeological past.

Household production strictly for household use or the “domestic mode of production” (i.e., Sahlins 1972) may be augmented by the circulation of things between
households, or within and between lineages or larger communities along non-commercial lines without a well-developed market system. Nonetheless, Feinman and Nickolas suggest that the degree of craft specialization found in the Valley of Oaxaca during the Classic period makes widespread commercial exchange likely and that the large-scale redistribution of goods was also unlikely given the settlement pattern emphasizing hilltop elite residential sectors.

“[B]ecause so many of the larger valley settlements were situated on hilltops, with high-status families generally living at the apexes of the sites, redistribution would have required many energetically costly trips up and down steep hills to the residences or other domains associated with rulers.” (Feinman and Nicholas 2010:94)

Here high status families are the focus of redistribution, not a single centralized authority as previously suggested. It is worth considering the possibility of some level of redistribution along lines other than market exchange – whether this integrated a single 2000 km² unified system, operated at the level of the single center, or was restricted to exchanges between and within social segments of a single center. When all goods are moved by human porter, it is energetically costly to move goods by any means, whether centrally pooled and redistributed or moved in, out, and between marketplaces. Feinman and Nicholas envision widespread exchange at numerous centers of the valley, held in open air plazas outside the central residential precinct.

“In contrast, the large Classic period settlements in the Valley of Oaxaca often have extensive open plazas situated at their peripheries that may have been marketplaces. At Monte Albán, Blanton (1978:86) identifies an open area near the base of the site as a possible setting for market activities because it was adjacent to a major road and surrounded by a residential zone in which many of the terraces yielded indications of craft activity. Likewise, we suspect (Feinman and Nickolas 2004b:123-124) that a similar open plaza at El Palmillo may also have been a market area. This large, flat feature is located close to the base of the site, just below the densest concentration of residential terraces. Several ancient paths or roads lead up to this plaza from the base of the site, with one of them continuing up to the site’s densest residential zones.” (Feinman and Nickolas 2010:94-95)
Evidence of craft specialization at secondary centers in the valley suggests a degree of community interdependence which could have led to marketplace exchange and the development of a market system incorporating areas of differential productive potential. The community specialization in processing maguey and other plants at El Palmillo suggests to Feinman and Nicholas that this community was producing for exchange with agricultural communities emphasizing maize production. Evidence for shell ornament manufacture from the secondary center of Ejutla (Feinman and Nicholas 2000) is consistently cited in support of the market exchange model, although shell ornaments certainly fall into Feinman and Nicholas’ (2010) category of lightweight, high-value items expected under their definition of a redistribution system.

Feinman and Nicholas bring together multiple, circumstantial lines of evidence for a complex market system economically integrating the Valley of Oaxaca during Classic Period times. These authors are among a growing group dissatisfied with textbook definitions of market arrangements that do not fit their particular geographic and temporal area of study. Feinman and Nicholas specifically argue for the investigation of market systems, even if they do not meet the strict criteria for classification as market economies (i.e., Polanyi 1957; Finley 1973).

“The definition of market systems has been widened (recognizing greater diversity in these modes of exchange), and the qualitative gulf Polanyi and his associates posited between capitalist market economies and other commercialized economies has been narrowed. With these conceptual reevaluations, market exchange and commercialization have now been convincingly recognized in the Greek and Roman worlds (Davies 2005; Greene 1986, 2000); Temin 2001, 2006), ancient Mesopotamia (Gledhill and Larson 1982; Silver 1983; Snell 1997:145-158), and medieval Europe (Moreland 2000), among other regions.” (Feinman and Nicholas 2010:89)

Favoring the newer commercial market-based interpretations of ancient societies, Feinman and Nicholas note that even the most commercial societies on the planet do not meet the stringent criteria of Polanyi and Finley.
“Yet it is also important to recognize that notions of entirely free market systems operating exclusively on the principles of supply and demand often ascribed to those two scholars [Polanyi and Finley] simply have not been found to exist in history, whether in the deep past or more recently.” (Feinman and Nicholas 2010:89)

I don’t believe that the alleged lack of entirely free enterprise operating exclusively on the principles of supply and demand in modern market economies in any way lessens the distinction between these and archaic economies before industrialization, or even camel caravan or horse-drawn carriages in antiquity. It should be noted that Polanyi never denied the presence of peripheral markets in ancient societies and that Finley was well aware of market systems in the ancient world.

“What [Moses Finley] denied was the integration of markets empire-wide to a point that they can be analyzed as a single unit of supply and demand. There were markets, even linked markets, but not integrated markets.” (Saller 2002:254)

To argue that Polanyi’s distinction between the modern market economy and economies of ancient societies is too strict does little to illuminate the specifics of exchange in any particular circumstance. During the Classic period residents of the Valley of Oaxaca probably did not use money, mathematically calculate future profits, or streamline production in assembly-line fashion in centralized manufactories to meet market demand; wage labor and land were unlikely to have transacted on the market. This is an old debate, whether incipient forms of credit and lending or marketplace exchange in archaic societies are simply different is scale, not in kind.

“Quantitative differences between cultures most certainly exist; the people of one will have mechanical machinery while those of another may lack even the wheel; in one case literacy will be so common that almost everyone reads a morning newspaper, while in another case even the wise men of the people may have nothing corresponding to written characters.” (Goodfellow 1968[1939]:56-57)

Peripheral markets, even those influenced by the supply and demand factors, do not form a market economy in which the market principle is the dominant integrating
factor throughout society when market ‘prices,’ or equivalencies, do not strongly influence production decisions, particularly, the allocation of resources among alternative outputs (Bohannan and Dalton 1962:8). In other words, marketplaces do not form a market economy until the majority of subsistence goods and services are transacted there, and their supply and demand ratios dictate nearly all investment in production with an eye toward maximum profit and efficiency. This point is often missed by anthropologists who see profit motive and supply and demand factors operating on a minor scale within society, specifically, only in the marketplace.

“When an anthropologist says that some African market operates like a Western market, he usually means simply that there are seasonal price fluctuations caused by changes in supply and demand; he does not mean that an interrelated set of market prices are formed which guide production decisions, or that the populace derives its livelihood through selling something on the market.” (Bohannan and Dalton 1962:10)

Any market system operating in the Valley of Oaxaca in the distant past was probably of only peripheral importance in the everyday lives of valley residents. It is unlikely that a hierarchically organized market system moved goods and services around to the extent that residents depended for the majority of their livelihood on their smooth functioning. The degree of production for exchange and the distribution of products at the point of consumption would help to define the economic exchange system of the valley in ancient times, and clarify whether products moved throughout the entire valley within one integrated system or if sub-regional centers were more self-sufficient in terms of localized production and consumption. Researchers working in the Valley of Oaxaca have made a case for the existence of a market system, but one which is not specific enough to be contrasted against other regions on more than a general, somewhat abstract level.
Ceramic Distributions in the Petexbatun Polity of the Classic Maya Lowlands

The twin capitals of Dos Pilas and Aguateca dominated the Petexbatun polity of the Pasión region of the Maya lowlands during the Late Classic (A.D. 650 – 830), including the centers of Seibal, Tamarindito, Arroyo de Piedra, and Punto de Chimino. Foias and Bishop’s analysis of ceramic distributions suggests that political authority was weakly centralized and characterized by a lack of control over the distribution of utilitarian ceramics but direct control over a small percentage of prestige ceramics (2007:216). The Petexbatun region, in general, was bounded and not integrated into larger distribution networks for ceramic vessels, except for a limited, low volume importation of specific pottery types mostly related to elite consumption patterns. The dominant pattern in the Late Classic to emerge from this analysis consists of localized production and consumption at each center with some intraregional exchange within the politically unified region.

This regional analysis began with the Type-Variety system classification of 547 sherds/vessels and proceeded to a detailed modal analysis combined with compositional analysis (INAA) of the same pottery collections. Examples of the most common monochrome and polychrome pieces were submitted for INAA in order to construct control groups of locally manufactured pottery in accord with the “criterion of abundance” (see Bishop, Rands, and Holley 1982) (Foias and Bishop 2007:216). This procedure isolated compositional reference groups for local production at each center. Even the core reference group of pottery from Punto de Chimino was compositionally distinct from the core reference group of pottery from Aguateca, only 5 km away! (Foias and Bishop 2007:227). Overall, 83% of the polychromes and 97% of the monochromes submitted appear to have been manufactured within the limits of the center where they were recovered. The sampled sites [Dos Pilas, Aguateca, Tamarindito-Arroyo de Piedra, Quim Chi Hilan, and Punto de Chimino] show general “compositional tendencies” related to geological variation in clay and temper sources indicating localized manufacture around each center (Foias and Bishop 2007:222). Ninety-seven percent of
the ceramic assemblages were produced intraregionally and were not imported from farther off than the immediate Pasión/Petexbatun region (Foias and Bishop 2007:217).

The highly diverse potting clay recipes show that neither polychrome nor monochrome pottery manufacturing was limited to just a few “workshops” or production units/centers (Foias and Bishop 2007:222). The basic sorting premise of the study is that a high degree of standardization equates with large-scale production and fewer production units; a low degree of standardization is equated with more production units each producing at lower volumes of output (re: Benco 1988; Costin 1991; Costin and Hagstrum 1995; Feinman, Blanton, and Kowalewski 1984; Longacre et al. 1988; Rice 1981, 1991; Sinopoli 1988). The coefficient of variation (CV) was calculated for three metric attributes of ceramic vessels that were used as proxies for standardization in the general sense of ascertaining the relative number of distinct production units (cf. Costin 1991). This analysis did not produce a definitive or straight-forward correlation between standardization and production output, just a general trend toward the redundancy of production units for any given ceramic type or form class (Foias and Bishop 2007:218).

The coefficient of variation (CV) was calculated for rim diameter, wall thickness, and ridge/neck height on monochrome vessels and for rim diameter, wall thickness, and overall vessels height on polychrome vessels. Monochrome vessels are represented in common form classes (basins, large bowls, and jars) from common ceramic Types (Tinaja Red, Pantano Impressed, Subin Red, Chaquiste Impressed). Red-slipped jars with restricted necks and red-slipped round-sided bowls produced CV scores for single attributes ranging from 16.8 to 30.4. Polychrome vessels of the Palmar and Zacatal Ceramic Groups represented by tripod plates, cylindrical vases, outcurved bowls/dishes, and round-sided bowl forms produced CV scores ranging from 13.9 to 23.6. Polychrome vessels evidence a relatively greater standardization than monochrome vessels (Foias and Bishop 2007:218). The only standout difference reflected in these CV scores is between the Aguateca and Dos Pilas ceramic assemblages for rim diameter of round-sided polychrome bowls. The CV of 10.8 for Aguateca specimens as opposed to the CV of
24.2 for Dos Pilas specimens may reflect fewer producers for this ware at Aguateca (Foias and Bishop 2007:219). Foias and Bishop (2007) interpret the CV scores (over 10%) to generally indicate large numbers of production units and localized production around each center.

“[S]everal lines of evidence suggest that there was small-scale localized pottery production, possibly at the level of part-time household or workshop industry as defined by Peacock (1981; see also Rice 1985, 1987; Potter and King 1995). Second, we propose that at least some of the polychromes were manufactured by different potters from those who produced the monochromes, following distinct clay-temper and firing techniques that were more labor intensive. Finally, the localized nature of pottery production in the Petexbatun region may make direct elite control over production impossible, as dispersed manufacturing loci would be hard to supervise constantly.” (Foias and Bishop 2007:220)

**General Trends in the Petexbatun Intraregional Pottery Distributions**

Intraregional pottery exchange was fairly common within the Petexbatun; in both monochrome and polychrome pottery. About one fourth of the Aguateca ceramic assemblage was imported from other centers of the Petexbatun region; comparison of the compositional reference core groups from each center suggests that this pottery came mostly from Dos Pilas, with slight amounts also imported from Punto de Chimino. At Dos Pilas, one third of the pottery assemblage was imported from other regional centers, mostly from Aguateca. This is not surprising, given that Aguateca and Dos Pilas were the two politically aligned dominant political centers of the regional polity. Pottery from the Dos Pilas and Aguateca centers was plentiful at Tamarindito-Arroyo de Piedra, although intraregional exchange may be inflated or exaggerated due to the imprecision of the compositional reference groups at their current state of refinement. Nonetheless, the most intensive exchange of pottery was between Dos Pilas and Aguateca, which might be accounted for by the movement of the royal court between these two centers or indicate that pottery entered dominant centers as tribute (Foias and Bishop 2007:229-230).
It is of note that pottery distribution studies rarely contemplate the movement of peoples; typically pottery movements are viewed as commodity exchanges. In light of the known political hierarchy of the Petexbatun region, there is a strong possibility that pottery moved from its point of manufacture along political line, as tribute or attached production belonging to mobile elites. This goes back to the fundamental issue of social organization at Classic Maya centers first proposed by Rands (1967) when discussing his inward/outward looking models. Robert Rands asked whether residents around a center would have been completely sedentary with political allegiance to that one ‘home’ center, or if a higher degree of physical (and social) mobility was more characteristic of Classic Maya inhabitants, with individuals and households moving between centers more opportunistically. In the Petexbatun region, we must contemplate the movement of not just humble householders but also of highly-skilled itinerant artisans of high status, themselves members of the dynastic court. Alternatively, these hypothesized elite artisans might never have been considered members of the dynastic court and have worked on commission within strictly patron-client arrangements.

Isolating Interregional Importation of Prestige Ceramics

The majority of polychrome vessels consumed within the Petexbatun polity were made locally, and most often these were manufactured within the same center as they were consumed. These included tripod plates, hemispherical bowls, and outcurved-sided bowls and dishes mostly decorated with geometric designs. At the same time, an intrusive subset of volcanic ash-tempered polychrome vases painted with elaborate figural scenes and glyphic captions was imported into the region. Also, a distinct subset of finely painted vases were recovered from a number of sites in the Petexbatun, most from Dos Pilas, followed by Arroyo de Piedra and then Tamarindito, and were most likely produced within an undefined zone near the center of Dos Pilas (Foias and Bishop 2007:225-227). Hence, there was at least one production unit within the region manufacturing highly elaborate figural vases concurrent with their importation from
outside the region. Foias and Bishop suspect that highly skilled scribes may have painted pottery as specialists, attached to the dynastic court of Dos Pilas (2007:227).

Alongside the predominantly localized production and fair degree of intraregional exchange of both monochrome and polychrome pottery, small amounts of pottery from two general paste classes was consistently imported from beyond the Petexbatun region at low volumes (Foias and Bishop 2007:230). Chablekal Group fine grey pottery was imported from the western lowland region of the Usumacinta drainage area (Bishop et al. 2004; Foias and Bishop 2005), an exchange dominantly in open-mouthed serving wares – plates, dishes, bowls, beakers, and vases, mainly too small to have served as containers for the transport of other commodities. These vessels enter Dos Pilas, the dominant center of the Petexbatun, and to a lesser extent, Aguateca, the secondary capital of the region; importation seems to follow political supremacy. Only around 1% of the ceramic assemblage of the Petexbatun region is comprised of imported volcanic ash-tempered pottery, and only .2% is Chablekal pottery (Foias and Bishop 2007:230-231).

Comparative compositional analysis utilizing the entire existing Maya ceramic data base suggests that there were at least three probable production loci for the interregional imports to the Petexbatun region.

1. The Tikal-Uaxactun area (mostly to Dos Pilas) in finely painted glyphic serving wares (probably on a sub-elite level and not through the dominant political authority of Tikal ([see Houston 1993; Martin and Grube 2000:42, 56-58])).
2. Motul de San José, the “Ik” zone or west, northwest of Lake Peten Itza (mostly to Dos Pilas and Aguateca)
3. The Greater Usumacinta drainage – in non-polychrome serving vessels, either black or orange slipped and stuccoed, carved, or incised bowls and vases (Mostly to smaller sites in the Petexbatun polity, not the capitals of Dos Pilas or Aguateca as often)
“[T]hese pottery imports were prestige items probably exchanged through gift presentation and/or feasting among Maya elites as a way to form and confirm social and political alliances (Ball 1993; McAnany 1995; Reents-Budet, Bishop, and MacLeod 1994; Reents-Budet 2000; Foias 2002). . . overall, the level of interregional pottery exchange is miniscule, and it should be understood in a political, rather than economic, context.” (Foias and Bishop 2007:231)

Foias and Bishop emphasize that numerous possibilities existed for the control over raw materials by elites but note that clay and calcite for temper were basically ubiquitous and not easily controlled through direct measures (2007:220). Suggesting limited direct economic intervention by elites, these authors characterize the pottery production/distribution system as dominantly household or workshop production of utilitarian ceramics distributed through decentralized mechanisms concurrently with a small exchange sphere in imported prestige ceramics directly controlled by elites.

**Circulation of Pottery in the Aztec Empire**

There is a deficiency of data from documentary sources concerning the production and circulation of utilitarian goods within the Aztec empire (Hodge and Minc 1990:415). Tribute in ceramics is mentioned in the ethnohistoric documents (Scholes and Adams 1957) but Black-on-Orange ceramics are not specifically mentioned. Fine craft items, clothing, and other utilitarian and wealth items were manufactured and distributed in marketplaces within urban centers, such as Tenochtitlan, Texcoco or other large centers within the Aztec empire (Brumfiel 1987:110-111; Hodge et al. 1993:133). Black-on-Orange ceramics are not an elite item and are characterized by unrestricted distribution patterns, recovered from small hamlets to large urban centers and were evidently used as domestic wares. Black-on-Orange ceramics are an easily recognized ceramic type and were very uniform in appearance during the Late Aztec period (Hodge et al. 1993:134, 137).
Given the widespread documentation of marketplace-exchange and the reputation as a commercially-based society commonly ascribed to the Aztecs, the marketplace-exchange of these ceramics was likely and anticipated (Hodge et al. 1992). In the early colonial period documents, six centers are specified as pottery production loci: Cuauhtitlan, Azcapotzalco, Tenochtitlan-Tlatelolco, Huitzilopochco, Xochimilco, and Texcoco. Unfortunately these accounts are not detailed or specific enough to correlate any of these centers with any specific pottery Types produced (Hodge et al. 1993:133).

In order to evaluate the distribution system (i.e., market system) of the Aztec Empire, Hodges and Minc (1990) looked at data on ceramic distributions from the Texcoco, Ixtapalapa, and Chalco Survey Regions of the eastern portion of the Valley of Mexico collected by the Valley of Mexico Survey Projects in the 1970s (Blanton 1972; Parsons 1971; Parsons, Brumfiel, Parsons, and Wilson 1982; Sanders et al. 1979).

Ceramic wares and types collected from the eastern portion of the valley within the surveyed zones (1280 km² area) were first tabulated and grouped into geographic ranges. The ceramic counts were transcribed from the data collection sheets from these surveys kept on file at the University of Michigan Museum of Anthropology (Hodge and Minc 1990:419). Documentary sources indicate that these geographic ranges conformed to political units in Late Aztec times. Ethnohistoric documentation indicates that about forty autonomous city-states, or altepetl, existed in the entire Basin of Mexico in Early Aztec times. Archaeological sites in the eastern portion of the surveyed area analyzed in this study range from small hamlets to large urban centers (N=130). Ethnohistoric documents indicate that these were grouped into twelve city-states (altepetl) with their dependencies (Hodge and Minc 1990).

The percentages of ceramic wares and types recovered from each geographic area were used to gauge the intensity of economic interaction. The intensity of interaction between the geographic areas was then interpreted as an indication of the degree of market integration, as marketplace-exchange is well attested in the documentary sources (Hodge and Minc 1990:415). The degree of economic symbiosis among city-states and
the degree of centralization of the Aztec market system are still questioned and debated (i.e., Berdan 1982, 1983, 1985; Brumfiel 1980, 1986; Chapman 1959; Hodge and Minc 1990; Hodge et al. 1993; Hicks 1994; Isaac 1986b). While a centralized imperial tribute system was set up, documentary sources do not help to discern the degree of centralization of the exchange economy. In fact, utilitarian craft production and distribution receive but the scantiest treatment in documentary sources, in contrast to extensive descriptions of elite luxury crafts. This situation has led to considerable speculation about the workings of the Aztec economy. The decentralized perspective holds that markets were held in a variety of centers, not just the politically dominant largest ones. The centralist position holds that exchange became increasingly more centralized at the core market area around the capital of Tenochtitlan. Production of elite craft items was concentrated in the Aztec core although specific tribute obligations for warrior costumes and other sumptuary crafts was also in the hands of tributary centers around the Basin of Mexico. The production and distribution systems of more mundane utilitarian craft items are largely unknown. Potters may have located in proximity to superior clay sources (Sanders et al. 1979:402) and the transportation costs involved in distributing heavy, bulky pots may also have promoted decentralized production and exchange (Sanders and Webster 1988:542).

In sum, two competing models suggest that either previously autonomous city-states maintained their existing internal production and distribution systems after incorporation into the Aztec political sphere, or that newly incorporated centers shifted their focus away from craft production and toward agricultural intensification (Charlton et al. 2007:239). Presumably, agricultural products were destined for imperial tribute payment as well as exchange in the largest centralized markets in reaction to increasing specialized production in the Aztec capital. Based on archaeological excavations at smaller tributary centers outside the Aztec core, Brumfiel (1980; 1986) has argued that these subservient centers increased agricultural production and decreased craft production. She attributes this phenomenon to state direction and an increased
centralization of exchange at the largest markets of the largest centers in the imperial core (i.e., Tlatelolco, Tenochtitlan, Texcoco).

Aztec pottery has been identified and grouped by common characteristics. No ceramic production areas are known, only the distributions of specific ceramic wares and types (Hodge and Minc 1990:423).

“Aztec wares have been distinguished on the basis of general uniformity of paste and modal surface color and finish (Parsons 1966). Aztec ceramic types within each ware have been distinguished on the basis of basic decorative traditions, including the presence and type of paint, incising, and specific motifs.” (Hodge and Minc 1990:419)

“In most cases, Aztec ceramic types have been further combined with vessel forms (bowls, basins, dishes, plates, molcajetes [grater bowls], and copas [goblets]) to create a single type-shape unit. Variants have then been distinguished within each type-shape class unit on the basis of specific decorative patterns such as consistencies in the choice and execution of design motifs (see Noguera 1930; Franco and Peterson 1957; Parsons 1966). Vessel shapes and design variants [were] not analyzed in this study, because all surveys of the study area did not record these ceramic attributes in a comparable way.” (Hodge and Minc 1990: Footnote 4)

I will note that the term “ware,” as Hodge and Minc employ it here, equates to a ceramic group as it is commonly used in the Type-Variety system as applied to the Classic Maya lowlands. Hodge and Minc determined distribution patterns for six Early Aztec period ceramic types and eight Late Aztec period ceramic types. The greatest influence on the statistics indicating greater or lesser homogeneity of ceramic assemblages was the widespread occurrence of Tenochtitlan Black-on-Orange (also called Aztec Black-on-Orange) in all assemblages analyzed (Hodge and Minc 1990:425). The widespread distribution of this ceramic type had previously been ascribed to the greater political centralization of the Aztec state and a regional exchange economy centered on the Capital of Tenochtitlan (Sanders et al. 1979; Tolstoy 1958; Vaillant 1938 cited in Hodge and Minc 1990:425; cf Inka Imperial Ware, D’Altroy and Bishop 1990).
The intensity of pottery exchange was calculated separately for Early Aztec and Late Aztec periods using the Brainerd-Robinson coefficient (Robinson 1951). This statistic generates a score from 0 to 200; higher scores indicate higher degrees of economic interaction between centers and lower scores reflect lesser degrees of economic interaction (Hodge and Minc 1990:423). Brainerd-Robinson coefficients generated between ceramic collections from different centers ranged from 20 to 187 for Early Aztec period collections and from 90 to 190 for Late Aztec period collections. The expectations were that the Early Aztec period would be characterized by less centralized political control correlating with less centralized exchange; the pattern would support a model of more localized exchange rather than more widespread regional exchange. The Late Aztec period would be characterized by a more centralized regional organization and a concomitant greater intensity of exchange (Hodge and Minc 1990:424).

For the Early Aztec period, the analysis demonstrated that “communities interacted more with their nearest neighbors and [the pattern] is consistent with the expectation that exchange was organized through local rather than regional networks” (Hodges and Minc 1990:424). The analysis also demonstrated a distinct break between the two dominant confederacies of the north and south ends of the western survey zone during the Early Aztec period. In the Late Aztec period, economic interactions were not strongly correlated with distance and an overall greater homogeneity of assemblages existed. This indicates that “factors other than geographic proximity influenced exchange in the Late Aztec period,” and an overall greater intensity of exchange among all polities in the Late Aztec period consistent with the expectation of a greater centralization of the exchange economy following political integration by the Triple Alliance (Hodge and Minc 1990:424-425).
**Specific Interpretations of the Aztec Ceramic Study**

For the Early Aztec period, ethnohistoric sources document two regional political confederations of aligned city-states in the study region of the eastern portion of the Basin of Mexico:

1. The Chalco League (south) consisting of Chalco, Tenango, Tlalmanalco, and Amecameca
2. The Acolhua League (north) consisting of Tepetlaoztoc, Chiautla, Texcoco, Huexotla, and Coatlinchan

Between these two Leagues three city-states, Chimalhuacan, Coatepec, and Ixtapaluca, were allied with the Chalco League in Early Aztec times and with the Acolhua League in Late Aztec times. Both Leagues were incorporated wholesale into the Aztec Empire in Late Aztec times (Hodges and Minc 1990:420).

At the ceramic type level of analysis, the distributions of the two types of Early Aztec period Black-on-Orange pottery (Culhuacan and Tenayuca) conform to expectations for separate production and distribution networks within two different economic (and political) systems – the confederacies, north and south. Culhuacan Black-on-Orange pottery was restricted to the northern half of the survey zone controlled by the Acolhua League while Tenayuca Back-on-Orange pottery was concentrated in the south (Chalco League) and characterized by decreasing percentages across the political border into Acolhua territory. This pattern is consistent with separate but overlapping production and distribution systems (Hodges and Minc 1990:428).

Red Ware pottery exhibited a distribution similar to that of Tenayuca Black-on-Orange pottery, with Black-On-Red and Black-and-White-on-Red types concentrated in the northern portion of the survey zone with decreasing proportions recovered from the southern portion of the survey zone. The Black-on-Red Incised type was mostly restricted to the southern portion of the survey zone of the Chalco League. Black-on-Red
Incised types make up 90-100% of the ceramic assemblages recovered from Ixtapaluca, on the border between the two confederacies, and this is the likely home of production for this specific ceramic type, circulating mostly to the south with small amounts trickling into the northern centers (Hodges and Minc 1990: Figure 8).

The Early Aztec period distribution patterns indicate that two sub-regional systems of greater economic interaction were separated by a political border inhibiting exchange between the two systems (Hodge and Minc 1990:430). In Late Aztec times, the analysis revealed a much more homogenous distribution of both Orange and Red Wares. In spite of the apparently more widespread distribution of these wares, a highly restricted distribution pattern for Chalco-Choluca Polychromes also emerged. In the Late Aztec period these polychrome vessels are confined just to the Ixtapaluca polity, whereas this type had been more widely circulated through the northern territory or Chalco polities in the Early Aztec period (Hodge and Minc 1990:430).

Hodge and Minc (1990:431) reconstructed the following distribution systems for the Late Aztec period:

1. An area-wide system, within which the percentages of Orange Ware show no linear decline with distance.
2. A southern system, in which Red Ware predominates.
3. A minor system responsible for the distribution of Chalco-Choluca Polychrome, which appears concentrated in the polity of Ixtapaluca.

Conclusions from the Aztec Ceramic Analysis

The Early Aztec period was characterized by overlapping exchange systems with a steady decline as a function of distance from the area of greatest concentration of recovered specimens and assumed to be the production area based on the criterion of
abundance (Hodge and Minc 1990:432). At the type level of analysis, two sub-regional production/distribution systems were apparent.

“This…is consistent with a model of regionally non-centralized market exchange (i.e., a series of localized markets with overlapping service areas) unaffected by individual city-state boundaries.” (Hodges and Minc 1990:432).

In the Late Aztec period a region-wide distribution system existed for the entire zone throughout which Tenochtitlan Black-on-Orange and Black-on-Red ceramics circulated. A more localized system continued to circulate Black-and-White-on-Red ceramics, though this subsystem was less efficient and less widespread. The sharply decreasing percentages of this ceramic type suggest that it was “exchanged directly from a Chalco-Ixtepaluca center of production and did not enter into the larger valley-wide system” (Hodges and Minc 1990:433). The distribution pattern for Black-and-White-on-Red ceramics in the Late Aztec period and the more restricted yet similar pattern for Chalco-Choluca Polychromes during the Early Aztec period suggest that a sub-regional exchange system persisted in the southern polities even after incorporation into the Aztec Empire in Late Aztec times. Even so, this was a minor subsystem and the general findings of the study suggest that Late Aztec times were characterized by greater integration and more widespread exchange.

“Overall, the spatial distributions of Late Aztec ceramics indicate more intensive exchange among all polities, and the presence of a region-wide, centralized exchange system through which several ceramic types apparently moved.” (Hodges and Minc 1990:433).

**Critique of the Aztec Ceramic Distribution Study**

This study was conducted at the ceramic type level of analysis and even specific varieties were not considered, even though distinct decoration programs were known to characterize various ceramics and suspected to relate to different production units or communities (Hodge 1990). The large regional approach does provide a synopsis of
broad trends, but it is assumed that ceramic types equate with the products of specific production units or manufactories. The sub-regional distribution patterns indicate that more localized exchange was responsible for some documented patterns, but that Late Aztec times were characterized by a greater centralization of the market system. Political unification probably permitted, facilitated, and accelerated exchange over previously restricted borders, but it is unknown how many production units produced each ceramic ware or type – it is assumed that specialized community or large workshop/manufactory production did. Hodge and Minc (1990) have shown that an independent, localized sub-regional system persisted even after unification of the Basin under the Triple alliance. It is also probable that cultural or ethnic affiliations were largely responsible for the ceramic type categories upon which the analysis depends.

**A Revised Perspective of Aztec Ceramic Distribution Study Based on Compositional Analysis**

The type level analysis of ceramic distributions conducted by Hodge and Minc (1990) did not discriminate the products of individual ceramic production centers. After compositional analysis (INAA) their conclusion of greater centralization of the Late Aztec economy was seriously compromised.

“The visual similarity among Late Aztec Black-on-Orange vessels might be assumed to result from widespread exchange of the vessels from a central point, but our results indicate instead that this similarity represents a regional ceramic style and not centralized production and distribution of these ceramics.” (Hodge et al. 1993:152)

The primary reason for recanting their previous conclusion that Late Aztec Black-on-Orange ceramics were circulated through a centralized market system is the revelation that the uniform or ‘standardized’ appearance of these vessels does not indicate centralized production at one or a few major centers. Instead, it appears that a more complex production system with a greater redundancy of production units produced very
similar looking pottery in accord with a standardized mental template of what the pottery should look like.

“Compositional analyses have permitted us to dismiss the possibility that the uniform appearance of Late Aztec Black-on-Orange vessels results from their being produced in and distributed from a single area. This study has identified three production zones for Late Aztec Black-on-Orange ceramics in the eastern and southern Basin of Mexico and indicates that in other parts of the basin more will be defined by future studies.” (Hodge et al. 1993:150)

To investigate the production and circulation of this pottery further, 85 Late Aztec Tenochtitlan Black-on-Orange specimens were subjected to INAA (Hodge et al. 1993) in order to discriminate different production areas for the type. Sherds were recovered from 25 sites in the Texcoco, Ixtalapalapa, Chalco, and Xochimilco survey regions of the eastern and southern portions of the Basin of Mexico. It was also believed that compositional groups representing production areas could be associated with specific design motifs on the decorated specimens, as it had previously been demonstrated that motifs do cluster in geographic areas (Hodge 1990) which suggested multiple areas of production. Another 65 Early Aztec ceramic specimens were also analyzed to evaluate continuity of paste recipes and evaluate whether or not Late Aztec ceramic production zones varied from Early Aztec ones. A typical process of group formation and refinement followed INAA (see Hodge et al. 1993:138-147 for details).

Comparing the composition of sherds confirmed continuity in the use of clay sources from Early Aztec into Late Aztec periods; potting communities continued exploiting the same clay resources uninterrupted (Hodge et al. 1993:141). Based on the criterion of abundance, three compositional reference groups formed were formed and refined: Texcoco, Ixtapalapa, and Chalco.

“Since the Texcoco and Ixtapalapa Peninsula groups have the same compositional profiles as Early Aztec sherds found primarily at sites in these areas, we conclude that both the area around Texcoco and the western part of the Ixtapalapa peninsula continued as ceramic production areas in the Late Aztec period.” (Hodge et al. 1993:149)
The compositional profile of a clay sample provided by modern potters of Texcoco fell squarely within the refined compositional reference group of Aztec period sherds and indicates the pre-Columbian manufacture of Aztec period Black-on-Orange pottery there (Hodge et al. 1993:145, Figure 7). These findings also confirm the ethnohistoric documentation of Texcoco as a pottery production center. Texcoco was a large and urban center during Aztec times and a member of the Triple alliance so it is reasonable to assume that pottery production was centrally located here for local consumption and perhaps export as well.

After formulation of the Texcoco, Ixtapalapa, and Chalco compositional reference groups, six specimens still could not be assigned membership within one of these core groups and may indicate the presence of other production areas. One of these specimens from El Risco, near Tenochtitlan, was highly similar in composition to seventeen specimens of Black-on-Orange pottery recovered archaeologically from sites near Tenochtitlan (Hodge et al. 1992); these have been grouped as an additional provisional compositional group representing a fourth probable production center (Hodge et al. 1993:145). These researchers were surprised at the low number of analyzed sherds with non-local compositional signatures from the study area.

“Based on the documentary reports of widespread exchange, more interregional exchange was expected.” (Hodge et al. 1993:151)

Some sherds were found outside their “home” production zone, an indication of exchange, and some crossover occurred among all three groups, supporting the market model, just not a centralized market model. Unfortunately the small sample size precluded the calculation of import-to-export ratios (Hodge et al. 1993:150-151).

Charlton et al. (2007) have reported a similar pattern for the center of Otumba in the Teotihuacán Valley. INAA of ceramic sherds indicates that Early Aztec Red Ware and Black-on-Orange Ware were primarily produced and distributed locally throughout the Otumba polity although a few products from foreign clay sources were identified as
well (Charlton et al. 2007:259). The ceramic distribution patterns for the Late Aztec period were not appreciably different and were still characterized by a predominantly local production and exchange pattern for Late Aztec Red Ware, although small quantities of ceramics recovered from excavations at Otumba are congruent with other city-states’ dominant compositional reference group, indicating some exchange. Noting that there is a greater mix of compositional reference groups for Late Aztec Black-on-Orange pottery in the Teotihuacán Valley, Charlton et al. (2007) suspect that Otumba’s incorporation into the Aztec empire resulted in some overlap of exchange networks. However, this economic incorporation was not complete, Red Ware production and distribution were still predominantly locally focused while Black-on-Orange pottery was imported through the alleged Basin-wide market-system (Charlton et al. 2007:260-265).

While at least three distinct compositional reference groups were defined for the eastern basin survey region, indicating at least three separate production areas for the same type of ceramic, some sherds remained unassigned. Chalco, the smallest of the compositional reference groups, may be subdivisible and thus represent diversity in the manufacture of Black-on-Orange pottery within that group. Chalco is not mentioned as a pottery production center in the documents (Hodge et al. 1993:145,150).

“Since the Chalco area produced Early Aztec Polychrome and distinctive Early Aztec Orange wares that also fall into the Chalco compositional group, it appears that the Late Aztec Black-on-Orange sherds in the Chalco group were produced by existing workshops that began to make ceramics imitating typical vessels produced in the north…The Chalco-area sites’ relative lack of Late Aztec Black-on-Orange ceramics indicates also that they did not participate intensively in the ceramic exchange system of the northern and central basin (Hodge and Minc 1990:Figure 9).” (Hodge et al. 1993:150)

This is an updated interpretation of the figure from the 1990 article, when it was based solely on a type level analysis and it was concluded that Black-on-Orange ceramics were distributed through a single imperial economic exchange network. This work with Aztec ceramics demonstrates how the application of INAA facilitates the discrimination of different production units and produces a clearer picture of pottery circulation patterns.
In the absence of more precise provenience information, the analyst is forced to formulate a reconstruction of ceramic distributions from gross categories that do not accurately reflect production loci. The true value of these combined studies is the realization that finer distinctions are possible, and that a refined analysis utilizing the most up to date provenience techniques will certainly augment or even contradict previous analyses conducted without the benefit these. Archaeology is based in refinement and archaeologists argue for the most parsimonious reconstructions based on available data. It is promising to see the level of precision possible through the application of INAA.

8.4 – Concluding Remarks to Chapter 8

The introduction to this chapter made a theoretic distinction between the archaeologically recovered distribution patterns of artifacts and the different social mechanisms or institutional arrangements which once structured exchanges. Specific ceramic production loci (i.e., workshops) are rarely encountered in Mesoamerica and the organization of pottery production is largely inferred from pottery distributions. The technical and stylistic variability in the production of various ceramic types or wares are assumed to reflect different production groups. Archaeologists rely on ceramic variability to infer patterns of economic organization (Pool 1992:306), including deciphering distribution patterns to suggest the social and economic mechanisms responsible for them. Reciprocity, redistribution, and market exchange are not mutually exclusive principles and a mix of transactional modes should be assumed for any given ancient society. The archaeological record represents a compressed picture comprising the totality of exchanges enacted along different transactional principles. In multicentric economies, the distribution of goods transacted through different modes of transference confounds the simple interpretation of artifact distributions.

Consumer demand can stimulate the number and forms of pots produced or even their standardized size or individual attributes, especially when merchants or middle traders are involved. Pottery production is a plastic medium and potters can adapt to new
consumer conditions quickly. Traditional pottery does have finite distribution limits and traditional potters and merchants take solace in knowing that a conservative assemblage of pottery will sell. Household level pottery production for exchange can link communities characterized by varied specialized production capacities and vertical or horizontal interdependence. The agricultural cycle sets the rhythm of pottery production in agrarian societies. Vessels produced during the dry season are often stockpiled and later bartered or sold during the wet season. Potters will also provide specific orders for vessels requested in advance.

The marginalized peasant model interprets pottery production as a means to buffer against marginal agricultural returns. Potting may also represent a strictly economic opportunity for profit or a way of augmenting the household’s productive capacity. In agrarian societies, pots are often bartered for foodstuffs, including the practice of exchanging the pot for the volume of the vessel in grain. Traditional potters are often female and balance household production with domestic work. Without kilns or dedicated workshops, traditional potters procure clay and temper locally and open-fire pots that enter regional distribution networks connecting areas of differential production. In the Andes, vessels from the highlands are traded for lowland products while lowland vessels are traded for highland crops; each half of the system produces a different set of vessels reflecting their respective culinary traditions. Nonetheless, through this form of vertical community specialization, pots are circulated widely and intermixed in both highland and lowland regions.

Kalinga women travel to other communities in the Pasil region to directly barter ceramic vessels. Networks of kinship relations developed over time involve members of other communities and structure the network of exchange for vessels. Distribution spheres have widened with the advent of transportation improvements and the cash economy. Kalinga women will travel to more distant settlements in the months before the seasonal rice harvest, when prices are at their highest. Increased access to a wider consumer market through middle traders can influence the organization and scale of
production. In the Guatemalan system of the 1970s, numerous middle agents connected a wide exchange network connecting small rural villagers to the international hub in Guatemala City, where the profit motive and impersonal exchange characterize this urban market setting.

Still, all traditional pottery systems discussed were grounded in the basic agricultural lifestyle and the influence of traditional cooking and water storage habits. Conservative assemblages have a guaranteed market, mostly as replacement vessels for a range of domestic functions including dry storage, water storage, and cooking. Traditional agrarian household requirements and a healthy respect for costumbre act to keep ceramic assemblages conservative in terms of variety of forms. Social agreements, such as encargas ordered to coincide with community (cofradía) or family celebrations may be transacted outside the marketplace and largely outside the market principle. Middle traders may also make more strictly economic pre-orders for ceramics to be picked up at the potter’s home. Although more truncated distribution spheres characterized the past, walking itinerant merchants still linked various settlements into complex market systems.

The long archaeological sequence documenting complex society in the Valley of Oaxaca is generally interpreted within a market system model. This economic model is consistently contrasted against a redistributive model. The waxing and waning of centralized control from Formative to Classic times is interpreted in terms of the degree of centralization of economic activities. While specialized production at the community level is well documented within the valley, the exchange of the products of these communities has not been demonstrated to consistently encompass valley-wide distributions. Given the unrestricted nature of clay deposits in the region it is likely that multiple production units made pottery in accepted regional styles from locally available resources. Research suggests that Crema ceramics were made at and then distributed from Monte Alban in Late Classic times. INAA of sherds from various valley sites indicate multi-directional trade among centers within the Valley and suggests that marketplace exchange was likely. It is unknown to what degree residents of the Valley of
Oaxaca relied upon market exchange in their daily lives. The peripheral location of suspected open marketplaces suggests that markets may have been peripheral institutions, and that most transactions in the marketplace were supplementary to household self-provisioning. It has yet to be demonstrated that the majority of valley residents made the majority of their living from market transactions.

Foias and Bishop’s (2007) regional analysis of Petexbatun ceramic distributions during the Late Classic period (A.D. 600 – 830) suggests that weakly centralized political authorities had direct control over a small percentage of prestige ceramics with little or no involvement in the production or distribution of utilitarian ceramics. Except for a limited, low-volume importation of Late Classic polychromes related to elite consumption patterns, localized production and consumption around each individual center was also augmented by some intraregional exchange of pottery among politically aligned centers. The highly diverse potting clay recipes suggest a redundancy of production units or “workshops” producing similar polychrome and monochrome pottery. High CV values for metric attribute standardization support the interpretation of multiple production units. Metric attribute standardization was slightly higher on polychrome vessels (i.e., lower CV values) of the Palmar and Zacatal Ceramic Groups than other serving wares or utilitarian pottery Types (Foias and Bishop 2007:218).

Foias and Bishop (2007) interpret the CV values (over 10%) to indicate large numbers of production units and localized production around each center. Some vessels likely circulated through political alliance between Dos Pilas and Aguateca. The greater intensity of pottery exchange between these two sites may be accounted for by the movement of the royal court between the centers or tribute influx to both the twin capitals (Foias and Bishop 2007:229-230). The small amount of pottery imported from outside the region relates to three different traditions. Dos Pilas received finely painted glyphic serving wares manufactured in the Tikal-Uaxactun area of the Peten. Dos Pilas and Aguateca received ‘palace school’ polychrome vases from the Motul de San José (“Ik”) zone northwest of Lake Peten Itza. Serving vessels imported from the Greater
Usumacinta drainage was consumed in low volume in a number of centers, not primarily at Dos Pilas or Aguateca. Ceramics imported from other regions make up less than 2% of the overall ceramic assemblage even at the capitals of Dos Pilas and Aguateca.

Marketplace exchange of Tenochtitlan Black-on-Orange (also called Aztec Black-on-Orange) pottery has always been expected during the apex of the mature Aztec regional exchange economy centered on Tenochtitlan. The widespread distribution of this and other ceramic types throughout the eastern portion of the Valley of Mexico in Late Postclassic times were quantified by Hodge and Minc (1990) from ceramic type frequency data recorded during region survey. Hodge and Minc (1990) concluded that in Late Aztec times, Tenochtitlan Black-on-Orange and Black-on-Red ceramics circulated through a region-wide distribution system, while a more localized system continued to circulate Black-and-White-on-Red ceramics less widely.

A subsequent INAA study of pottery from the eastern Basin of Mexico ceramics isolated regional ceramic compositional reference profiles for three groups: Texcoco, Ixtapalapa, and Chalco. This analysis indicated that some exchange among regions occurred. Sherds were found outside their “home” production zone, and some crossover occurred among all three regional groups suggesting some market integration. In general, production was regionally based with the production of “standardized” vessels conforming to cultural norms of shape and design in the hands of different production units in different centers. Unfortunately the small sample size precluded the calculation of import-to-export ratios (Hodge et al. 1993:150-151). INAA of pottery from the secondary Aztec period center of Otumba in the Teotihuacán Valley indicate that Early Aztec Red ware and Black-on-Orange ware were primarily produced and distributed locally throughout the Otumba polity but that the center increasingly received imported Black-on-Orange vessels from other regional clay sources in Late Aztec times as the center was brought into the centralized distribution sphere (Charlton et al. 2007).
The archaeological investigation of distribution systems requires accurate provenience data. Instrumental Neutron Activation Analysis has been the most sensitive technique available to distinguish compositional signatures in groups of pottery that can be directly correlated with production units. In the last example, the widespread distribution of Aztec Black-on-Orange pottery, once thought to have been produced and distributed from Tenochtitlan, reflects the production of regional centers specializing in the production of this ceramic type, not centralized distribution through market exchange or redistribution. Rather, regional production centers provided the bulk of pottery consumed in the region while some imported pots from other regions were occasionally imported as well, possibly through interrelated marketplaces.
Chapter 9– Analysis of the PST Project Data

9.1 – Introduction

The PST Project began in 2003 by relocating the northern earthwork initially reported by Puleston and Callendar (1967). We followed and transit mapped the northern earthwork and associated settlement for a linear distance of 13.6 km. The slightly winding northern earthwork covers a straight-line distance of about 11.7 km. During our first season we also followed the bifurcation at the western end of the northern earthwork as it turns and continues in a southwest direction. We mapped 39 groups comprised of 159 structures within our corridor extending 125 m to either side of the northern earthwork, (Webster et al. 2004) (Table 9.1.1). In 2005 we began trenching across the earthwork path and test-pitting at residential groups throughout the northern earthwork corridor. Additional blocks of settlement were mapped to the west, north, and southeast in our second and third seasons. The west and north survey blocks are over 4 km from the central 16 km² Tikal map, and the southeast survey block is over 8 km from the North Acropolis. In 2006 we returned to continue trenching excavations through segments of the western and eastern earthworks and to test-pit residential groups in the west and southeast survey blocks. The latter block encompasses the minor center of Ramonal/Chalpate (Figure 9.1.1), where we excavated eleven test-pits bringing our total number of test-pits from the northern, western, and southeastern survey areas to sixty. At project’s end, 38 trenches (18 operations) had been excavated through various segments of the northern, western, and eastern earthworks (see Webster et al. 2007) (Table 9.1.2 and Figures 9.1.2a and 9.12b).

Ceramic Assemblages

Ceramic sherds are the most common and numerous artifacts recovered from our excavations in 2005-2006. The PST project collected stratigraphic lots of sherds from
Figure 9.1.1 – Map of the southeast survey block including the minor center of Ramonal/Chalpate (+ signs mark augered soil tests).
Table 9.1.1 – Groups mapped within the northern earthwork corridor by the PST Project.

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totals = 39 groups 163 45
Figure 9.1.2a – Map of Tikal with 2006 PST Project excavations.
Figure 9.1.2b – Detailed map of all PST Project excavation along the northern earthwork corridor.
Table 9.1.2 – All PST Project excavations 2005-2006.

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<td>test-pit</td>
<td>2006</td>
</tr>
<tr>
<td>34</td>
<td>1</td>
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<td>test-pit</td>
<td>2006</td>
</tr>
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<td>35</td>
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</tr>
<tr>
<td>36</td>
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<td>2006</td>
</tr>
<tr>
<td>37</td>
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<td>2006</td>
</tr>
<tr>
<td>38</td>
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</tr>
<tr>
<td>39</td>
<td>1</td>
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<td>2006</td>
</tr>
<tr>
<td>40</td>
<td>1</td>
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<td>2006</td>
</tr>
<tr>
<td>41</td>
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<td>2006</td>
</tr>
<tr>
<td>42</td>
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<td></td>
<td>test-pit</td>
<td>2006</td>
</tr>
<tr>
<td>101</td>
<td>1</td>
<td>1</td>
<td>trench</td>
<td>2006</td>
</tr>
<tr>
<td>102</td>
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<td>trench</td>
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</tr>
<tr>
<td>104</td>
<td>1</td>
<td>1</td>
<td>trench</td>
<td>2006</td>
</tr>
<tr>
<td>105</td>
<td>1</td>
<td>1</td>
<td>trench</td>
<td>2006</td>
</tr>
<tr>
<td>111</td>
<td>2</td>
<td></td>
<td>test-pit</td>
<td>2006</td>
</tr>
<tr>
<td>112</td>
<td>2</td>
<td></td>
<td>test-pit</td>
<td>2006</td>
</tr>
<tr>
<td>113</td>
<td>2</td>
<td></td>
<td>test-pit</td>
<td>2006</td>
</tr>
<tr>
<td>114</td>
<td>4</td>
<td></td>
<td>test-pit</td>
<td>2006</td>
</tr>
<tr>
<td>115</td>
<td>1</td>
<td></td>
<td>test-pit</td>
<td>2006</td>
</tr>
<tr>
<td>201</td>
<td>3</td>
<td>3</td>
<td>trench</td>
<td>2006</td>
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<tr>
<td>202</td>
<td>4</td>
<td>4</td>
<td>trench</td>
<td>2006</td>
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<tr>
<td>211</td>
<td>2</td>
<td></td>
<td>test-pit</td>
<td>2006</td>
</tr>
<tr>
<td>211</td>
<td>3</td>
<td></td>
<td>test-pit</td>
<td>2006</td>
</tr>
<tr>
<td>301</td>
<td>5</td>
<td>5</td>
<td>trench</td>
<td>2006</td>
</tr>
</tbody>
</table>
thirty-seven of the sixty test-pits associated with peripheral settlement, and occasionally a few sherds from larger excavations focused on the earthwork. Test-pits were 2 x 2 m or smaller (Figures 9.1.3 – 9.1.22, Table 9.1.3), trenches were cut perpendicular to the earthwork and were up to 22 m in length. With the exception of two trenches (7.1 & 9.1) (Figures 9.1.23 and 9.1.24) abutting residential units along the northern earthwork, the excavations through the ditch and embankment typically produced no more than a few worn and unrecognizable sherds. Large lots from middens associated with peripheral households were cataloged for percentages of different shape classes of pottery. A total of 9212 ceramic sherds (268.64 kg) was recovered, washed and analyzed. Specific types and varieties were recorded, and a representative subset of 162 sherds and all eight ceramic figurine fragments was sampled for Instrumental Neutron Activation Analysis. The 170 ceramic paste samples, stored in small glass vials, were delivered to the Smithsonian Center for Materials Research and Education (SCMRE) where they were subjected to Instrumental Neutron Activation Analysis (INAA) at the National Institute of Standards and Technology (NIST) reactor by Dr. Ronald Bishop.

Dateable pottery from within the construction core of the earthwork segments was rare and three deposits are discussed below. The majority of the ceramic collection was recovered from test-pits placed off the backs of low structure or plaza platforms or in the center of the plaza at each residential group. Most of the ceramic assemblages recovered from off-plaza testing relate to the final occupation phase of the group (Tables 9.1.4 and 9.1.5). One notable exception is a deep stratified midden at Group 1 (Op. 7.3) (Figure 9.1.25), directly behind a low structure platform on the east side of the group, which produced a 1.7 m sequence from Imix back through Early Manik times, ca. A.D. 300 – 800. Sizeable Preclassic and Early Classic stratigraphic deposits were never identified elsewhere in the survey zone, although isolated sherds were recovered in mixed lots or orphaned.
Figure 9.1.3 - Illustration conventions for the earthwork segments and excavation profiles.

**Earthwork segments**

- Lip of the ditch
- Bottom of the ditch
- Top of the embankment
- Rear limit of the embankment

**Excavation profile**

- Limit of excavation
- Ground surface
- Small pebble and limestone chips
- Unmodified limestones
- Distinct limit of humus/subhumus layer
- Construction blocks
- Bedrock
Figure 9.1.4 - Plan map of Groups 11A and 11B with locations of test-pit excavations.
Figure 9.1.5 - Excavation profiles from Group 11A (Operation 13).

Op. 13.1, east profile
Op. 13.1, south profile
Op. 13.1, plan view facing west, detail of platform.

Op. 13.2, plan view facing west, edge of platform.
Figure 9.1.6 - Excavation profiles from Group 11B (Operation 15).

Op. 15.1, cast profile.

Op. 15.1, south profile.

Op. 15.1, plan view showing location of unexcavated chultun.
Figure 9.1.7 - Plan map of Groups 21 and 21A with locations of test-pit excavations.
Figure 9.1.8 - Excavation profiles from Group 21 (Operation 21.1).


Op. 21.1, west profile.
Figure 9.1.9 - Plan map of Group 45 with locations of test-pit excavations.
Figure 9.1.10 - Excavation profiles from Group 45 (Operation 37.1).

Op. 37.1, west profile.

Op. 37.1, north profile.

Op. 37.1, plan view, facing east, detail of edge of platform.
Figure 9.1.11 - Excavation profiles from Group 45 (Operation 37.2).


Figure 9.1.12 - Plan map of Group 46 with location of test-pit excavation.
Figure 9.1.13 - Excavation profiles from Group 46 (Operation 14).


[unexcavated platform]

[excavated to bedrock]

Figure 9.1.14 - Plan map of Group 47 with location of test-pit excavation.
Figure 9.1.15 - Excavation profiles from Group 47 (Operation 16).

Op. 16.1, south profile.

Op. 16.1, west profile.
Figure 9.1.16 - Plan map of Groups 48, 49, and 50 with location of test-pit excavation.
Figure 9.1.17 - Excavation profiles from Group 48 (Operation 40).

Figure 9.1.18 – Test-pits excavated at Ramonal/Chalpate.
Figure 9.1.19 - Excavation profiles from the Ramonal acropolis (Operation 113).

Op. 113.1, east profile.

Op. 113.1, south profile.

Op. 113.2, north profile.

Op. 113.2, cast profile.
Figure 9.1.20 - Excavation profiles from settlement east of Ramonal.

Op. 114.1, east profile.

Op. 114.1, south profile.


Figure 9.1.21 - Excavation profiles and plan drawings from settlement excavations east of Ramonal.

Op. 114.3, plan view, facing east, detail of low stuccoed stone platform.

Op. 114.4, east profile.
Op. 114.4, south profile.
Op. 114.4, plan view, facing north, detail of stone platform corner.
Figure 9.1.22 - Excavation profiles from the 1 x 2 m test-pit into the community midden from Settlement east of Ramonal.

Op. 115.1, north profile.

Op. 115.1, east profile.
Figure 9.1.23 – Plan map of Group 1 with locations of excavations, including the 10 m trench (Op. 7.1) across the projected path of the northern earthwork.
Figure 9.1.24 – Plan map of Group 4 with location of the 14 m trench (Op. 9.1) across the northern earthwork.
Figure 9.1.25 - Excavation profiles from the 2 x 2 m test-pit into a midden at Group 1 (Op. 7.3).
Table 9.1.3 – PST Project excavation lots defined.

<table>
<thead>
<tr>
<th>Group</th>
<th>Op.</th>
<th>Sub-Op.</th>
<th>Lot</th>
<th>Length (m)</th>
<th>Width (m)</th>
<th>Depth (cm)</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>E.W.</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>12</td>
<td>1</td>
<td>150</td>
<td>cleanup of Puleston's Trench &quot;B&quot;</td>
</tr>
<tr>
<td>E.W.</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td>Cruciform</td>
<td>1</td>
<td>250</td>
<td>cleanup of Puleston's cruciform trench at point &quot;B&quot;</td>
</tr>
<tr>
<td>E.W.</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td>3.5</td>
<td>1.8</td>
<td>&lt;100</td>
<td>below humus layer to contact with the 'puente'</td>
</tr>
<tr>
<td>E.W.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>1</td>
<td>1</td>
<td>25</td>
<td>extension to east of 'puente' in south profile cut</td>
</tr>
<tr>
<td>E.W.</td>
<td>1</td>
<td>2</td>
<td>4</td>
<td>1</td>
<td>1</td>
<td>&gt;200</td>
<td>below humus layer to bedrock</td>
</tr>
<tr>
<td>E.W.</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>12</td>
<td>1</td>
<td>250</td>
<td>cleanup of Puleston's Trench &quot;A&quot;</td>
</tr>
<tr>
<td>E.W.</td>
<td>3</td>
<td>1</td>
<td>1</td>
<td>4.5</td>
<td>1</td>
<td>150</td>
<td>1 m extension to the west of (parallel with) Puleston's Trench &quot;B&quot; [Op. 1.2] through embankment</td>
</tr>
<tr>
<td>E.W.</td>
<td>3</td>
<td>1</td>
<td>2</td>
<td>4.5</td>
<td>**</td>
<td>**</td>
<td>dark original topsoil level (ancient A horizon) visible at base of Op. 3.1 extension trench</td>
</tr>
<tr>
<td>E.W.</td>
<td>5</td>
<td>1</td>
<td>1</td>
<td>6</td>
<td>1</td>
<td>0-30</td>
<td>humus/subhumus (tangled web of fine roots over bedrock)</td>
</tr>
<tr>
<td>E.W.</td>
<td>5</td>
<td>1</td>
<td>2</td>
<td>6</td>
<td>1</td>
<td>30-60</td>
<td>grey soil with few limestone chips</td>
</tr>
<tr>
<td>E.W.</td>
<td>5</td>
<td>1</td>
<td>3</td>
<td>6</td>
<td>1</td>
<td>60-118</td>
<td>very compacted fine white sascab-like soil with few inclusions</td>
</tr>
<tr>
<td>G1</td>
<td>7</td>
<td>1</td>
<td>1</td>
<td>10</td>
<td>1</td>
<td>0-30</td>
<td>dark brown [2.5yr 3-4/1] humus/subhumus with &lt;14 cm limestones</td>
</tr>
<tr>
<td>G1</td>
<td>7</td>
<td>1</td>
<td>2</td>
<td>10</td>
<td>1</td>
<td>30-85</td>
<td>grey mixture of fine particulate soil, small limestone chips, and 25-40 cm partially faced or unfaced limestone blocks</td>
</tr>
<tr>
<td>G1</td>
<td>7</td>
<td>1</td>
<td>3</td>
<td>4.5</td>
<td>0.5</td>
<td>0-60</td>
<td>runs from Op. 7.1 trench 4.5 m southwest, following the cut stone face of a construction platform (Op. 7.1 feature #1)</td>
</tr>
<tr>
<td>G1</td>
<td>7</td>
<td>1</td>
<td>4</td>
<td>1</td>
<td>1</td>
<td>0-50</td>
<td>test unit to obtain datable ceramics from Op. 7.1 feature #1, the construction platform</td>
</tr>
</tbody>
</table>
Table 9.1.3 continued – PST Project excavation lots defined.

<table>
<thead>
<tr>
<th>Group</th>
<th>Op.</th>
<th>Sub-Op.</th>
<th>Lot</th>
<th>Length (m)</th>
<th>Width (m)</th>
<th>Depth (cm)</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>G1</td>
<td>7</td>
<td>1</td>
<td>4</td>
<td>1</td>
<td>1</td>
<td>0-50</td>
<td>test unit to obtain datable ceramics from Op. 7.1 feature #1, the construction platform</td>
</tr>
<tr>
<td>G1</td>
<td>7</td>
<td>2</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td>0-20</td>
<td>humus/subhumus</td>
</tr>
<tr>
<td>G1</td>
<td>7</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>20-45</td>
<td>grey powdery soil with few limestone chips</td>
</tr>
<tr>
<td>G1</td>
<td>7</td>
<td>3</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td>surface</td>
<td>surface collection of ceramic and chert artifacts</td>
</tr>
<tr>
<td>G1</td>
<td>7</td>
<td>3</td>
<td>2</td>
<td>2</td>
<td>1</td>
<td>0-20</td>
<td>humus/subhumus</td>
</tr>
<tr>
<td>G1</td>
<td>7</td>
<td>3</td>
<td>3</td>
<td>2</td>
<td>1</td>
<td>20-50</td>
<td>arbitrary lot change</td>
</tr>
<tr>
<td>G1</td>
<td>7</td>
<td>3</td>
<td>4</td>
<td>2</td>
<td>1</td>
<td>50-80</td>
<td>arbitrary lot change</td>
</tr>
<tr>
<td>G1</td>
<td>7</td>
<td>3</td>
<td>5</td>
<td>2</td>
<td>1</td>
<td>80-94</td>
<td>abundant carbonized wood</td>
</tr>
<tr>
<td>G1</td>
<td>7</td>
<td>3</td>
<td>6</td>
<td>2</td>
<td>1</td>
<td>94-110</td>
<td>arbitrary lot change</td>
</tr>
<tr>
<td>G1</td>
<td>7</td>
<td>3</td>
<td>7</td>
<td>2</td>
<td>1</td>
<td>110-117</td>
<td>arbitrary lot change, terminates at bedrock at southern limit</td>
</tr>
<tr>
<td>G1</td>
<td>7</td>
<td>3</td>
<td>8</td>
<td>2</td>
<td>1</td>
<td>117-145</td>
<td>following truncation pit to bedrock at northern limit</td>
</tr>
<tr>
<td>G1</td>
<td>7</td>
<td>3</td>
<td>9</td>
<td>2</td>
<td>1</td>
<td>145-170</td>
<td>following truncation pit to bedrock at northern limit</td>
</tr>
<tr>
<td>G1</td>
<td>7</td>
<td>3</td>
<td>10</td>
<td>2</td>
<td>1</td>
<td>0-20</td>
<td>humus/subhumus</td>
</tr>
<tr>
<td>G1</td>
<td>7</td>
<td>3</td>
<td>11</td>
<td>2</td>
<td>1</td>
<td>five to 20</td>
<td>partial coverage; leveling of excavation</td>
</tr>
<tr>
<td>G1</td>
<td>7</td>
<td>3</td>
<td>12</td>
<td>2</td>
<td>1</td>
<td>20-50</td>
<td>partial coverage; leveling of excavation</td>
</tr>
<tr>
<td>G1</td>
<td>7</td>
<td>3</td>
<td>13</td>
<td>2</td>
<td>1</td>
<td>50-80</td>
<td>arbitrary lot change</td>
</tr>
<tr>
<td>G1</td>
<td>7</td>
<td>3</td>
<td>14</td>
<td>2</td>
<td>1</td>
<td>80-100</td>
<td>around 96 ch depth, a stucco floor is encountered</td>
</tr>
<tr>
<td>G1</td>
<td>7</td>
<td>3</td>
<td>15</td>
<td>2</td>
<td>1</td>
<td>105-117</td>
<td>this lot is sealed by the stucco floor which capped the midden; a log fire was built directly upon the stucco floor</td>
</tr>
<tr>
<td>G4</td>
<td>9</td>
<td>1</td>
<td>1</td>
<td>14</td>
<td>1</td>
<td>0-25</td>
<td>humus/subhumus</td>
</tr>
<tr>
<td>G4</td>
<td>9</td>
<td>1</td>
<td>2</td>
<td>14</td>
<td>1</td>
<td>25-134</td>
<td>fill; mostly fine grey soil with a few limestones and cultural artifacts, down to bedrock</td>
</tr>
</tbody>
</table>
Table 9.1.3 continued – PST Project excavation lots defined.

<table>
<thead>
<tr>
<th>Group</th>
<th>Op.</th>
<th>Sub-Op.</th>
<th>Lot</th>
<th>Length (m)</th>
<th>Width (m)</th>
<th>Depth (cm)</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>G4</td>
<td>9</td>
<td>1</td>
<td>3</td>
<td>approx. 6</td>
<td>1</td>
<td>contact</td>
<td>contact with bedrock</td>
</tr>
<tr>
<td>E.W.</td>
<td>9</td>
<td>2</td>
<td>1</td>
<td>2.5</td>
<td>1.5</td>
<td>0-30</td>
<td>humus/subhumus</td>
</tr>
<tr>
<td>E.W.</td>
<td>9</td>
<td>2</td>
<td>2</td>
<td>2.5</td>
<td>0.75</td>
<td>30-130</td>
<td>grey powdery soil with few limestone chips</td>
</tr>
<tr>
<td>E.W.</td>
<td>9</td>
<td>3</td>
<td>1</td>
<td>3.5</td>
<td>1.5</td>
<td>0-20/30</td>
<td>humus/subhumus</td>
</tr>
<tr>
<td>E.W.</td>
<td>9</td>
<td>3</td>
<td>2</td>
<td>3.5</td>
<td>1.5</td>
<td>20/30-150</td>
<td>grey powdery soil with few limestone chips</td>
</tr>
<tr>
<td>E.W.</td>
<td>9</td>
<td>4</td>
<td>1</td>
<td>2.5</td>
<td>1.5</td>
<td>0-20</td>
<td>humus/subhumus</td>
</tr>
<tr>
<td>E.W.</td>
<td>9</td>
<td>4</td>
<td>2</td>
<td>2.5</td>
<td>1.5</td>
<td>20-180</td>
<td>grey powdery soil with few limestone chips</td>
</tr>
<tr>
<td>E.W.</td>
<td>9</td>
<td>5</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td>0-20</td>
<td>humus</td>
</tr>
<tr>
<td>E.W.</td>
<td>9</td>
<td>5</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>20-180</td>
<td>black earth into clay</td>
</tr>
<tr>
<td>G8</td>
<td>10</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td>0-20</td>
<td>humus/subhumus</td>
</tr>
<tr>
<td>G8</td>
<td>10</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>20-50</td>
<td>grey-brown [2.5yr 4/4] dark sublayer to contact with bedrock</td>
</tr>
<tr>
<td>G8</td>
<td>10</td>
<td>2</td>
<td>1</td>
<td>1.5</td>
<td>1.5</td>
<td>0-30</td>
<td>looter's backdirt</td>
</tr>
<tr>
<td>G8</td>
<td>10</td>
<td>2</td>
<td>2</td>
<td>1.5</td>
<td>1.5</td>
<td>30-50</td>
<td>buried humus/subhumus layer</td>
</tr>
<tr>
<td>G8</td>
<td>10</td>
<td>2</td>
<td>3</td>
<td>1.5</td>
<td>1.5</td>
<td>50-85</td>
<td>grey powdery soil with few limestone chips</td>
</tr>
<tr>
<td>G9</td>
<td>11</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td>0-40</td>
<td>humus/subhumus overlying construction platform</td>
</tr>
<tr>
<td>aguada</td>
<td>12</td>
<td>1</td>
<td>1</td>
<td>12</td>
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Table 9.1.3 continued – PST Project excavation lots defined.

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Table 9.1.3 continued – PST Project excavation lots defined.

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Table 9.1.3 continued – PST Project excavation lots defined.

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Table 9.1.3 continued – PST Project excavation lots defined.

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<td>2</td>
<td>25-32 max.</td>
<td>subhumus [10yr 4/1]</td>
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<tr>
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<td>1</td>
<td>2</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td>0-25</td>
<td>humus [10yr 3/2]</td>
</tr>
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<td>1</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>25-50</td>
<td>grey soil w/ pebbles [10yr 5/1]</td>
</tr>
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<td>2</td>
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<td>2</td>
<td>50-85 max.</td>
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<td>2</td>
<td>0-20</td>
<td>humus [5yr 3/1]</td>
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<td>2</td>
<td>2</td>
<td>2</td>
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<td>2</td>
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<td>1</td>
<td>40-48</td>
<td>south half of unit beyond construction platform; grey soil [5yr 4-5/1]</td>
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<tr>
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<td>112</td>
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<td>1</td>
<td>1</td>
<td>0-30</td>
<td>humus [10yr 3/2]</td>
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<tr>
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<td>112</td>
<td>2</td>
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<td>1</td>
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<td>brown earth [10yr 4/1] w/ pebbles</td>
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<tr>
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<td>113</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td>0-25</td>
<td>humus [5yr 4-5/1]</td>
</tr>
<tr>
<td>Ramonal</td>
<td>113</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>25-50</td>
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<td>2</td>
<td>2</td>
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<td>4</td>
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<td>70-88 max.</td>
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Table 9.1.3 continued – PST Project excavation lots defined.

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<th>Lot</th>
<th>Length (m)</th>
<th>Width (m)</th>
<th>Depth (cm)</th>
<th>Description</th>
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<td>113</td>
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<td>2</td>
<td>2</td>
<td>0-30</td>
<td>humus [5yr 4/1]</td>
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<tr>
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<td>2</td>
<td>2</td>
<td>30-78</td>
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<tr>
<td>E. Ramonal</td>
<td>114</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td>0-30</td>
<td>humus [5yr 5/1]</td>
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<tr>
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<td>114</td>
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<td>2</td>
<td>1</td>
<td>30-57 max.</td>
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<td>0-20</td>
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<td>E. Ramonal</td>
<td>114</td>
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<td>20-40</td>
<td>grey soil [2.5y 5/1] w/ pebbles and 5-15 cm limestones</td>
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<tr>
<td>E. Ramonal</td>
<td>115</td>
<td>1</td>
<td>1</td>
<td>1.5</td>
<td>1.5</td>
<td>0-25</td>
<td>grey soil [2.5y 5/1]</td>
</tr>
<tr>
<td>E. Ramonal</td>
<td>115</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>25-50</td>
<td>grey soil [2.5yr 5/1] w/ pebbles</td>
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<tr>
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<td>1.5</td>
<td>50-70</td>
<td>very fine pure grey soil [2.5y 6/1]</td>
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<td>115</td>
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<td>1</td>
<td>1</td>
<td>0-30</td>
<td>humus [2.5yr 2.5/1]</td>
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<tr>
<td>E. Ramonal</td>
<td>115</td>
<td>3</td>
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<td>1.5</td>
<td>1.5</td>
<td>20-40</td>
<td>subhumus mixed w/ grey soil, pebbles, and sherds</td>
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<tr>
<td>E. Ramonal</td>
<td>115</td>
<td>3</td>
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<td>1.5</td>
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<td>30-70 max.</td>
<td>grey soil [2.5y 6/1]</td>
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<td>115</td>
<td>4</td>
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<td>2</td>
<td>1</td>
<td>0-25</td>
<td>humus [5yr 2.5/1]</td>
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<tr>
<td>E. Ramonal</td>
<td>115</td>
<td>4</td>
<td>2</td>
<td>2</td>
<td>1</td>
<td>25-50</td>
<td>subhumus mixed w/ grey soil, pebbles, and sherds</td>
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<tr>
<td>West Block</td>
<td>211</td>
<td>1</td>
<td>1</td>
<td>1.5</td>
<td>1</td>
<td>0-30</td>
<td>humus into pebble layer (possibly a floor ballast)</td>
</tr>
<tr>
<td>West Block</td>
<td>211</td>
<td>1</td>
<td>2</td>
<td>1.5</td>
<td>1</td>
<td>30-58 max.</td>
<td>grey soil</td>
</tr>
<tr>
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<td>211</td>
<td>2</td>
<td>1</td>
<td>1.5</td>
<td>1</td>
<td>0-40</td>
<td>humus/subhumus [10yr 4-5/1]</td>
</tr>
<tr>
<td>West Block</td>
<td>211</td>
<td>2</td>
<td>2</td>
<td>1.5</td>
<td>1</td>
<td>40-98 max.</td>
<td>grey soil [10yr 7/1] w/ pebbles</td>
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Table 9.1.3 continued – PST Project excavation lots defined.

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<tr>
<th>Group</th>
<th>Op.</th>
<th>Sub-Op.</th>
<th>Lot</th>
<th>Length (m)</th>
<th>Width (m)</th>
<th>Depth (cm)</th>
<th>Description</th>
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</thead>
<tbody>
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<td>211</td>
<td>3</td>
<td>1</td>
<td>1.5</td>
<td>1</td>
<td>0-25</td>
<td>humus w/ pebbles and 5-10 cm limestones</td>
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<td>West Block</td>
<td>211</td>
<td>3</td>
<td>2</td>
<td>1.5</td>
<td>1</td>
<td>25-48 max.</td>
<td>grey-brown soil [10yr 7/1] w/ 5-10 cm limestones</td>
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<td>211</td>
<td>4</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>0-40</td>
<td>humus/subhumus [10yr 4-5/1]</td>
</tr>
<tr>
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<td>211</td>
<td>4</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>40-81 max.</td>
<td>grey-brown soil [5yr 3/2]</td>
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<td>5</td>
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<td>1</td>
<td>1</td>
<td>0-30</td>
<td>humus [10yr 4/1] w/ pebbles</td>
</tr>
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<td>1</td>
<td>30-60</td>
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<td>211</td>
<td>5</td>
<td>3</td>
<td>1</td>
<td>1</td>
<td>60-90 max.</td>
<td>grey soil [w/10 yr 7/1] compact sascab (construction fill)</td>
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Table 9.1.4 – PST Project occupation levels from northern earthwork corridor test-pits.

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<th>Width</th>
<th>Depth</th>
<th>Ceramic Phase</th>
<th>Year</th>
</tr>
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<td>7</td>
<td>2</td>
<td>G1</td>
<td>2m</td>
<td>2m</td>
<td>45cm</td>
<td>Imix</td>
<td>2005</td>
</tr>
<tr>
<td>7</td>
<td>3</td>
<td>G1</td>
<td>2m</td>
<td>2m</td>
<td>170cm</td>
<td>Manik / Ik / Imix</td>
<td>2005</td>
</tr>
<tr>
<td>8</td>
<td>1</td>
<td></td>
<td>.5m</td>
<td>.5m</td>
<td>45cm</td>
<td>nd</td>
<td>2005</td>
</tr>
<tr>
<td>10</td>
<td>1</td>
<td>G8</td>
<td>2m</td>
<td>2m</td>
<td>50cm</td>
<td>nd</td>
<td>2005</td>
</tr>
<tr>
<td>10</td>
<td>2</td>
<td>G8</td>
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<td>1.5m</td>
<td>85cm</td>
<td>Manik</td>
<td>2005</td>
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<td>11</td>
<td>1</td>
<td>G9</td>
<td>2m</td>
<td>2m</td>
<td>40cm</td>
<td>Cauac - Cimi</td>
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</tr>
<tr>
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<td>1</td>
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<td>1m</td>
<td>80cm</td>
<td>Imix</td>
<td>2005</td>
</tr>
<tr>
<td>13</td>
<td>2</td>
<td>G11a</td>
<td>2m</td>
<td>1m</td>
<td>85cm</td>
<td>nd</td>
<td>2005</td>
</tr>
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<td>2005</td>
</tr>
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<td>G11b</td>
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<td>2m</td>
<td>45cm</td>
<td>Ik / Imix</td>
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<td>50cm</td>
<td>Manik / Ik / Imix</td>
<td>2005</td>
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<td>95cm</td>
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<td>2005</td>
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<td>125cm</td>
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</tr>
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<td>2m</td>
<td>50cm</td>
<td>nd</td>
<td>2005</td>
</tr>
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<td>50cm</td>
<td>nd</td>
<td>2005</td>
</tr>
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<td>2m</td>
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<td>nd</td>
<td>2005</td>
</tr>
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</tr>
<tr>
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<td>G15</td>
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<td>1.5m</td>
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<tr>
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<td>1.5m</td>
<td>50cm</td>
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<tr>
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<td>1.5m</td>
<td>85cm</td>
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<td>1.5m</td>
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<td>1m</td>
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<td>2m</td>
<td>70cm</td>
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<td>61cm</td>
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<td>2m</td>
<td>2m</td>
<td>51cm</td>
<td>Imix</td>
<td>2006</td>
</tr>
<tr>
<td>41</td>
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<td>G44</td>
<td>2m</td>
<td>2m</td>
<td>48cm</td>
<td>Imix</td>
<td>2006</td>
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<td>2m</td>
<td>60cm</td>
<td>Ik / Imix</td>
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Table 9.1.5 – PST Project occupation levels from Chalpate/Ramonal test-pits.

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<th>Sub-Op</th>
<th>Location</th>
<th>Length</th>
<th>Width</th>
<th>Depth</th>
<th>Ceramic Phase</th>
<th>Year</th>
</tr>
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<tbody>
<tr>
<td>32</td>
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<td>G52</td>
<td>1.5m</td>
<td>1.5m</td>
<td>50cm</td>
<td>Late Classic</td>
<td>2006</td>
</tr>
<tr>
<td>32</td>
<td>3</td>
<td>G52</td>
<td>1m</td>
<td>1m</td>
<td>50cm</td>
<td>nd</td>
<td>2006</td>
</tr>
<tr>
<td>33</td>
<td>1</td>
<td>G21a</td>
<td>2m</td>
<td>2m</td>
<td>88cm</td>
<td>Imix</td>
<td>2006</td>
</tr>
<tr>
<td>34</td>
<td>1</td>
<td>G41</td>
<td>2m</td>
<td>2m</td>
<td>35cm</td>
<td>nd</td>
<td>2006</td>
</tr>
<tr>
<td>35</td>
<td>1</td>
<td>G43</td>
<td>2m</td>
<td>2m</td>
<td>45cm</td>
<td>Imix</td>
<td>2006</td>
</tr>
<tr>
<td>35</td>
<td>2</td>
<td>G43</td>
<td>2m</td>
<td>2m</td>
<td>78cm</td>
<td>Imix</td>
<td>2006</td>
</tr>
<tr>
<td>36</td>
<td>1</td>
<td>G49</td>
<td>2m</td>
<td>1.5m</td>
<td>55cm</td>
<td>nd</td>
<td>2006</td>
</tr>
<tr>
<td>37</td>
<td>1</td>
<td>G45</td>
<td>2m</td>
<td>2m</td>
<td>101cm</td>
<td>Ik / Imix</td>
<td>2006</td>
</tr>
<tr>
<td>37</td>
<td>2</td>
<td>G45</td>
<td>2m</td>
<td>2m</td>
<td>70cm</td>
<td>Imix</td>
<td>2006</td>
</tr>
<tr>
<td>38</td>
<td>1</td>
<td>G51</td>
<td>2m</td>
<td>2m</td>
<td>70cm</td>
<td>Imix</td>
<td>2006</td>
</tr>
<tr>
<td>39</td>
<td>1</td>
<td>G3</td>
<td>2m</td>
<td>1.5m</td>
<td>61cm</td>
<td>Imix</td>
<td>2006</td>
</tr>
<tr>
<td>40</td>
<td>1</td>
<td>G48</td>
<td>2m</td>
<td>2m</td>
<td>51cm</td>
<td>Imix</td>
<td>2006</td>
</tr>
<tr>
<td>41</td>
<td>1</td>
<td>G44</td>
<td>2m</td>
<td>2m</td>
<td>48cm</td>
<td>Imix</td>
<td>2006</td>
</tr>
<tr>
<td>42</td>
<td>1</td>
<td>G50</td>
<td>2m</td>
<td>2m</td>
<td>60cm</td>
<td>Ik / Imix</td>
<td>2006</td>
</tr>
<tr>
<td>111</td>
<td>1</td>
<td>Chaplate</td>
<td>2m</td>
<td>2m</td>
<td>32cm</td>
<td>Edznab</td>
<td>2006</td>
</tr>
<tr>
<td>111</td>
<td>2</td>
<td>Chaplate</td>
<td>2m</td>
<td>2m</td>
<td>85cm</td>
<td>Ik / Imix</td>
<td>2006</td>
</tr>
<tr>
<td>112</td>
<td>1</td>
<td>S. Chalp.</td>
<td>2m</td>
<td>1m</td>
<td>48cm</td>
<td>Ik</td>
<td>2006</td>
</tr>
<tr>
<td>112</td>
<td>2</td>
<td>Causeway</td>
<td>1m</td>
<td>1m</td>
<td>62cm</td>
<td>Ik</td>
<td>2006</td>
</tr>
<tr>
<td>113</td>
<td>1</td>
<td>Ramonal</td>
<td>2m</td>
<td>2m</td>
<td>88cm</td>
<td>Imix</td>
<td>2006</td>
</tr>
<tr>
<td>113</td>
<td>2</td>
<td>Ramonal</td>
<td>2m</td>
<td>2m</td>
<td>78cm</td>
<td>Imix</td>
<td>2006</td>
</tr>
<tr>
<td>114</td>
<td>1</td>
<td>E. Ram.</td>
<td>2m</td>
<td>1m</td>
<td>57cm</td>
<td>Imix</td>
<td>2006</td>
</tr>
<tr>
<td>114</td>
<td>2</td>
<td>E. Ram.</td>
<td>2m</td>
<td>1m</td>
<td>72cm</td>
<td>Edznab</td>
<td>2006</td>
</tr>
<tr>
<td>114</td>
<td>3</td>
<td>E. Ram.</td>
<td>2m</td>
<td>1m</td>
<td>70cm</td>
<td>Ik / Imix</td>
<td>2006</td>
</tr>
<tr>
<td>114</td>
<td>4</td>
<td>E. Ram.</td>
<td>2m</td>
<td>1m</td>
<td>70cm</td>
<td>Ik / Imix</td>
<td>2006</td>
</tr>
<tr>
<td>115</td>
<td>1</td>
<td>E. Ram.</td>
<td>2m</td>
<td>1m</td>
<td>101cm</td>
<td>Ik</td>
<td>2006</td>
</tr>
<tr>
<td>211</td>
<td>1</td>
<td>N. Block</td>
<td>1.5m</td>
<td>1m</td>
<td>58cm</td>
<td>Ik</td>
<td>2006</td>
</tr>
<tr>
<td>211</td>
<td>2</td>
<td>N. Block</td>
<td>1.5m</td>
<td>1m</td>
<td>98cm</td>
<td>nd</td>
<td>2006</td>
</tr>
<tr>
<td>211</td>
<td>3</td>
<td>N. Block</td>
<td>1.5m</td>
<td>1m</td>
<td>48cm</td>
<td>Late Classic</td>
<td>2006</td>
</tr>
<tr>
<td>211</td>
<td>4</td>
<td>N. Block</td>
<td>1m</td>
<td>1m</td>
<td>81cm</td>
<td>nd</td>
<td>2006</td>
</tr>
<tr>
<td>211</td>
<td>5</td>
<td>N. Block</td>
<td>1m</td>
<td>1m</td>
<td>90cm</td>
<td>Manik / Ik / Imix</td>
<td>2006</td>
</tr>
</tbody>
</table>
The overwhelming majority of datable pottery from all of our operations comes from the Late Classic Ik and Imix ceramic complexes. Late Preclassic ceramics are surprisingly rare, and we found no large, single-component deposits dating to this temporal horizon. Previous investigations suggested that the Late Preclassic occupation was nucleated around central Tikal (Puleston 1973:220) and our test-pitting program confirms that Late Preclassic material is not abundant in the peripheries. While some Late Preclassic sherds were recovered from trench or test-pit excavations, no residential areas tested produced definitive Preclassic levels. Late Preclassic Waxy Red sherds of the Sierra ceramic group were found in excavations to the south and west of Group 1. A one meter trench running 10 m south from the southernmost structure of Group 1 partially uncovered a broad, low platform which might be Late Preclassic in date (Figure 9.1.5). Early Classic ceramic deposits were also uncommon. Some Early Classic sherds were recovered from mixed lots of domestic refuse, but only one stratigraphic midden contained appreciable quantities of Early Classic Manik sherds.

Of the Manik ceramic complex pottery recovered, black gloss pottery of the Balanza ceramic group is represented in round-sided or outflaring-walled bowls, often with cross-hatching designs incised or plastic decorations gouged-incised (i.e., Lucha Incised, Utita Gouged-Incised types). Many of the Balanza Black sherds recovered from peripheral excavations share a similar compositional profile, and form one of the compositional paste groups discussed later. Late Classic domestic ceramic assemblages produced polychrome pottery of the Saxche and Palmar groups. Gloss orange or cream polychrome dishes, bowls, and cylindroids were found broken and discarded in domestic middens abutting large and small residential platforms. Larger groups tended to have more pottery overall and higher percentages of polychrome vessels in their assemblages. The elemental characterization of Late Classic polychrome serving vessels is discussed in terms of production and exchange.

Few specimens from peripheral test-pitting excavations can be considered elite pottery or inalienable possessions likely circulated by gift-giving mechanisms. Only nine
Figure 9.1.26 - Profile drawing of Feature 1 from Op. 7, Group 1.
sherds are inscribed or painted with glyphic passages. Seven of these nine specimens were from the architectural core and clustered residential sector of the minor center of Ramonal/Chalpate. The other two specimens came from two of the largest multiple plaza groups along the northernearthwork corridor, Group 1 and Group 45.

Fifty-one cultural levels produced enough well-preserved pottery to establish dates (Table 9.1.6; see Table 1.3.1 for ceramic complex chronology chart). Strictly counting definite occupation levels, the majority of datable deposits fall into the Late Classic, when populations hit a demographic peak. Definite Ik lots and Imix lots were identified separately, although in three instances only a general Late Classic date could be assigned. Imix occupations account for almost half of the sample, while Preclassic and Terminal Classic levels combined only make up 5.9% of the sample.

Table 9.1.6 – PST Project occupation levels by ceramic phase.

<table>
<thead>
<tr>
<th>Ceramic complex</th>
<th>occupation levels</th>
<th>percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cauac</td>
<td>1</td>
<td>2%</td>
</tr>
<tr>
<td>Manik</td>
<td>6</td>
<td>12%</td>
</tr>
<tr>
<td>Ik</td>
<td>15</td>
<td>29%</td>
</tr>
<tr>
<td>Imix</td>
<td>24</td>
<td>47%</td>
</tr>
<tr>
<td>Late Classic</td>
<td>3</td>
<td>6%</td>
</tr>
<tr>
<td>Edznab</td>
<td>2</td>
<td>4%</td>
</tr>
<tr>
<td>total=</td>
<td>51</td>
<td>100%</td>
</tr>
</tbody>
</table>

The Ik, Imix, and Late Classic lots combined account for over 82% of the dateable occupation levels covering the entire Late Classic period (A.D. 550 – 850) (Table 9.1.7). This overwhelmingly Late Classic dominant collection is surely a product of our non-invasive excavation program, yet still documents the likely demographic boom at Tikal in later times.
Table 9.1.7 – PST Project occupation levels by chronological period.

<table>
<thead>
<tr>
<th>occupation levels</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Preclassic</td>
<td>2.0%</td>
</tr>
<tr>
<td>Early Classic</td>
<td>11.8%</td>
</tr>
<tr>
<td>Late Classic</td>
<td>82.4%</td>
</tr>
<tr>
<td>Terminal Classic</td>
<td>3.9%</td>
</tr>
</tbody>
</table>

Taking into account that nine groups had overlapping Ik and Imix levels, the number of Late Classic occupation levels still accounts for over three-quarters of the sample (Table 9.1.8).

Table 9.1.8 – PST Project occupation levels by chronological period adjusted for combined Ik/Imix lots.

<table>
<thead>
<tr>
<th>occupation levels</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Preclassic</td>
<td>2.4%</td>
</tr>
<tr>
<td>Early Classic</td>
<td>14.3%</td>
</tr>
<tr>
<td>Late Classic</td>
<td>78.6%</td>
</tr>
<tr>
<td>Terminal Classic</td>
<td>4.8%</td>
</tr>
</tbody>
</table>

Our findings differ from those reported by Fry (1969) and Puleston (1973) for the sustaining area transect surveys of the 1960s. They encountered Early Classic occupation levels as frequently as Late Classic ones. I am certain that I was much more conservative in assigning occupation levels than the earlier University of Pennsylvania project was. In general, occupation levels were determined from deposits containing multiple diagnostic sherds from the same ceramic complex. I did not assign occupation levels for deposits of just a few sherds and my chronological data come from test-pits that did not sample structure fill. Puleston found that Early Classic occupations were more common to the south of the site, and 43 % of all the combined north and south survey brecha occupation levels dated to the Early Classic period (Table 9.1.9).
Table 9.1.9 – Occupation levels by time period for the north and south brecha surveys of the Tikal Sustaining Area Project based on definite and probable categories for ceramic dating (after Puleston 1973, based on Fry 1969).

North brecha:

<table>
<thead>
<tr>
<th>Occupation levels</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Preclassic</td>
<td>11.8%</td>
</tr>
<tr>
<td>Early Classic</td>
<td>36.2%</td>
</tr>
<tr>
<td>Late Classic</td>
<td>36.2%</td>
</tr>
<tr>
<td>Terminal Classic</td>
<td>15.8%</td>
</tr>
</tbody>
</table>

South brecha:

<table>
<thead>
<tr>
<th>Occupation levels</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Preclassic</td>
<td>9.9%</td>
</tr>
<tr>
<td>Early Classic</td>
<td>37.8%</td>
</tr>
<tr>
<td>Late Classic</td>
<td>34.2%</td>
</tr>
<tr>
<td>Terminal Classic</td>
<td>16.2%</td>
</tr>
<tr>
<td>Postclassic</td>
<td>1.8%</td>
</tr>
</tbody>
</table>

North and south brechas:

<table>
<thead>
<tr>
<th>Occupation levels</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Preclassic</td>
<td>5.9%</td>
</tr>
<tr>
<td>Early Classic</td>
<td>43.2%</td>
</tr>
<tr>
<td>Late Classic</td>
<td>35.7%</td>
</tr>
<tr>
<td>Terminal Classic</td>
<td>14.6%</td>
</tr>
<tr>
<td>Postclassic</td>
<td>0.5%</td>
</tr>
</tbody>
</table>

The PST Project ceramic evidence suggests that most groups were inhabited during the latter half of the Late Classic period (A.D. 700 – 850), just as Fry and Puleston had earlier concluded for their sample. In spite of the ceramic sample being skewed toward Late Classic occupations, Early Classic and Terminal Classic pottery will be discussed in terms of production and exchange. Late Classic pottery distributions for serving vessels were discriminated by compositional analysis and pattern recognition.
The distribution of vessels from the same compositional reference groups indicate that pottery was widely circulated throughout Tikal. The number of similar vessels that could not be assigned to a compositional reference group suggests a redundancy of production units making similar pottery.

Non-ceramic Artifacts

Lithics were the second most common artifacts recovered from our peripheral excavations. Chert was extremely common; 4262 chert flakes (63.59 kg.), 53 formal chert implements (5.201 kg.), and an additional 18 chert cores or hammerstones (3.313 kg.) were recovered. Obsidian was fairly rare, with only 106 obsidian fragments, weighing 120 grams in total, recovered from all excavations combined. Another thirteen ground stone artifact fragments (7.04 kg.) represent domestic maize grinding stones. Some of these implements may have been made from imported stone. Beyond the ceramic and lithic catalog, just three shell fragments (30 grams) were recorded. The following analyses focus on the distribution patterns of the most abundant artifact classes: ceramics, chert, and obsidian.

The preponderance of lithic material collected during our excavations represents household level expedient flake tool production utilizing locally available cherts of mostly poor to medium quality. We also collected a sample of fifty-three discarded fragments of formal bifacial chert implements. Celtiform axes, laurel leaf elongate “picks” and a few other forms are represented at twenty-nine (62%) of the households tested. The small collection of obsidian consists mostly of prismatic blade fragments. These were never found in any great concentrations, although most test-pits produced at least one prismatic blade fragment. All blade fragments appear to be late stage pressure blades from the reduction of polyhedral blade cores. No obsidian production evidence was encountered. We recovered no platform preparation or core shaping flakes, no large first or second series blades, nor expedient flake blades. Aside from one rejuvenation flake, all blades recovered are symmetrical latter stage prismatic blades. Only two
obsidian projectile points were recovered; one likely made from Ucareo obsidian from central Mexico.

Quantities of formal chert implements and expedient flakes tools were routinely recovered from household test-pitting and sometimes from surface collections or trenching of the earthwork ditch and embankment. Our 2005-2006 excavations confirm earlier findings (Moholy-Nagy 1997) that expedient knapping occurred at all households in the Tikal periphery. Simple expedient direct percussion flake tools produced from multidirectional chert cores (often reused as hammerstones or pecking stones themselves) were recovered from nearly all excavations in the periphery. Ovoid bifaces, or celtiform axes, were the most common formal chert tools recovered, and probably represent items exchanged by part-time specialists. These axes were usually broken, often with evidence of crude resharpening errors. Hammerstones, elongated “picks,” and multidirectional flake cores were also common in household test-pitting excavations. Natural chert is abundant to the lowlands west of central Tikal and chert debitage (flakes, chunks and shatter) can be seen washing out of the topsoil along the west transect brecha. The widespread debitage probably derives from production at the source or testing of chert nodules for quality before removal for working in domestic compounds. Excavations at residential groups in the west were characterized by high lithic densities, although none of the recovered debris from our test-pits reflected bifacial knapping at these groups.

Local cherts are of medium to poor quality and occur throughout the periphery in varying concentrations and quality. Chert nodules are common in the bajos that cover approximately 40% of the land and suitable cherts were probably accessible to all peripheral inhabitants in Classic times. The sixty peripheral excavations yielded an average chert “debitage” ratio of 430 g/m³ of excavated material. The bulk of this “debitage” reflects expedient flake tool production, discarded simple flake tools, or bifacial thinning flakes used secondarily as cutting implements.

The distribution of formal chert implements suggests that all peripheral households had access to them. The only ‘restricted’ implements which do not appear throughout the
entire surveyed area are finely crafted bifacial thin knives (or projectile points) made from fine textured honey brown chert. Four of these specimens were recovered from a small residential group (G11b), and one from the Group 1 midden. Although the fine brown chert may have been imported from the southeast Belizean chert bearing zone, it is equally likely that this fine quality chert was locally available, although rare. Two celtiform axe fragments and a partially reduced bifacial celtiform implement recovered from peripheral excavations suggests that high quality knapping stone was occasionally encountered by the ancient Tikal inhabitants in the form of small float nodules. The color of this stone is not consistent with reference material from Colha (Z. Hruby, personal communication to Straight, 2006). None of the chert implements or debris recovered from excavations appears imported.

9.2 – Obsidian at Tikal

Obsidian at Tikal was all imported; the nearest source, El Chayal, is located approximately 315 km to the southwest in the highlands of Guatemala. Green obsidian recovered from excavations at Tikal represents importation from the Basin of Mexico, some 1000 km to the north. Noted for its exceptional cutting edge, obsidian has often been described as a common utilitarian good used by all ranks of Classic Maya society. Alternately, the possibly restricted access to obsidian has been emphasized by others (e.g., Aoyama 2001). Of the recovered pieces, there are 100 fragments from prismatic blades and only two projectile points, one irregular overshot or core rejuvenation fragment, and 3 nondescript ‘shatter’ fragments. Most appear to be latter stage pressure blades from the reduction of grey or black polyhedral cores; the majority of obsidian blade proximal fragments have ground platforms (Table 9.2.1).

The obsidian industry at Tikal is reviewed here precisely because obsidian does not occur naturally at Tikal. All obsidian worked within Tikal was imported in one form or another, either as large polyhedral cores for blade production or as finished artifacts. Blade fragments recovered from household middens from the most humble of Maya
households represent the final consumption of this material. The obsidian had to be imported from hundreds of kilometers away, either before or after being transformed from a rough core into a refined polyhedral core; subsequently, blades were removed and circulated. The “workshop dump” contexts from epicentral excavations conducted by the University of Pennsylvania project contained large macroflakes, platform preparation flakes, and abundant debitage (Table 9.2.2). These enigmatic deposits suggest some form of centralized sponsorship of obsidian importation with the initial reduction of polyhedral cores for blade production occurring near the North Acropolis. For Copán, as stated earlier, Aoyama (2001) has argued that dynastic elites controlled the importation of obsidian cores from the nearby Ixtepeque source, distributing them to subordinate political elites. Large deposits of primary debitage from the initial stages of core preparation have yet to be discovered in the peripheries of Tikal and we are uncertain if the epicentral obsidian production debris deposits at Tikal represent exclusive access to obsidian in large polyhedral core form. Likewise, it is unknown if Tikal’s epicentral obsidian and chert debitage deposits reflect attached production to supply construction crews or if tools produced were circulated more widely to central or peripheral inhabitants.

No peripheral groups tested by the PST project produced obsidian concentrations indicative of production and most obsidian artifacts recovered appear to be spent and discarded blade fragments. Seventy-two percent of the PST Project obsidian prismatic blades are visually congruent with the El Chayal source, a few look like San Martin Jilotepeque or Ixtepeque material. Only two obsidian artifacts (< 2%) from peripheral excavations appear to be Basin of Mexico imports. A small green obsidian blade fragment was recovered from excavations at a small household group in the western survey block. It is most likely Pachuca obsidian and cannot be dated by associated ceramics. A fragment of a stemmed projectile point pulled from a household midden from the largest group (G45) toward the western end of the northern earthwork corridor is opaque grey in color with symmetric wide striations, most likely from the Ucareo quarry in central Mexico (Figure 9.2.1). The form of the point is congruent with Mexican norms
Table 9.2.1 – Obsidian blades recovered from the PST Project peripheral excavations, 2005-2006.

<table>
<thead>
<tr>
<th>Op.</th>
<th>form</th>
<th>portion</th>
<th>Platform</th>
<th>width (mm)</th>
<th>thick (mm)</th>
<th>weight (g.)</th>
<th>Color</th>
<th>source</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.2.1</td>
<td>prismatic blade</td>
<td>medial fragment</td>
<td></td>
<td>11.68</td>
<td>2.91</td>
<td>&lt;1</td>
<td>opaque gray</td>
<td>Ixtepeque</td>
</tr>
<tr>
<td>7.1.2</td>
<td>prismatic blade</td>
<td>medial fragment</td>
<td></td>
<td>10.02</td>
<td>3.17</td>
<td>1</td>
<td>gray w/ blk striations</td>
<td>Chayal</td>
</tr>
<tr>
<td>7.1.3</td>
<td>prismatic blade</td>
<td>medial fragment</td>
<td></td>
<td>12.59</td>
<td>3.68</td>
<td>2</td>
<td>gray w/ blk striations</td>
<td>Chayal</td>
</tr>
<tr>
<td>7.3.1</td>
<td>prismatic blade</td>
<td>proximal fragment</td>
<td>Ground</td>
<td>12.85</td>
<td>3.17</td>
<td>4</td>
<td>translucent gray</td>
<td>Chayal</td>
</tr>
<tr>
<td></td>
<td>prismatic blade</td>
<td>medial fragment</td>
<td></td>
<td>10.9</td>
<td>2.5</td>
<td></td>
<td>translucent gray</td>
<td>Chayal</td>
</tr>
<tr>
<td></td>
<td>prismatic blade</td>
<td>medial fragment</td>
<td></td>
<td>11.03</td>
<td>2.48</td>
<td></td>
<td>translucent gray</td>
<td>Chayal</td>
</tr>
<tr>
<td></td>
<td>prismatic blade</td>
<td>medial fragment</td>
<td></td>
<td>11.19</td>
<td>5.7</td>
<td></td>
<td>foggy grey w/ blk striation</td>
<td>?</td>
</tr>
<tr>
<td>7.3.2</td>
<td>prismatic blade</td>
<td>medial fragment</td>
<td></td>
<td>11.87</td>
<td>3.32</td>
<td>1</td>
<td>opaque gray</td>
<td>Ixtepeque</td>
</tr>
<tr>
<td></td>
<td>prismatic blade</td>
<td>medial fragment</td>
<td></td>
<td>11.04</td>
<td>1.99</td>
<td></td>
<td>gray w/ blk striations</td>
<td>Chayal</td>
</tr>
<tr>
<td></td>
<td>prismatic blade</td>
<td>medial fragment</td>
<td></td>
<td>10.52</td>
<td>3.31</td>
<td></td>
<td>gray w/ blk striations</td>
<td>Chayal</td>
</tr>
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Table 9.2.1 continued – Obsidian blades recovered from the PST Project peripheral excavations, 2005-2006.

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Table 9.2.1 continued – Obsidian blades recovered from the PST Project peripheral excavations, 2005-2006.

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<td></td>
<td>prismatic blade</td>
<td>medial fragment</td>
<td>10.32</td>
<td>2.23</td>
<td>gray w/ blk striations</td>
<td>Chayal</td>
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<td></td>
<td>prismatic blade</td>
<td>distal fragment</td>
<td>-----</td>
<td>2.96</td>
<td>translucent gray</td>
<td>Chayal</td>
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<td></td>
<td>prismatic blade</td>
<td>proximal fragment</td>
<td>ground</td>
<td>10.89</td>
<td>3.2</td>
<td>foggy gray mottled black</td>
<td>?</td>
<td></td>
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<tr>
<td></td>
<td>prismatic blade</td>
<td>proximal fragment</td>
<td>10.97</td>
<td>3.19</td>
<td>translucent gray</td>
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<td>prismatic blade</td>
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<td>12.59</td>
<td>2.3</td>
<td>opaque gray</td>
<td>Iztepeque</td>
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<td>proximal fragment</td>
<td>-----</td>
<td>3.04</td>
<td>translucent gray</td>
<td>Chayal</td>
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<td>proximal fragment</td>
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<td>3.5</td>
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<td>Iztepeque</td>
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<td>medial fragment</td>
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<td>3.97</td>
<td>t. gray clouded black</td>
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<td>1.95</td>
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<td>?</td>
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<td>2.26</td>
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<td>medial fragment</td>
<td>-----</td>
<td>2.41</td>
<td>translucent gray</td>
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<td>211.2.2</td>
<td>prismatic blade</td>
<td>proximal fragment</td>
<td>no prep</td>
<td>10.89</td>
<td>3.2</td>
<td>foggy gray mottled black</td>
<td>?</td>
<td></td>
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<tr>
<td></td>
<td>prismatic blade</td>
<td>medial fragment</td>
<td>8.09</td>
<td>2.72</td>
<td>gray w/ blk striations</td>
<td>Chayal</td>
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<td></td>
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<tr>
<td></td>
<td>prismatic blade</td>
<td>medial fragment</td>
<td>10.35</td>
<td>1.73</td>
<td>green</td>
<td>Pachuca</td>
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<td>211.5.1</td>
<td>shatter</td>
<td>-----</td>
<td>-----</td>
<td>&lt;1</td>
<td>foggy gray</td>
<td>?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>211.5.2</td>
<td>prismatic blade</td>
<td>medial fragment</td>
<td>10.92</td>
<td>2.99</td>
<td>translucent gray</td>
<td>Chayal</td>
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</table>
### Table 9.2.2 – Epicentral obsidian concentrations recovered by the University of Pennsylvania project, 1956-1969.

<table>
<thead>
<tr>
<th>CONTEXT</th>
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<th>DATE</th>
<th>CITATION(S)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group 5C-1 (ceremonial twin pyramid complex converted to residential group); midden</td>
<td>&gt;1800 &quot;pieces of chert debitage&quot;</td>
<td>&quot;fragments of domestic artifact types of chert, obsidian, ground stone, pottery figurines, censer fragments, and over 300 pounds of potsherds&quot;</td>
<td>Late Classic</td>
<td>Moholy-Nagy 1994:116-117</td>
</tr>
<tr>
<td>peripheral group; midden</td>
<td>&quot;hundreds of pounds of chert debitage [flake cores, nudules, decortication flakes, blade cores, failed bifaces]&quot;</td>
<td>&quot;domestic trash, such as fragments of used obsidian blades, ground stone tools, freshwater snails, unworked animal bone, stucco, pottery censers, charcoal, and over 170 pounds of potsherds&quot;</td>
<td>Late Preclassic</td>
<td>Fry 1969:144; Moholy-Nagy 1997:301</td>
</tr>
<tr>
<td>peripheral deposit</td>
<td>&quot;2500 fragments of obsidian&quot;</td>
<td>&quot;relatively little chert and household trash&quot;</td>
<td>Protoclassic</td>
<td>Mohly-Nagy 1997:301</td>
</tr>
<tr>
<td>Group 4F-1, shallow pit dug into building platform (P.D. 217)</td>
<td>&quot;1354 pieces of obsidian from the manufacture of prismatic blades&quot;</td>
<td></td>
<td>Classic</td>
<td>Haviland 1985:158-159, Figures 30,31; Moholy-Nagy 1997:302</td>
</tr>
<tr>
<td>Group 7F-1, shallow pit dug into building platform (P.D. 37)</td>
<td>&quot;602 pieces of obsidian from the manufacture of prismatic blades; 24 pieces of chert&quot;</td>
<td></td>
<td>Classic</td>
<td>Moholy-Nagy 1997:302</td>
</tr>
<tr>
<td>Group 5D-33 (cache, special purpose dump) (P.D. 33)</td>
<td>&quot;approximately 200 pieces of chert debitage and over 3000 of obsidian&quot;</td>
<td>&quot;more typical cache materials, such as eccentric obsidians, red pigment, charcoal, and shells&quot;</td>
<td>Intermediate Classic</td>
<td>Coe 1990:517-518; Moholy-Nagy 1997:302</td>
</tr>
<tr>
<td>Cache 140A and B</td>
<td>&gt;2800 &quot;fragments of obsidian debitage&quot;</td>
<td>&quot;placed exterior to the repository of what came to be designated as Cache 140A and B&quot;</td>
<td>Early Classic (Manik ceramic complex)</td>
<td>Culbert 1993:Figure101; Moholy-Nagy 1997:306</td>
</tr>
</tbody>
</table>
Table 9.2.2 continued – Epicentral obsidian concentrations recovered by the University of Pennsylvania project, 1956-1969.

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</thead>
<tbody>
<tr>
<td>Structure 5D-22-6th, Bu. 185, associated material outside grave</td>
<td>&quot;variable dense concentrations of flint and obsidian material…about 100 pieces of obsidian scrap (preparatory core and blade material) and some 210 lbs of flint flakes. An estimated 10 lbs of flint lies beyond excavation limit.&quot;</td>
<td>Protoclassic</td>
<td>Coe 1990: 336</td>
<td></td>
</tr>
<tr>
<td>Structure 5D-22-1st (P.D. 134), associated material outside grave</td>
<td>20 eccentric flints; 322 unmodified flint flakes; 10 obsidian eccentrics; &quot;circa 2273 miscellaneous pieces of obsidian (exhausted blade core fragments, simple flakes, irregular blade flakes, and undifferentiated items)&quot;</td>
<td>associated with Bu. 200 and Bu. 201</td>
<td>Late Classic (Ik and Edznab ceramic complex)</td>
<td>Coe 1990:401-402; Culbert 1993:Figures146,147</td>
</tr>
<tr>
<td>Structure 5D-34 (Bu. 10), associated material outside grave</td>
<td>3373 unmodified flint flakes, 2664 obsidian flake-blades (including fragments), 546 flakes and blade core fragments, 79 blade cores (both modified and unmodified), and 16 eccentrics recorded.</td>
<td>&quot;An estimated 10000 pieces of flint actually distributed is not unreasonable&quot;</td>
<td>Early Classic (Manik ceramic complex)</td>
<td>Coe 1990:478-486; Culbert 1993:Figures 14-21</td>
</tr>
</tbody>
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Table 9.2.2 continued – Epicentral obsidian concentrations recovered by the University of Pennsylvania project, 1956-1969.

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</thead>
<tbody>
<tr>
<td>Structure 5D-34-1st (Bu. 23), associated material outside grave</td>
<td>788 pieces of obsidian (flake-blades and bits of blade cores), 1 whole and 1 incomplete eccentric obsidian, 175 flint flakes, and 390 obsidian flakes (at least half seemingly chippeddebitage)</td>
<td>&quot;That three 'lithic seals' existed in all, and with compositional differences among them, leaves sources, true purpose, and entire quantity open to guesswork. (the latter was probably in the low thousands)&quot;</td>
<td>Late Classic (Ik ceramic complex)</td>
<td>Coe 1990:536-539; Culbert 1993:Figures 39-41</td>
</tr>
<tr>
<td>Structure 5D-33-1st (Bu. 24), associated material outside grave</td>
<td>approximately 492 unmodified flint flakes; 200 intermixed used flake-blades and flakes of obsidian</td>
<td>&quot;probably half the total [lithics] actually present was recouped&quot;</td>
<td>Late Classic (Ik ceramic complex)</td>
<td>Coe 1990:540-543; Culbert 1993:Figures 41,42</td>
</tr>
<tr>
<td>Structure 5D-1-1st (Bu. 116), associated material outside grave</td>
<td>3240 grams of obsidian and 476 flint pieces collected; estimated total of 157,000 pieces of chert, 380,000 pieces of obsidian</td>
<td>&quot;several large cement bags of flint recovered … seem to have escaped quantification and study&quot;</td>
<td>Late Classic (Imix ceramic complex)</td>
<td>Coe 1990:604-607; Culbert 1993:Figures 64-75; Moholy-Nagy 1997:304-306</td>
</tr>
<tr>
<td>Structure 5D-73 (Bu. 196), associated material outside the grave</td>
<td>2620 pieces of flint, 1204 pieces of obsidian</td>
<td>incomplete recovery</td>
<td>Late Classic (Imix ceramic complex)</td>
<td>Coe 1990:641-645; Culbert 1993:Figures 83-96</td>
</tr>
</tbody>
</table>
and the point fragment was discarded into a household midden with ceramics from the Imix ceramic complex (A.D. 700 – 850). An ovoid projectile point made from semi-translucent black obsidian was also recovered from this test-pit off the main plaza at Group 45, it was probably made of Chayal obsidian (Figure 9.2.2).

While obsidian is ubiquitous at all Classic Maya sites, research is more and more focused quantitatively on the scale of production and qualitatively on the organization of production. The advent of compositional sourcing of obsidian through XRF and INAA (Fowler et al. 1989; Moholy-Nagy et al. 1984; P. Rice 1984; P. Rice et al. 1985) has added another dimension to these studies, facilitating the reconstruction of procurement patterns from different sources. In 1976 Raymond Sidrys quantified obsidian recovered from lowland Maya centers to reconstruct the distribution system of Classic times.

“Several studies that have emphasized the apparent random distribution or widespread abundance of obsidian as evidence of its everyday use (Rathje 1972; Moholy-Nagy 1974) have confused nominality (i.e., presence/absence) with quantity. While it may be true that obsidian is randomly distributed at a site in the nominal sense, it is not randomly distributed in the quantitative sense.” (Sidrys 1976:458)

The Obsidian Density Index (O.D. Index, Sidrys 1976) as calculated from the 60 test-pits of the PST peripheral household testing program comes to .85 g/m³ of excavated material. If all excavations from 2005-2006 were used to calculate the O.D. Index, this figure would be even lower, because few obsidian artifacts were recovered from larger trenching operations through the earthwork (only seven prismatic blade fragments from eighteen large trench operations). In contrast to the 15.3 g/m³ O.D. published for Tikal (Sidrys 1976), our peripheral excavations indicate that local populations had reduced access to this commodity in contrast with central inhabitants; a pattern also reported for the Lake Peten area (see Rice 1984; Rice et al. 1985). The twenty-three test-pits excavated by Ford (1981, 1986) along the Tikal-Yaxha transect produced an O.D. of 2.7g/m³ (Ford and Glicken 1987:493), again suggesting that distance from a major center is inversely proportional to the amount of obsidian recovered.
Figure 9.2.1 – Fragment of stemmed obsidian projectile point from Group 45 (top – dorsal surface; bottom – ventral surface).
Figure 9.2.2 – Ovoid obsidian projectile point from Group 45 (top – dorsal surface; bottom – ventral surface).
Sidrys was also acutely aware of the shortcomings of certain labels and categories which archaeologists apply in dichotomous fashion to certain artifact classes. Obsidian, in different manufactured forms, can certainly be characterized as a utilitarian item or an exotic luxury item. Even more confusing, obsidian eccentrics are one of the items that Moholy-Nagy (2003a, 2003b, 2008) believes were exchanged at the central marketplace at Tikal; that these eccentrics had a “commodity phase” (Appadurai 1986:13) before being acquired for ritual deposition.

“However to assign functional values to artifacts, for example functional-useful (Tourtellot and Sabloff 1972:129), productive-nonproductive (Renfrew 1975:45), or utilitarian-luxury (Rathje 1971), unavoidably creates ambiguity. Clearly a commodity may possess high value and/or high status and still retain a useful utilitarian function. Luxury cars or diamond watches in modern western society are examples. Analogously, imported obsidian blades may have served some useful tasks and still have been restricted commodities.” (Sidrys 1976:456)

Microwear analysis of green obsidian prismatic blades from excavations at Copán confirm that these blades were used for a variety of mundane tasks such as meat or hide processing, or for working wood/plant material (Aoyama 1999:107). Microwear analysis on tools recovered from elite domestic contexts at Aguateca confirm that obsidian blades were used for both craft production and domestic household tasks (Aoyama 2007, 2009; Emory and Aoyama 2007). Specific finished forms have been associated with particular obsidian sources. At Tikal, thin bifaces manufactured from central Mexican grey and green obsidian were likely imported in finished form (Moholy-Nagy 1999; Moholy-Nagy et al. 1984). The recovery contexts of Central Mexican obsidian imported into the Maya lowlands suggest that its presence be evaluated both as cultural contact and as long-distance trade. Green obsidian artifacts arriving in the Maya lowlands may also have circulated as gifts, to encourage loyalty among sub-elites or for other politically or culturally motivated reasons.

The obsidian industry at Tikal does not appear to be a simple phenomenon which ran along a single trajectory. Multiple obsidian sources were exploited, and the
importance of each waxed and waned through time (Fowler et al 1989; Moholy-Nagy et al. 1984; Rice 1984; Rice et al. 1985). Elite preferences for eccentric forms influenced obsidian consumption at Tikal at the same time that the commodity was circulated in small quantities to the inhabitants of the periphery, apparently as an everyday utilitarian commodity. Obsidian is recovered from different consumption contexts at Tikal: secondary deposition of production debitage in epicentral deposits, elite ritual use of eccentrics, and ubiquitous household consumption in prismatic blade form. These varied consumption contexts likely reflect different systems of production and exchange, although these may have overlapped to some degree.

Modeling the Obsidian Trade

Quantitative and qualitative investigation of the obsidian trade at Tikal and other Peten Maya areas demonstrate that the importation of obsidian was a somewhat complicated matter – with multiple sources exploited simultaneously, certain sources represented in specific artifact forms, and long-term shifting patterns of source procurement. Given the more recent emphasis on obsidian manufacture as a subtractive technology which can be modeled through linear reduction models (Collins 1975; Fowler 1991:2; Hirth 2000, 2003; Sheets 1972, 1975, 1977, 1978), our reconstruction of the obsidian industry at Tikal would be greatly advanced by an analysis of the debitage deposits to determine what forms were being produced. Unfortunately, technical analysis of the individual flakes or mass/assemblage analysis (i.e., Prentiss 1988; Sulivan and Rozen 1985) of whole deposits of obsidian debitage was never carried out on the Tikal material, so we are ignorant of exactly what production events are represented by redeposited or dumped debitage material. We also lack fundamental information on the size, organization and location of actual obsidian crafting areas or “workshops.” Do the (re)deposits at Tikal (Moholy-Nagy 1976:100-102, 1990, 1992) represent the debitage from unique workshops crafting particular forms or are they composed of the debitage from multiple households or other production units collected for re-deposition? Without the very necessary information concerning scale, kind, and organization of production it
is incredibly difficult to test any model of obsidian production or/and distribution (Aldenderfer 1991:119).

Researchers have attempted to define distribution patterns at varying scales of analysis at the levels of intraregional, interregional and/or long-distance circulation spheres (Marcus 1983:477-479). This quantitative analysis of trade has led to the ranking of centers in terms of amount of obsidian procured (J. Johnson 1976; Sidrys 1976). Obsidian sourcing provides a key to understanding long-distance trade, but does not fully explain the intra- and inter-regional distribution mechanisms or institutions responsible for the recovered distribution patterns. We have good information on obsidian sources, but cannot discriminate among alternative modes of organization for procurement, production or distribution. Quantitative analysis of obsidian importation at major, minor and non-center locations combined with known source attributions does give a rough indicator of the intensity of obsidian movement within the Peten area. Sidrys (1976) has shown that larger Peten centers imported more obsidian than did secondary centers.

Obsidian recovered from survey and excavation along transects sampled around Lake Peten Itza provide data from habitation to the south of Tikal. The Lake Peten CPHEP test-pitting program produced 826 pieces of obsidian from 355 structure fill or midden excavations. Researchers submitted 296 pieces of obsidian (223 or 75.3% bladelet fragments, 4 projectile points, one chipped disc, one ground disc fragment, 2 scrapers, 24 prismatic core fragments and 41 flakes) for compositional sourcing (Rice et al. 1985:592-593).

“The patterns of obsidian procurement in this [Lake Peten] area conform to the general outline of source exploitation identified for the larger civic-ceremonial centers of Peten, in that most of the Preclassic obsidian artifacts are from the San Martin Jilotepeque source, most of the artifacts from deposits phased to the Classic period are from El Chayal, and most of the obsidians from Postclassic contexts can be traced to the Ixtepeque source.” (Rice et al. 1985:604)
Interestingly, only two pieces (.2%) of green obsidian (sourced to the Pachuca quarry in central Mexico) were recovered during the CPHEP program (Rice et al. 1985:598-599). The Lake Peten area is only 23 km from the center of Tikal, so distance does not seem to be as important a factor as the elite context of much of the green obsidian recovered from Tikal. The correlations between obsidian source and artifact form suggest that different quarries produced stone more amenable to the production of certain forms, or that craftspeople specializing in certain forms did not have access to raw material from all quarries.

The Lake Peten survey obsidian distribution data add another dimension to the overall distribution model; obsidian was even less abundant in the lakes region which was largely peripheral to the interior centers. This situation supports a model of down-the-line trade or of a hierarchical market system which did not effectively redistribute much obsidian to the lowest level of society (i.e., C. Smith’s [1976a] dendritic or solar system). Sidrys interpreted the gross quantitative Peten obsidian data to support a centralized redistribution model through Maya political centers, although he stated that the data could also support a Central Place market system model. Any quantitative analysis of trade, such as Sidrys 1976 study, is still subject to the equifinality dilemma, we cannot discriminate between the alternate modes of exchange from the examination of the recovered distribution pattern alone (K. C. Chang 1975:24; Tourtellot 1978:15-16).

“The previous analyses demonstrated that lowland major centers had significantly more obsidian per capita than did minor centers. The organizational correlate to this empirical finding is open to debate. At the outset, two organizational modes appear to “fit” the empirical data well: central place markets and central place redistribution centers… Both modes are examined and, on balance, the redistribution center is the best model for Classic period trade.” (Sidrys 1976:456)

The quantitative analysis of obsidian procurement does necessitate the use of several assumptions of dubious value. In Sidrys analysis, obsidian densities were calculated from field reports and published data. An assumption that all 17 centers included in the study were excavated (and published) in relatively similar fashion with
equal emphasis is unwarranted. Specifically for Tikal, with one of the highest obsidian densities in Sidrys’ analysis, the Tikal researchers were unable to reconstruct the size of excavation lots or counts and weights of obsidian artifacts, many large deposits were not fully recovered, and their absolute size only approximated.

Another dubious variable in the obsidian density index is the employment of linear distance to the nearest obsidian source (see Rovner 1975:110-111). Through physiochemical testing, obsidian artifacts recovered from Tikal have been sourced to at least ten obsidian sources, many in highland Mexico. It is clear that the complexities of exploiting multiple sources at vary varied distances is just not captured in the Sidrys model. Furthermore, social distance is underplayed in this analysis, a factor that may account for much of the variation in distribution patterns of imported obsidian at lowland Maya centers.

Although Tortellot (1978) agrees with Sidrys’ (1976) assertion that first-order centers (e.g., Tikal) imported more obsidian than did second-order centers (e.g., Uaxactun), he is wary of the measurements and feels that these are only approximations and just not inaccurate enough for any further, more detailed analysis.

“More fundamentally, there have to be problems, of a very great magnitude, with the basic minimum estimates of obsidian mass (cf Sidrys 1976). These problems are representativeness of the excavation samples, incomplete reports of excavation volumes and artifact counts, omission of refuse deposit volumes, problematical count to weight conversion factors, poor recovery rates (Stoltman n.d.), lack of differentiation between residential and civic areas within the sites, and inflexible structure volume categories.” (Tortollet 1978:78-79)

After reviewing numerous ethnographic studies of the weight of loads carried and distance covered by human porters from contemporary Maya communities, Tourtellot calculated an average porter trip of at least 20 km per day (range 10-32) carrying a 45 kilogram load on average (range 22-64). He then converted Sidrys’ O.D. Index for several lowland Maya centers into porter days, estimating that 6555 porter-days would be
necessary to obtain all the obsidian recovered from Tikal, noting that over 1500 years this was a low volume (Tourtellot 1978:74-77). Such an abstract calculation may not help to determine the organization of obsidian trade but it does bring the overall volume of trade into perspective.

William Fowler (1991) has reviewed the shortcomings of Sidrys’ (1976, 1977, 1978, 1979) quantitative index approach, concluding that centers should be ranked according to their positions with respect to other centers as well as with obsidian sources. In short, Fowler believes that obsidian was redistributed by first-order centers to second-order centers that did not directly import the material from quarries. Fowler also sees a greater evil in the general concepts that form the basis for quantitative models of this kind.

“These specific problems are symptomatic of a much larger one: they are all inspired by a formalist bias which assumes that all societies operate according to principles of economic maximization. Thus, the validity of various ratios, indices, and distance measures is assumed rather than demonstrated. In my opinion, this assumption is severally flawed, and it has retarded the development of useful economic models of the ancient Maya.” (Fowler 1991:10)

Tourtellot (1978) conducted a distribution analysis of marine shell recovered from Peten centers similar to Sidrys’ obsidian distribution studies. His analysis of marine shell importation demonstrated that shells were not always or usually imported from the geographically nearest source (1978:80-81). Even knowing the source of the raw material and the final consumption context, the intervening route certainly deviated from a straight line. This is a major limitation of formal modeling of this kind.

“Deviations from the principle of least-effort in the transport function may be indicative of structured variation in cultural demand. Social implications of the postulated general cross-peninsular traffic pattern do not support a least-cost view of Maya trade rationality in Preclassic or Classic times. In Rathje’s terms (1975), they were conspicuously failing to control costs.” (Tourtellot 1978:81)
The simple formalist model converting weight and distance into trade indices does not capture the intricacies of the movement of raw materials to consumption contexts at centers. As a gross index of the relative volume of recovered obsidian at a given center, directly comparable to other centers, Sidrys’ O.D. index is a starting point for evaluating the relative scale of obsidian importation at lowland Maya centers. At this scale of analysis, it is unlikely that the discrimination of organizational modes, such as separating market exchange from complex redistribution, will be possible.

The large central (re)deposits of obsidian demonstrate that the elite segment of Tikal society had much greater access to this commodity and that the importation of the material was likely controlled to some degree by these elites or greatly influenced by their consumption proclivities. In contrast, the low volume of obsidian recovered from peripheral and hinterland excavations implies that obsidian was not redistributed to the lower levels of society to any great extent. It should also be recognized that we are unaware of the value of obsidian from the Maya perspective. This ‘value’ is further complicated by the conspicuous consumption of the material by elites. The exchange value of obsidian was either ignored, or more probably manipulated, by these elites hoarding the majority of the product for non-utilitarian consumption. This practice may have increased the exchange value of obsidian by limiting the quantities available; it may also have removed obsidian from any kind of marketplace exchange, conferring a decidedly ‘special-purpose,’ non-economic attribute to green obsidian, imported thin bifaces, or even obsidian blades.

Although the “workshop dump” deposits of obsidian debitage recovered by the University of Pennsylvania project (Moholy-Nagy 1976:100-102, 1990, 1992) (see Table 9.1.2) were not systematically recorded and analyzed, it has been reported that 98% of all recovered obsidian from Tikal represents finished prismatic blades or production by-products from the core/blade reduction sequence (Moholy-Nagy et al. 1984:105). Exhausted grey obsidian cores from prismatic blade production were often reworked into eccentric forms. These eccentric forms were recovered mainly from epicentral or central
excavations with a distribution pattern only 2 km in radius from the Great Plaza (Moholy-Nagy 2008:23-24). Physiochemical sourcing attributed six of these artifacts, as well as two eccentrics manufactured by incising large macroblades or macroflakes, to the highland Guatemalan El Chayal source – the major source utilized in the obsidian blade industry at Tikal (Moholy-Nagy 2003b; 2008:23-24; Moholy-Nagy and Nelson 1990). A few prismatic blades and exhausted cores have also been attributed to highland Mexican sources of grey obsidian [Otumba, Paredon, and Zaragoza] and green [Pachuca] obsidian (Moholy-Nagy and Nelson 1990; Moholy-Nagy et al. 1984).

The epicentral recovery contexts of eccentrics in caches and tombs and debitage deposits exterior to burial chambers has been interpreted by Moholy-Nagy as a sign of centralized control, probably incorporating attached or patronized production (Moholy-Nagy 2003a:91, 108), as well as the safe disposal of ‘hazardous waste’ in construction episodes (Moholy-Nagy 1990:274, 1997:307). A similar pattern of debitage disposal is documented at household groups outside the epicenter where deposits of around 1000 pieces of debitage were incorporated into residential structure platforms (Becker 1973a, 1973b, Haviland 1985). In general, Moholy-nagy envisions epicentral production under elite supervision and sponsorship for both elite consumption and for broader market exchange; production for market exchange was augmented by production at the household level.

Central Mexican Obsidian in the Maya Area

A Teotihuacán ‘presence’ has long been documented at Tikal (Ball 1983; Coggins 1975; Proskuriokoff 1993), and has only gained support since reinforced by epigraphic data (Martin and Grube 2000; Stuart 2000). Disruption of Tikal’s dynastic line, the construction of Teotihuacán style architecture, Teotihuacán costume elements carved into stelae portraits, and the recovery of Teotihuacán-influenced ceramics from tombs and caches amply attest to central Mexican involvement at Tikal. A complementary Peten Maya presence during the Early Classic period is present at Teotihuacán, concentrated in
the “merchant’s barrio,” but present throughout the site as well (Rattray 1987; Clayton 2005). Ethnic barrios are not uncommon at Teotihuacán and Spence has suggested that residents geared household production toward reinforcing their ethnic identity. A Zapotec enclave in the Tlailotlacan barrio of Teotihuacán produced pottery for basic domestic food preparation and serving vessels of Zapotec form, “…probably to signal support of the enclave's distinctive Zapotec identity and to facilitate the enculturation of the young” (Spence 1992). A somewhat analogous Teotihuacán barrio (Group 6C-XVI – the Lost World complex) was established at Tikal in the Early Classic, although the syncretism of central Mexican and Lowland Maya culture traits may indicate a political intrusion from Teotihuacán, one resulting in a permanent sub-settlement within the epicenter of Tikal. These residents may have followed central Mexican social conventions while intermarrying and assimilating local culture at the same time.

“Group 6C-XVI, at least for part of its history, appears to represent more than simply the piece-meal adoption of some Teotihuacan symbols and architectural traits in order to express an affiliation with that city's elite. Instead, it forms an integrated complex that follows Teotihuacan canons for the organization of space as well as for specific architectural features and motifs. It is, in short, a Teotihuacan complex, out of place in a Maya city. Nevertheless, there are a number of purely Maya elements also represented in the complex. The ceremonial deposits PNT-019 and PNT-031 are Maya ritual forms (Laporte 1988), and the mural art and ceramics are largely Maya (Laporte 1988; Laporte and Fialko 1990). Group 6C-XVI suggests a Teotihuacan presence in Tikal, one that was more spatially focused than Moholy-Nagy (1987) believed, but at the same time was blended to some degree with indigenous forms.” (Spence 1996:28)

Looking just at the percentages of thin bifaces manufactured from green obsidian and just for the Early Classic period, these items represent 18.8% of recovered specimens at Kaminaljuyu (Kidder et al. 1946:136, 138), 13.8% at Tikal (Moholy-Nagy et al. 1984: Table 1), and only 2.7% at Copán.

“These data may indicate that the Yax K’uk’ Mo’ dynasty [at Copán] had different exchange ties with Teotihuacan than the other cities [Tikal and KJ].” (Aoyama 2001:352)
This pattern of decreasing percentages of green obsidian is demonstrated only for major centers. Green obsidian may have generally move from the Basin of Mexico southward through highland Guatemala and down through the Peten continuing on further south to Copán. The pattern may indicate down-the-line trade, with the amount of material received by each center diminishing as a function of distance as well as the influence of other consumer centers. The distribution pattern may also be a reflection of individual trips directly to each center from the Basin of Mexico, not a single continuous trade route. It should be stressed that green Mexican obsidian is always a minority product at Tikal. Even if grey obsidian imported from the Basin of Mexico is quantitatively equal to the percentage of green Mexican obsidian recovered from Tikal, the fact remains that the entire lithic trade between the Basin of Mexico and the Maya lowlands was not of great economic importance. The Maya lowlands were not dependent upon the Mexican obsidian trade.

“By the same token, the Maya consumption of Teotihuacan obsidian would not have played a major role in the development of the Teotihuacan obsidian industry. The effect of such consumption is difficult to measure precisely, because none of the artifact forms produced in Teotihuacan work-shops was destined exclusively for use in the Maya region. It seems unlikely, however, that the occasional display requirements of a distant Teotihuacanized elite could begin to match the daily utilitarian needs of some 100,000-200,000 urban Teotihuacanos, plus the many thousands more within the city’s orbit on the central plateau.” (Spence 1996:34)

Several researchers view the context and volume of imported Mexican obsidian in the Maya lowlands on a gift-giving or elite interaction scale (e.g., Clark 1986; Spence 1977, 1981, 1996). Again, this is not to say that the importation of obsidian and whatever products from the lowlands for which it was exchanged (or ‘counter-gifted’) represent strictly non-economic transactions without benefit to either side. It is apparent, however, that green Mexican obsidian did not flow evenly into all sectors of the southern Maya lowlands. Specific first-order centers obtained more than secondary ones, and the imported product is almost always recovered in elevated concentrations (i.e., hundreds of pieces) from special deposits, dominantly elite tombs and caches. It is therefore
hypothesized that much of the imported Mexican obsidian recovered from elite contexts at Tikal primarily represents face-to-face contact between the elites of Teotihuacán (or other central Mexican polities) and Tikal during the Early Classic period. Alternately, trade routes may have been maintained by a group or groups of central Mexican immigrants living in Peten centers.

“The contexts in which these items [of Mexican obsidian] are found [in the Maya lowlands] generally suggest special elite ritual occasions with strong Teotihuacan links. Probably the artifacts were transported there by special emissaries or traders, to serve as gifts to foreign rulers or as components in the rituals of Teotihuacanos resident in the foreign communities (Spence 1977).” (Spence 1981:781)

There was some importation of Mexican obsidian into the Maya lowlands before and after the height of Teotihuacán involvement in the Lowlands. While a sustained cultural contact between Tikal and Teotihuacán is well attested for the Early Classic (Coggins 1975; Martin and Grube 2000; Proskouriakoff 1993; Stuart 2000), this was surely not the only cultural contact that political elites from Peten centers had with counterparts at Central Mexican centers over time. While a definite period of more intense contact between the Peten and central Mexico is the main point of our inquiry here (see Braswell 2003; Santley 2004), it is admitted that this was only one episode in a much longer development which we do not fully comprehend.

Most Mexican obsidian identified at Tikal dates to the Classic period, with almost half assigned to Early Classic or to mixed Late Preclassic/Early Classic contexts. The Early Classic period sees the importation of Mexican obsidian eccentrics and sequins, while in later times, only prismatic blades and thin bifaces are present. Green obsidian is said to form about 1% of the total recovered from Tikal, although considerable variation exists in the proportion of Guatemalan to Mexican obsidian as a function of the time period, artifact type, and recovery context. Small amounts of green obsidian occur in Late Preclassic/Early Early Classic contexts, but the majority can be assigned to the Early Classic period [Manik Ceramic Complex, A.D. 250 – 550] (Moholy-Nagy and Nelson 1990:77). In Manik deposit PNT-019 of Group 6C-XVI [the Lost World complex], the
proportion of green obsidian reaches 30% (Laporte 1988:170, 172). In the Terminal Classic period at Tikal, central Mexican green obsidian (Pachuca) still constituted over 5.5% of the obsidian artifacts attributable to that time period (Spence 1996). Of the obsidian thin bifaces recovered from Tikal by the University of Pennsylvania project, 182 of 580 (31%) were green obsidian from Pachuca. Physiochemical testing sourced 11 of 13 (85%) grey obsidian thin bifaces to highland Mexican quarries. Moholy-Nagy has suggested the possibility that nearly all obsidian thin bifaces at Tikal were imported in finished form from the Basin of Mexico (Moholy-Nagy 1999:304).

For Early Classic Copán Aoyama also suggests that the importation of finished green obsidian artifacts from central Mexico was politically motivated. In contrast to the interregional pattern exploiting the highland Guatemalan Ixtepeque obsidian source, green obsidian artifacts were imported in finished form at low volume by the dynastic elites of Copán, but not by elites in neighboring regions.

“While nearly all obsidian continued to be procured from Ixtepeque, as in previous periods, Yax K'uk' Mo' may have started to obtain small numbers of finished artifacts (primarily prismatic blades, but also small quantities of bi-facial points) from highland Mexico, including the green obsidian from the Pachuca source. The import of green obsidian artifacts was a low-volume undertaking. However, the percentage of green obsidian (9.8%) in obsidian artifacts (N = 82) from the Yax Structure, which Yax K'uk' Mo' commissioned, is one of the highest in the Classic Maya lowlands. This percentage is lower than that found for some single deposits at Tikal (Laporte 1988:170, 172) but higher than that of Guatemalan highland sites such as Kaminaljuyu (Kidder et al. 1946:136, 138). Also notable is the near absence of green obsidian in regions neighboring Copan, such as Quirigua (Stross et al. 1983:335), the region of La Entrada, and Chalchuapa (Sheets 1978:13).” (Aoyama 2001:352)

Most of the grey obsidian in Teotihuacán came from the Otumba source, 16 km to the east of the urban center (Spence and Parsons 1972; Charlton 1978a:1229-1230). This Otumba obsidian was used primarily for biface and scraper production, and for the production of blanks for export (Spence 1981:772). The green obsidian of the Pachuca source was dominantly used in polyhedral core form for blade manufacture, but was also frequently employed in scraper production (Spence 1981:774-775). At Tikal, Mexican
obsidian, either green or grey, appears by the Late Middle Preclassic period and continues in use until the Early Postclassic period (Moholy-Nagy 1999). Many thin bifaces were made from green obsidian originating at the Pachuca source, hypothesized to have been controlled by Teotihuacán (Sanders et al. 1979; Santley 1983, 1986; Spence and Parsons 1972; Spence 1981). The number of thin bifaces at Tikal which were made from highland Mexican grey or black obsidian is unknown, but appears to be a significant proportion.

From a formal economic standpoint, importing obsidian from highland Guatemalan sources in the 300 km range should entail about 1/3rd the cost of importing obsidian from the Basin of Mexico, at 1000 km distance. However, we do not know the organization of obsidian procurement and do not know what other activities followed this trade. Cacao, cotton, jade, copal, marine shell, and feathers may have entered Teotihuacán through Maya trade networks (Millon 1988:122), though it has been argued that this trade was small in volume and restricted to a few imported goods desired as status markers or for conspicuous consumption by the Teotihuacán elite (Clark 1986:64-68; Spence 1996:34). While the Peten is noted for having tropical forest products which would facilitate exchange with Central Mexican trading partners, it is assumed that these must be the same products used to exchange for obsidian with the less distant highland Guatemalan sources, unless a direct procurement model is favored – at which point, a 600 km round trip to highland Guatemalan sources would seem favorable to a 2000 km round trip into the Basin of Mexico – 3 and 1/3rd times more favorable. Still, the volume of exchange seems low and unlikely to represent a commercial enterprise for the lowland Maya or for the Teotihuacánoes.

While the application of formal economic models to preindustrial, primitive or ancient cultures is a debatable subject, at Tikal and other lowland Maya centers, the recovery of green Mexican obsidian has always been viewed in terms of cultural contact with the Basin of Mexico (Brown 1977; Clark 1986; Kidder 1947:10; Moholy-Nagy et al. 1984; Sanders 1977; Spence 1977, 1981, 1996). These hypotheses have included
commercial oriented traders moving south out of the Basin of Mexico, Teotihuacán warriors entering the Maya lowlands in conquest, and ‘elite interaction spheres’ in which the elites of peer-polities gift-exchanged goods on infrequent, but important political forays. It seems likely that a mixture of exchange events of differing natures accounts for the known distribution of Mexican obsidian in the Maya Lowlands. Perhaps no single institution held a monopoly over obsidian procurement, production or distribution, though this is far from clear.

“Hypotheses presented to explain these finds [of green obsidian in the Maya lowlands] have ranged widely, from incursions by Teotihuacan military forces (Agrinier 1970:81-82; Kidder et al. 1946:255) through the occasional activities of merchants or political emissaries (Brown 1977; Sanders 1977) to inter-elite exchanges of status-related items (Clark 1986:65-67; Kidder 1947:10; Spence 1977:295). In fact, it is unlikely that any single explanation accounts for all these occurrences; they vary too much in location, content, and context to be the result of only one process (Bove 1990:141-142; Hoopes 1985:150).” (Spence 1996:21-22)

In his examination of Teotihuacán-related ceramics found in the Maya region, Joe Ball (1983) concluded that the recovery contexts expressed personal relationships between Teotihuacán and Maya elite personages. Ball notes that imported Teotihuacán-type ceramics at Maya centers come predominantly from burials to the exclusion of structural caches, suggesting that individuals and not groups were the relevant social actors involved in these exchanges. The ceramics were presented to the individuals, either in life or as part of their funerary offerings as posthumous gifts (Ball 1983:138-143).

The prismatic blade industry utilizing obsidian imported from highland Guatemalan sources should not be overshadowed by the presence of obsidian artifacts of central Mexican origin or raw material. The Tikal data support a model of highland Guatemalan obsidian importation expressly for the production of prismatic blades which were circulated, at low volume, to all portions of the center and periphery. The majority of eccentric forms and macro debitage from obsidian reduction recovered from epicentral
contexts at Tikal also suggest that prismatic blade production was the primary goal. The recovery of obsidian debitage deposits from household contexts suggests that some manufacturing also occurred at the household level. We do not know what percentage of blade production occurred in the epicenter, center, and periphery, or how the blades were circulated. Moholy-Nagy feels confident that full-time specialist producers were engaged in production for exchange at an epicentral marketplace as well as through a complex market system reaching the entire population of Tikal. She reconstructs this market system as a dendritic or solar system, implying that peripheral inhabitants may not have been integrated into the system to any great degree.

The very low recovery rate of obsidian from our PST Project peripheral excavations suggests that obsidian simply was not consumed in great quantities by normative agrarian households. Nearly all obsidian recovered from peripheral household test-pits appears to have originated in the Guatemalan highlands and was used to produce prismatic blades.

9.3 – Chert at Tikal

In contrast to imported obsidian, locally available cherts of varying quality were used for chert flake and tool production at Tikal. Various reduction paths have been described for transforming chert nodules into bifacial tools, including initial end striking, nodule splitting, longitudinal splitting, and skimming (Aldenderfer 1991:124-127, Figure 2). The ovoid biface or celtiform axe was the most common formal tool form recovered during our peripheral excavation program at Tikal (N=38). Specimens range from crude attempts, rejects, and failures to finished forms that were broken after being well-used. Some chert bifacial tools recovered from the Tikal-Yaxha transect excavations (Ford 1981, 1986) are characterized as unfinished or uncirculated tools as well.

“Some may well be ‘practice,’ others blanks, and still others core fragments. Many are probably rejects, discarded and unfinished due to premature breakage, discovered impurities, or ‘problem’ pieces too difficult to reduce further.” (Aldenderfer 1991:128)
Terminal errors related to internal voids and other inconsistencies in the structure of the local Tikal cherts are apparent in many of the specimens recovered. Some crude bifaces may have primarily served as flake cores, not finished tools. At least one broken biface fragment has percussion wear on multiple surfaces indicating it was reused as a hammerstone.Crudely reduced bifacial implements could also have been used to re-peck the surfaces of metates. The majority of chert recovered from peripheral excavations at Tikal relates to household production of expedient chert flakes from multidirectional cores. Evidence of bifacial tool manufacture was rarely encountered. We did not recover any evidence for intentional chert prismatic blade manufacture. Although a couple specimens look like blades, these were likely unintentionally produced from a multidirectional core, not systematically extracted from a polyhedral chert core.

Chert occurs naturally in the Peten in concentrated outcrops or as isolated nodules covered in a grainy whitish-yellow cortex. Large chert nodules from 10-30 cm in length can be found scattered over the surface or within the first 20 cm of soil in low lying (bajo) areas. Nodules are usually spherical, ovoid, or bi-convex in shape. Chert nodules and chert debitage were more common in the bajo directly to the west of central Tikal. Fedick (1991) reports that chert nodules are also common in the area to the southeast of Tikal, between Tikal and Yaxha.

“Chert nodules are commonly found in the Tikal-Yaxha area eroding from ridges of limestone bedrock as well as scattered across the surfaces of bajos (swamps) where they are brought to the surface through the vertic activity of heavy clay soils (D. Puleston1973:233-234; Cowgill and Hutchinson 1963:12; Duffield 1970:1056; Thomas 1981). Inspection of chert nodules in the Tikal-Yaxha survey area indicated a great deal of variability in chert texture and color within deposits as well as individual nodules.” (Fedick 1991:112)

Tikal cherts range in color from light grey and pink to rose, tan, yellow, and buff. Colors comingle within the same nodule and flakes or bifacial tools often have streaks or mottling of multiple colors. The majority of chert available locally is medium grained, although courser and finer cherts are also present in lower quantities. Occasional blue or
dark grey specimens fall outside the normal color range, but may be local in origin as well. Fine-grained, semi-translucent whitish-yellow chalcedonies are also local in origin.

Cherts recovered from predominantly Late Classic contexts (A.D. 600 – 830) during the CPHEP survey around Lake Yaxha range in color from white to grey, pink, and red, with some darker reddish browns and pale yellow to deep yellow-brown material. Aldenderfer (1991:123) suspects that some of the light pink, red, and reddish brown cherts resulted from pyroclastic effects. Other rare colors of fine grained cherts around the lakes are deep blue, blue-black, deep grey, and brown-black; it is not known if these are local. Three percent of the lithic assemblage recovered by the CPHEP was pink to red (sometimes streaked) translucent or semi translucent chalcedonies which occur locally.

**Formal Tools**

We recovered 53 whole specimens and fragments of formal bifacially worked tools made from local cherts from 29 peripheral household excavations (Table 9.3.1). Ford (1981) recovered 26 formal chert tools and fragments from twenty-three .75 x 2 m test-pits placed in 13 residential groups throughout the Tikal-Yaxha intersite area (Fedick 1991). These implements are fairly abundant, occurring at most households in low volume. At Tikal the majority of bifacial tools recovered from household excavations are celtiform axes. These medium to large bifacial implements were usually made from medium or coursegrained local chert, although one specimen was manufactured from a fine-grained semi-translucent chalcedony (Figure 9.3.1). Recovered fragments weigh about 120 g on average, and the mean number recovered is 1.3 per household. Elongated “picks” are slimmer and longer bifacial implements with ground smooth tips. Two of the six specimens we recovered have clear evidence of laborious polishing where the distal tip is broken off (Figure 9.3.2). Projectile points were found only at the two largest groups (Group 1 and Group 45) within the northern earthwork corridor. We excavated 2 x 2 m test-pits straight through extensive middens over a meter in depth at each of these
households. One fine-grained light brown laurel leaf chert point (resharpened) was recovered from an Early Classic level of the Group 1 midden (Figure 9.3.3). The midden abutting the main plaza of Group 45 produced one fine chalcedony projectile point (Figure 9.3.4) and two obsidian points, one stemmed and one ovoid (see Figures 9.2.1 and 9.2.2). Two stemmed chert projectile points were also surface collected from the main plaza of Group 45.

The distribution of formal tools is fairly widespread; no elevated concentrations of specific tool forms indicate production or hoarding (Table 9.3.2). Some formal chert biface tools we recovered are clearly more uniform and carefully crafted than others, but it is difficult to say which tools were likely manufactured by full-time specialists. John Clark has noted that a tool produced by a specialist may not be qualitatively different from a tool produced by a non-specialist (Clark 1986:45). Aside from a lack of projectile points outside the two households of the northern earthwork corridor, only one group produced unusual chert tool concentrations. A shallow 2 x 2 m test-pit at the single structure Group 11B produced four large fragments of well-made fine-grained brown chert thin bifacial knives (Figure 9.3.5). The thin bifaces were mixed with abundant Late Classic sherds and chert debitage overlying a filled chultun. We did not excavate the chultun, which had evidently been entirely filled with refuse. I suspect that this single structure may have been a workshop or outbuilding for the residents living at Group 11A. The chert debitage does not appear to relate to the production of thin bifaces or any other bifacial form. The presence of the broken thin biface knives or points is anomalous. It is unknown why these superior specimens were broken and discarded at this unassuming location.
Table 9.3.1 – Formal chert implements recovered from PST Project excavations, 2005-2006.

<table>
<thead>
<tr>
<th>Op.</th>
<th>Group</th>
<th>Form</th>
<th>Fragment</th>
<th>Texture</th>
<th>Color</th>
<th>wt. (gr.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.2.2</td>
<td>Puleston &quot;B&quot;</td>
<td>Medium/Large Celtiform Axe</td>
<td>proximal 1/3rd</td>
<td>Course</td>
<td>mottled grey</td>
<td>108</td>
</tr>
<tr>
<td>6.1.1</td>
<td>G1</td>
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<td>distal ½</td>
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<tr>
<td>7.3.2</td>
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<td>Medium/Large Celtiform Axe</td>
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<td>Medium</td>
<td>mottled pink into grey</td>
<td>35</td>
</tr>
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<td>7.3.10</td>
<td>G1</td>
<td>Medium/Large Celtiform Axe</td>
<td>Medial</td>
<td>Course</td>
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<td>24</td>
</tr>
<tr>
<td>7.4.1</td>
<td>G1</td>
<td>Medium/Large Celtiform Axe</td>
<td>complete?</td>
<td>Medium</td>
<td>grey</td>
<td>235</td>
</tr>
<tr>
<td>G1E1</td>
<td>G1</td>
<td>Medium/Large Celtiform Axe</td>
<td>proximal</td>
<td>Medium</td>
<td>pink/rose/grey/dark grey</td>
<td>229</td>
</tr>
<tr>
<td>13.1.0</td>
<td>G11A</td>
<td>Medium/Large Celtiform Axe</td>
<td>distal 1/3rd</td>
<td>Fine</td>
<td>buff w/ blueish patina</td>
<td>86</td>
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<tr>
<td>15.1.2</td>
<td>G11B</td>
<td>Medium/Large Celtiform Axe</td>
<td>medial - 50%</td>
<td>Medium</td>
<td>pink to grey</td>
<td>72</td>
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<tr>
<td>15.1.2</td>
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<td>distal 1/3rd</td>
<td>Fine</td>
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<td>35.2.1</td>
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<tr>
<td>35 sc</td>
<td>G43</td>
<td>Medium/Large Celtiform Axe</td>
<td>complete blank</td>
<td>Course</td>
<td>Grey</td>
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<tr>
<td>37.1.2</td>
<td>G45</td>
<td>Medium/Large Celtiform Axe</td>
<td>proximal 1/3rd</td>
<td>Fine</td>
<td>pink to grey</td>
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<tr>
<td>37.1.3</td>
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<td>37.1.3</td>
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<td>37.2.2</td>
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<td>Medium/Large Celtiform Axe</td>
<td>proximal 1/3rd</td>
<td>Medium +</td>
<td>Purple</td>
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<td>G45</td>
<td>Medium/Large Celtiform Axe</td>
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<td>Medium</td>
<td>pink/grey mottled puple/maroon</td>
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<td>complete implement</td>
<td>Medium</td>
<td>buff w/ blue and maroon streaks</td>
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<td>G3</td>
<td>Medium/Large Celtiform Axe</td>
<td>distal</td>
<td>Medium</td>
<td>Pinkish [2.5yr 8/1 - 8/2]</td>
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<td>39.1.2</td>
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<td>Medium</td>
<td>Grey</td>
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<tr>
<td>40.1.2</td>
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<td>89</td>
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<td>G44</td>
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<td>Course</td>
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<td>115</td>
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<tr>
<td>103.1.2</td>
<td>W Earthwork</td>
<td>Medium/Large Celtiform Axe</td>
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<td>Medium to Fine</td>
<td>yellow w/ rust striations</td>
<td>138</td>
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<tr>
<td>112.1.2</td>
<td>S Chalpate</td>
<td>Medium/Large Celtiform Axe</td>
<td>distal 1/3rd</td>
<td>Medium to Fine</td>
<td>like Belize brown</td>
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<tr>
<td>113.2.1</td>
<td>Ramonal</td>
<td>Medium/Large Celtiform Axe</td>
<td>complete blank</td>
<td>Course</td>
<td>Grey</td>
<td>167</td>
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Table 9.3.1 continued – Formal chert implements recovered from PST Project excavations, 2005-2006.

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<td>Grey</td>
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Table 9.3.1 continued – Formal chert implements recovered from PST Project excavations, 2005-2006.

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Total = 8604
Table 9.3.2 – Distribution of formal chert implements from PST Project excavations, 2005-2006.

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<th>Projectile points - Obsidian</th>
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Figure 9.3.1 – Celtiform axe made on fine-grained semi-translucent chalcedony from Group 3 (Operation 39.1) (note – white color is from patina).
Figure 9.3.2 – Example of an elongated “pick” bifacial chert implement from a test-pit set within the settlement east of Ramonal, Operation 114.3 (top – dorsal surface, bottom – ventral surface; note polishing at broken end (left) in lower (ventral) photo).
Figure 9.3.3 - Resharpened laurel leaf point made on light brown fine-grained chert, from Group 1 midden (Operation 7.3).
Figure 9.3.4 - Bifacial point made on fine-grained semi-translucent chalcedony, from Group 45 (Operation 37.1).
These thin bifaces made on fine-grained brown chert were finished with pressure flaking. It is unknown whether these implements represent local production or were imported in finished form. The fine-grained brown chert superficially resembles Colha chert. We recovered a few fragments of fine-grained brown chert celtiform axes and a partially skimmed nodule of this fine-grained brown chert (Figure 9.3.6), suggesting that some nodules of the material were available locally. Direct percussion for flake production is clear from flakes with distinct bulbs of percussion and the presence of hammerstones and multidirectional cores. One large hammerstone was spherical, but a smaller hammerstone was recycled from the broken proximal end of a celtiform biface. The implement has light percussion wear on multiple surfaces and may have been used in the latter stages of biface production.

Debitage

All residential off-plaza test-pits produced chert flakes consistent with expedient tools production for household consumption. Two midden deposits produced unusual finds. A clustered deposit of 156 chert flakes came from a midden deposit from the minor center of Ramonal. The deposit likely represents a single basketload of flakes between ¾ and 2 inches long (2 – 5 cm) from the reduction of a single nodule, perhaps the manufacturing of a single biface tool. Cortical flakes formed 20% of the basketload by number and over 40% by weight. Nine percent of the cortical flakes had 100% cortex covering their dorsal surface, 29% had over 50%, and 66% of the cortical flakes had less than 50% cortex. Whole and snapped non-cortical flakes formed almost 60% of the basketload by number and 55% by weight. The basketload of deposited flakes appears to be the byproduct of a nodule reduction sequence. Some initial cortex removal is not represented and no distinctive bifacial thinning flakes were recovered suggesting that the deposit was secondarily dumped and does not represent the entire production sequence for manufacture of a bifacial tool. We found no other similar deposits of clustered reduction flakes in any other midden.
Figure 9.3.5 - Thin bifaces made from fine brown chert recovered from Group 11B (Operation 15.1).
Figure 9.3.6 – Partially worked (and snapped) nodule of fine-grained brown chert recovered from Ramonal (note the remaining cortex and internal void).
Over 11% of the chert flakes recovered from the test-pit placed into the 1.7 m-deep stratified midden at Group 1 are large chert bifacial thinning flakes, up to 3 ½ inches long (9 cm). We recovered over 1000 chert flakes from this 2 x 2 m excavation, more than any other excavation. These large biface thinning flakes have use wear on all edges, and do not represent the primary deposition of debitage. They are production byproducts removed from primary production context and used as expedient cutting flakes without further modification.

Group 1 was the first household investigated in 2005. The group is located just to the west of the north transect 4.6 km north of epicentral Tikal. Twelve structures surround two plazas at Group 1. The long eastern building of the main plaza had been extensively looted and contained three large burial chambers. Group 1 lies directly in the projected path of the northern earthwork although there is neither a ditch nor an embankment present at this particular point. Group 1 was the only household where bifacial thinning flakes were recovered in abundance (Figures 9.3.7 – 9.3.10). By Manik IIIA times, the midden had begun forming with the disposal of sherds and lithics behind what would eventually become a low structure platform on the west side of the main plaza, deposited directly on bedrock. Sometime near the end of the Early Classic period, the midden was covered by a stucco floor and domestic debris ceased being deposited for some time. In Imix times this location was again used for the disposal of refuse. Imix sherds were discarded directly over a log fire which had been built on the stucco floor, and the midden continued to grow until abandonment of the group.

The practice of using bifacial thinning flakes as expedient tools had a long history at Group 1. Some residents of the Group 1 household probably specialized in making chert bifacial tools, or else the Group 1 household received production debris from another household that produced them. The bifacial thinning flakes are substantial and up to 9 cm long. These bifacial thinning flakes are superior cutting implements and were likely
Figure 9.3.7 – A typical lot of chert flakes from the Group 1 midden [lot 7.3.4], note the lack of cortex.
Figure 9.3.8 – Bifacial thinning flakes sorted from the Group 1 midden [lot 7.3.4] (top – dorsal surfaces; bottom – ventral surfaces).
Figure 9.3.9 – Bifacial thinning flakes sorted from the Group 1 midden [lot 7.3.12] (top – dorsal surfaces; bottom – ventral surfaces).
Figure 9.3.10 – Bifacial thinning flakes sorted from the Group 1 midden [lot 7.3.14] (top – dorsal surfaces; bottom – ventral surfaces).
retrieved from production debris for the intended purpose of use as expedient tools in a domestic setting. It is also possible that these flakes were used in some repetitive task associated with the production of some other good. It is clear that the Group 1 residents had access to these production by-products and used them consistently. No other tested household consistently produced bifacial thinning flakes; all other lithic assemblages represent impromptu removal of flakes from multidirectional cores for use as expedient tools. Two 2 x 2 m test-pits and a 10 x 1 m trench were excavated around Group 1. These excavations produced only slightly more bifacial tools than the majority of households tested. The presence of the bifacial thinning flakes at just this group is anomalous and they are concentrated in the dense off-plaza midden only.

**Diversity of Chipped Stone Artifacts**

The two largest groups within the northern earthwork corridor, Group 1 and Group 45, did have slightly richer artifact assemblages than other households tested. The richest collection of lithic artifacts was recovered from Group 45 at the western end of the northern earthwork corridor. Group 45 has 21 structures arranged around five plazas. The main plaza group is upslope from the rest of the sprawling extended household compound. This main plaza has four long buildings on its north, south, west and east sides. Operation 37.1 was a 2 x 2 m test-pit placed to the exterior of the main plaza in the southwest corner. We recovered mostly Imix ceramics from the one meter deep deposit abutting the plaza platform. The excavation into this midden produced only 29 chert flakes but also several bifacial tools and tool fragments made from chert, a chalcedony projectile point, and two obsidian projectile points. One of the obsidian projectile points is a stemmed point made from opaque grey obsidian with symmetric wide striations likely from the Otumba quarry; the form of the point is congruent with central Mexican norms (see Figure 9.2.1). The other obsidian point recovered from the Group 45 midden is ovoid in shape and made from darker, shinier black obsidian (see Figure 9.2.2). We also recovered two stemmed chert projectile points from the surface of the main plaza at Group 45 (Figure 9.3.11).
Slightly to the south of this excavation, at a lower plaza level, we recovered more bifacial chert implements, a direct percussion hammerstone, and two partially reduced chert nodules. One was clearly a multidirectional core for removing expedient chert flakes and the other was an early stage failure at bifacial reduction. The 2 x 2 m test-pit (Operation 37.2) reached a depth of 70 cm but produced only 71 pieces of chert. These represent impromptu expedient tool production, not bifacial reduction. Each of the two test-pits at Group 45 produced one solid figurine head. The counts of bifacial tools from Group 45 are presented in Tables 9.3.3 and 9.3.4.

Table 9.3.3 – Bifacial tool counts from Group 45.

<table>
<thead>
<tr>
<th>Group 45 - Op. 37.1</th>
<th>Group 45 - Op. 37.2</th>
</tr>
</thead>
<tbody>
<tr>
<td>3 chert celtiform axes</td>
<td>4 chert celtiform axes</td>
</tr>
<tr>
<td>1 chert tapered biface (Figure 9.3.12)</td>
<td>1 early stage bifacially reduced nodules</td>
</tr>
<tr>
<td>2 stemmed chert projectile points</td>
<td>1 multi-directional chert core</td>
</tr>
<tr>
<td>1 chalcedony projectile point</td>
<td>1 hammerstone</td>
</tr>
<tr>
<td>1 stemmed obsidian projectile point</td>
<td></td>
</tr>
<tr>
<td>1 ovoid obsidian projectile point</td>
<td></td>
</tr>
</tbody>
</table>

The Group 1 midden produced several bifacially worked formal chert tools and fragments; several more were surface-collected from the plaza. One nearly whole projectile point made from fine-grained light brown chert is the only finished item comparable to the Group 11B thin bifaces in quality of material and skill in knapping (see Figure 9.3.3). Both Group 1 and Group 45 were sampled by deep test-pits through substantial residential middens directly abutting their main plazas. Surface survey and additional excavations collected even more cultural materials. In this respect, the lithic inventories of these two large households along the northern earthwork should be representative of “wealthy” household assemblages.
Figure 9.3.11 – Two stemmed chert points surface collected from Group 45.
Figure 9.3.12 – Chert tapered biface from Group 45, Operation 37.
Table 9.3.4 – Group 45 and Group 1 lithic inventories (excluding expedient chert flakes).

<table>
<thead>
<tr>
<th>Group 45 total</th>
<th>Group 1 total</th>
</tr>
</thead>
<tbody>
<tr>
<td>7 chert celtiform axes</td>
<td>4 chert celtiform axes</td>
</tr>
<tr>
<td>1 chert tapered biface</td>
<td>1 chert elongated pick</td>
</tr>
<tr>
<td>1 early stage bifacially reduced nodules</td>
<td>3 early stage bifacially reduced nodules</td>
</tr>
<tr>
<td>1 multi-directional chert core</td>
<td>1 fine-grained chert projectile point</td>
</tr>
<tr>
<td>1 hammerstone</td>
<td>1 stemmed chert projectile point</td>
</tr>
<tr>
<td>2 stemmed chert projectile points</td>
<td>20 obsidian blade segments</td>
</tr>
<tr>
<td>1 chalcedony projectile point</td>
<td>165 bifacial thinning flakes (chert)</td>
</tr>
<tr>
<td>2 obsidian projectile points</td>
<td></td>
</tr>
<tr>
<td>5 obsidian blade segments</td>
<td></td>
</tr>
</tbody>
</table>

A single 2 x 2 m test-pit at the very modest single structure Group 11B produced 3 celtiform axe fragments and 5 thin biface fragments made from fine-grained brown chert. Only 134 chert flakes were recovered from the test-pit and 40% of these were cortical flakes. The flakes, or debitage, do not reflect bifacial reduction, they represent expedient removal of flakes used without modification. The fine-grained chert thin bifaces are unique in the lithic assemblage recovered from all of our excavations. These may represent implements imported in finished form, or they could have been produced by local knappers exploiting rare local fine-grained chert nodules. The quality of the raw material and the skill of the knapper in producing these implements suggest that they were either produced by the resident of Group 11B themselves, or received from another household, expressly for use in some special purpose activity.

None of the households sampled had excessive inventories of lithic tools clearly indicative of production for exchange. The “wealthiest” household lithic assemblages had only a few additional implement forms or the occasional imported obsidian point. The Group 1 midden deposit demonstrates that the residents of this group had greater access to large chert bifacial thinning flakes which they used as expedient flake tools and discarded immediately adjacent to their household. The tabulation of flake types and percentages collected from The Group 1 midden demonstrates that these residents had a lithic
assemblage at least partially derived from bifacial chert tool production and distinctive in composition from other households investigated (Table 9.3.5).

By weight, less than 15% of the Group 1 chert flakes have any cortex. Fifty percent of the flakes were snapped and bifacial thinning flakes make up over 16% of the assemblage by number or by weight. This suggests that the assemblage was either entirely or partially produced during bifacial reduction. It is uncertain whether chert nodules were bifacially reduced at Group 1 or if bifacial thinning flakes were brought in from another location. As no other households tested produced quantities of bifacial thinning flakes, it is likely that the residents of Group 1 were involved in the bifacial reduction of chert nodules, either within their household compound or outside of it. Although we recovered more chert flakes from the Group 1 midden than any other excavation, the quantity suggests fairly low intensity knapping. Of course, the bifacial thinning flakes were removed from their primary production context and were used as flake tools before being deposited in the domestic midden. It is difficult to estimate bifacial tool production levels from the bifacial thinning flakes recovered from secondary context. Aside from occasion indirect evidence, no excavations produced strong evidence that peripheral residents were specializing in the bifacial reduction of chert.
Table 9.3.5 – Lithic flake inventories recovered from select PST Project excavations.

### Op. 7, Group 1

<table>
<thead>
<tr>
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<th>%</th>
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<th>%</th>
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<td>21.5</td>
<td>2227</td>
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<td>snapped</td>
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<td>45.6</td>
<td>2665</td>
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<td>shatter</td>
<td>40</td>
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<td>84</td>
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<td>BTF</td>
<td>114</td>
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<td>1045</td>
<td>11.7</td>
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<tr>
<td>snapped BTF</td>
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<td>5.0</td>
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### Op 15.1, Group 11B

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### Op. 37.1, Group 45

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<td>snapped</td>
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<td>6.9</td>
<td>29</td>
<td>6.6</td>
</tr>
<tr>
<td>shatter</td>
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### Op. 37.2, Group 45

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<td>54</td>
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<td><strong>totals=</strong></td>
<td>71</td>
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<td>969</td>
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9.4 – Ceramics from the Peripheries of Tikal

General Character

The majority of pottery sherds collected during our 2005 and 2006 field seasons came from household refuse deposits sampled by test-pit excavations. Both utilitarian pottery and serving wares were abundant in household excavations. Utilitarian forms include jars, large bowls, and basins (i.e., tinajas, tamaleros); serving wares are represented in plates, dishes, small bowls, beakers, and cylinders. Serving wares are often decorated with polychrome or incised designs. Ceramics recovered from household plaza groups within the northern settlement corridor following the earthwork as well as at the minor center of Ramonal/Chalpate are strikingly similar, with many inventories containing near identical forms with similar slipping, painting, and plastic design schemes. Much of the Tikal pottery recovered was well preserved with complete polychrome preservation. Judging from paste and form and occasional traces of slip, many of the less-well preserved sherds recovered from the first 30 cm of test units were originally slipped and/or painted.

During our test-pitting program, ceramics were the most abundant artifact class recovered. Sometimes a few sherds were found ‘floating’ in the excavated soil matrix; other times dense concentrations of sherds suggest primary deposition. Although I refer to test-pit samples as coming from domestic refuse or midden context, it should be noted that the term “midden” is a catch-all term. Refuse deposits were characterized by variable densities of sherds. Some refuse concentrations contained abundant sherds that were large with fresh breaks while others were characterized by numerous small, battered, and heavily weathered sherds. Figure 9.4.1 shows the conventions used for sherd illustrations.

“If one defines a midden as an archaeological deposit left untouched by cultural or natural processes after being discarded by the ancient inhabitants of a site, such deposits are rare at Tikal or any other major Maya site. Stratified middens – deposits in which middens accumulate stratigraphically over long intervals of time – are almost unknown.” (Culbert 2003:49)
Figure 9.4.1 – Ceramic illustrations convention key.

Color bars with solid vertical lines indicate definite colors, while dashed vertical lines indicate less certainty—that there were only traces of slip or that designs in other colors were or were possibly present over the base slip.

The reconstructed diameter of the vessel is indicated by a horizontal line drawn from the sherd towards the right. A vertical line at the right end of the horizontal diameter line indicates that the tilt angle of the sherd could definitely be ascertained. Solid diameter lines, as in example A and B, indicate that the diameter is secure while dotted lines, as in examples C and D, indicate a lesser degree of certainty. In example C, a second tilt angle has been draw to indicate a range in the possible orientation of the sherd. The lack of a vertical line at the right end of the diameter line in Example D indicates that the diameter could not be ascertained.

Interior color bars are placed to the left of the end of the diameter line, as in examples A, B, and C. Exterior color bars are placed either to the right of the diameter line, as in examples A, or to the left of the sherd profile, as in examples B and D. In example A, the exterior color bar with solid lines indicate a definite black monochrome exterior. The dashed vertical lines of the interior color bar indicates the presence of a black base slip—in this case an orange application covered the black base slip. In examples B and C, the dashed vertical lines of the interior color bars indicate that these are polychrome vessels with orange base slips. Only traces of black and red design elements were present in example B. In example C, a black rim band and wide red band below the rim were clearly present; other designs may have also been superimposed originally.

All sherd profiles are illustrated at one-third scale unless otherwise noted.
Stratified middens covering long, uninterrupted time periods were rarely encountered by our project. Most household artifacts come from shallow accumulations of discarded materials, often no more than 40 cm deep. These range in density from “sheet middens,” representing fairly dense horizontal deposits, to sporadic discards immediately adjacent to domestic spaces. What I refer to as sporadic discards may also represent the remaining sherds from the bottom of a midden accumulation left behind when the bulk of the midden was removed and used as structure fill (see Culbert 2003:49-50; Culbert et al. 1990:105-106; Fry 1990:288). Even deeper accumulations of midden debris are characterized by larger sherds of a single ceramic complex, not slow accumulations representing five-hundred-year periods of time.

Excavations at some larger groups with somewhat ‘wealthier’ artifact inventories did produce an abundance of polychrome sherds which represent hard-fired Saxche group barrels, bowls, and plates or dishes (i.e., serving wares) of the Ik ceramic complex (A.D. 550 – 700). Imix ceramic complex (A.D. 700 – 850) dishes, bowls, cylinders, and barrels were also common in our excavations. Well executed and finely decorated polychrome pottery was recovered from both large and small groups. Polychrome ceramics of the Saxche and Palmar ceramic groups were more abundant at larger groups (i.e., Group 1, Group 45) along the northern corridor than at smaller ones (i.e., Group 11B, Group 4), although this was probably influenced to some extent by the greater preservation of sherds in deeper midden deposits abutting taller plaza platforms.

No substantial Preclassic deposits were located during excavations. Preclassic sherds are generally rare in our catalog, and all date to the Late Preclassic period (Cauac-Cimi ceramic complex) (Figures 9.4.2). Excavations in the northern periphery, between 4.6 km and 6 km from the site epicenter, produced weathered Late Preclassic sherds. A few Cauac ceramic complex sherds were found in excavations in and around the large two-plaza Group 1. These are waxy red sherds of the Sierra Red ceramic group, either short neck jars or medial flanged large bowls. Very few Preclassic sherds were found, even in mixed lots at the
Figure 9.4.2 – Preclassic sherds from the PST Project excavations, captions.


B. 7.4.1a – Sierra Red. Medial-flanged deep bowl or dish rim. Waxy red monochrome exterior and interior.

C. 9.2.1 – Sierra Red. Wide everted and grooved dish rim. Waxy red monochrome slip exterior and interior.

D. KS0095 – Sierra Red. Medial-flanged deep bowl or dish rim. Waxy red monochrome exterior and interior.

E. 111.2.3 #2 – Sierra Red. Everted and grooved dish rim. Waxy red monochrome slip exterior and interior.


I. KS0094 – Sierra Red. Large lid. Waxy red monochrome exterior and interior.


Figure 9.4.2 Preclassic sherds from the PST Project excavations, 2005-2006.
bottoms of deeper excavations. A few well preserved Preclassic sherds (Flor Cream and Polvero Black) come from testing a barely visible informal structure group (Group 10) within the northern corridor, and some small, battered Preclassic sherds were identified from the excavations which trenched through the northern ditch and earthwork configuration where Puleston had placed his excavation trenches in the late 1960s. Excavations in the west sector produced no evidence of Preclassic occupation.

Testing off-plaza in the heart of the main Ramonal complex did produce Late Preclassic sherds (Laguna Verde Incised and Sierra Red jars) mixed at the base of the plaza platform at a depth of about one meter. Although not a primary deposit, the inclusion of orphaned Late Preclassic sherds overlying bedrock where a Late Classic midden later accumulated suggests two things. First, there was some kind of Late Preclassic occupation in the area, but most evidence of it was eradicated by subsequent building activity. Second, refuse that accumulated near architectural complexes, large and small, was probably reused as construction fill. This practice is both previously attested to and allegedly rare at Tikal (Fry 1990:288). Brenda Lou (1997) also reported an unbroken sequence of ceramics at Chalpate from Late Preclassic through Terminal Classic times.

The Early Classic is not well represented in the test-pitting program. Early Classic sherds appear in mixed lots from some households tested and in surface collections from disturbed structure cores. The most extensive primary deposit of Early Classic ceramics came from a deep 2 x 2 m test-pit placed off the western side of the plaza behind a low structure foundation at Group 1. Although it extended to a depth of 1.7 m below ground surface, this deposit did not turn out to be an unbroken stratigraphic midden. The lowest levels of this refuse deposit indicate a date prior to Manik 3A (A.D. 378) when the midden appears to have been growing incrementally with the deposition of sherds and utilized chert flake tools. During late Manik times the midden was stuccoed over with a 10 cm floor. On top of this newly prepared floor a log fire was built and subsequently the area started to accumulate Late Classic (mostly Imix phase) debris on top of the earlier Manik midden.
Although the ceramic sequence has a noticeable temporal gap during Ik times (A.D. 550 – 700), sherds from the surface of the plaza and other nearby looted mounds produced plenty of Ik material, including some of the finest Saxche ceramic group pottery recovered.

Our excavations produced mixed Terminal Manik/Early Ik occupation levels that contained early forms of Ik lateral-ridge tripod plates, as well as Manik horizon markers such as Urita Gouged-incised and Lucha incised types, indicating a ca. A.D. 550 – 600 date. Other deposits were purely Ik in date and still others contained a mix of Ik and Imix sherds. The overwhelming majority of recovered pottery was Late Classic in date, corresponding to the demographic peak in population at Tikal. Late Classic ceramic assemblages contained significant percentages of polychrome pottery of the Saxche and Palmar ceramic groups. Tripod dishes were a common temporal horizon marker. Both Ik ceramic complex lateral-ridge and deeper Imix ceramic complex slightly outflaring-walled tripod dishes sherds were decorated with polychrome, bichrome, and monochrome slipping/painting.

**Ceramics Recovered from the Earthwork Embankment**

One focus of our project was determining when the earthwork segments were constructed. Ceramic sherds recovered from the earthwork berm provide our only recourse for establishing any sort of chronological construction sequence for the various earthwork segments. Unfortunately, it was rare to recover even a few weathered sherds from any excavation through the earthwork berm. Puleston and Callendar reported one “definitely Early Classic rimsherd” recovered from below the embankment of the northern earthwork, which, along with the pattern of disuse around this “causeway” suggested that the earthwork was constructed during Manik times and fell into disuse during Ik times. Excavations through the embankment of the earthwork segments conducted by the PST Project encountered three deposits of dateable ceramics.
A. Six Late Preclassic sherds of the Sierra Red ceramic group were recovered from Operation 1, a reexamination of Dennis Puleston’s excavation “B” (Puleston and Calendar 1967). The stratigraphic profile of this trench through the earthwork suggests that earth was robbed from both the ditch to the north as well as the area directly to the south of the earthwork during construction. These sherds appear as tumblers or orphans and were probably picked up with loads of construction material for secondary deposition within the earthwork. They act to date the earthwork minimally to no earlier than Late Preclassic times.

B. Operation 202, to the west of central Tikal, produced multiple sherds of a single vessel, a thin-walled gloss orange jar. Although this jar may be classified as an Aguila Orange type, I am wary of this designation as the walls are extremely thin and the paste is distinct. These fifteen sherds of a single Early Classic vessel may be a secondary deposit because the vessel is still quite fragmentary. This deposit places the date of construction of the western earthwork no earlier than Manik times (A.D. 250 – 550).

C. Operation 103, in the Southeast sector, produced two sherds of Late Classic date. These are the first Late Classic sherds recovered from the berm of any earthwork segment. One sherd is from a lateral-ridge dish of the Ik ceramic complex; the other is a courseware jar rim. This distinct jar rim form appears in excavation levels in the Ramonal/Chalpate area where they are stratigraphically intermingled with Imix Ceramic complex sherds (A.D. 700 – 850). Given the temporal convergence of the two sherds, it appears quite likely that this section of the earthwork was constructed in Late Classic times, well beyond A.D. 550. It is still unclear if all segments of the earthwork were constructed simultaneously; nonetheless, this deposit negates the possibility of the entire earthwork having been constructed in Preclassic or Early Classic times. Perhaps a ca. A.D. 700 date for construction of some or all of the earthwork segments is worth consideration, given all information now available.
Ceramic Vessel Category Frequencies

Both Patrick Culbert and Robert Fry calculated the relative frequencies of different pottery categories recovered from excavations conducted at Tikal at both large and small residential groups during the University of Pennsylvania project in the 1950s and 1960s. Culbert (2003) compiled the following vessel category frequencies from two different recovery contexts. Operation 20 was the intensive excavation of the small residential groups 4H-1 and 4H-2 (Haviland 1985); Operation 22o was the large refuse deposit just north of the East Plaza (Jones 1996). While Operation 22o may represent material associated with the alleged central marketplace, it “might equally well have been debris from anywhere within the site core” (Culbert 2003:68).

Table 9.4.1 – Vessel category percentages from small and large groups at Tikal (after Culbert 2003:Table 2.2).

<table>
<thead>
<tr>
<th>Operation</th>
<th>% Serving Vessels</th>
<th>% Small-Mouth Jars</th>
<th>% Large Bowls</th>
<th>% Wide-Mouth Jars</th>
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<tr>
<td>20</td>
<td>25-45 %</td>
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<td>15-25 %</td>
<td>15-25 %</td>
</tr>
<tr>
<td>22o</td>
<td>60-75 %</td>
<td>15-20 %</td>
<td>5-15 %</td>
<td>3-9 %</td>
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</table>

“Several analyses were done comparing sherd collections from structure groups of varying sizes. There is a quantitative difference between groups of different sizes in the use of the four major categories of shapes: wide-mouth jars, narrow-mouth jars, large-capacity bowls, and serving vessels. The first three categories were almost surely for domestic use. The serving-vessel category includes a variety of shapes, many of which were probably multifunctional and served both for household uses such as food serving and containers and for ritual purposes. The percentage of serving vessels correlated directly with the size of groups: the larger the group, the greater the frequency of serving vessels.” (Culbert 2003:68)

Culbert (2003) has noted that elite households, based on architectural size and elaboration, used more “fancy pottery” than did lower status households. Nonetheless, even the inhabitants of small residential groups had access to polychrome pottery during the Late
Classic period. Polychrome pottery accounts for one-quarter to one-third or more of the total recovered ceramic assemblage of peripheral low-status group (Culbert 2003:69).

“It seems clear that – at least in the sense of access to specialist-produced painted pottery – even the lower-class inhabitants of Tikal had a high standard of living.” (Culbert 2003:69)

Our excavations confirm this observation. In addition to abundant polychrome pottery, we also recovered bichrome and monochrome serving ware pottery from residential groups of all sizes. Even when preservation was so poor that no slip or painted design could be discerned, serving ware forms were clearly represented. These serving forms were rarely if ever produced as unslipped wares and it is a safe assumption that recovered serving wares were finished by burnishing, slipping, and painting.

Table 9.4.2 - Vessel form class percentages from small and large groups for the Early Classic (after Fry 2003:Table 5.1).

<table>
<thead>
<tr>
<th>Shape Class</th>
<th>Navahuelal Fill Sample</th>
<th>SE(S) - 382</th>
</tr>
</thead>
<tbody>
<tr>
<td>Serving forms</td>
<td>66%</td>
<td>28%</td>
</tr>
<tr>
<td>Monochrome bowls</td>
<td>28%</td>
<td>25%</td>
</tr>
<tr>
<td>Slipped jars</td>
<td>2%</td>
<td>19%</td>
</tr>
<tr>
<td>Unslipped jars</td>
<td>4%</td>
<td>28%</td>
</tr>
</tbody>
</table>

Fry also recorded the recovered frequencies of the four major ceramic vessel form classes. Fry’s Navajuelal fill sample came from the main temple in the central group of this Minor Center. The structure fill samples from SE(S)-382 and SW(S)-157 represent the two largest ceramic assemblages recovered from excavations of peripherally located small structures within the southern brecha survey (Fry 2003:158). Fry used the categories “slipped jars” and “unslipped jars” as opposed to Culbert’s preference for narrow-mouthed vs. wide-mouthed jars. There is a near complete correlation between the two classificatory systems; narrow-mouthed jars being slipped and wide-mouthed jars being unslipped. Even
when slip preservation is absent, narrow-mouthed jars are typically well burnished/polished to accept slip and were most likely originally slipped.

Fry’s Early Classic vessel form class comparison demonstrates the significantly higher percentage of serving vessel forms at the Minor Center of Navajuelal. His compiled data support Culbert’s conclusion that larger, presumably wealthier or ‘elite,’ residents had greater access to, or need for, serving wares. He also compiled data on vessel form class percentages for the Late Classic from his excavations throughout the north and south survey brechas (Table 9.4.3).

“Minor Centers (D. E. Puleston 1983) were groupings with one or more large, temple-type constructions and large plazas, as exemplified by sites such as Navajuelal and Bobal. Large structures had two or more plazas in most cases and had an unexcavated mound height of 3 m. or more. Medium-size structures had a mound elevation ranging from 1.5 to 3 m., while small structures had elevations of under 1.5 m.” (Fry 2003:158)

These figures do not demonstrate as clear a distinction between the vessel form class categories of low and high status residents, as ascertained by mound size, as Culbert’s data do. While large mounds had somewhat elevated proportions of serving vessels in comparison to smaller mounds, Fry’s sample from Minor Centers had lower serving vessel percentages. This may have resulted from the use of borrowed material for fill at the Minor Centers. While ceramic collections from the construction fill of small structures almost certainly represent the reuse of refuse from the same group as fill, it is more likely that the structure fill for larger structures was brought from farther away (Culbert et al. 1990:105).

Serving vessels account for 25-45% of the total assemblage of the small residential group excavations at Groups 4H-1 and 4H-2 (Culbert’s Operation 20). In Fry’s sample, serving vessels account for 28% of the total assemblage from the two largest collections from small structures in the periphery during the Early Classic and 41% of all excavations in mounds of all sizes from peripheral and central Tikal during the Late Classic.
Table 9.4.3 – Vessel form class percentages from small and large mounds at Tikal for the Early Classic period (after Fry 2003:Table 5.2).

<table>
<thead>
<tr>
<th>Shape Class</th>
<th>Minor Centers</th>
<th>Large Mound</th>
<th>Medium Mound</th>
<th>Small Mound</th>
<th>Peripheral Tikal</th>
<th>Central Tikal</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No.</td>
<td>%</td>
<td>No.</td>
<td>%</td>
<td>No.</td>
<td>%</td>
</tr>
<tr>
<td>Serving vessels</td>
<td>101</td>
<td>34%</td>
<td>110</td>
<td>51%</td>
<td>163</td>
<td>41%</td>
</tr>
<tr>
<td>Large slipped bowls</td>
<td>106</td>
<td>35%</td>
<td>39</td>
<td>18%</td>
<td>103</td>
<td>24%</td>
</tr>
<tr>
<td>Narrow-mouth jars</td>
<td>45</td>
<td>15%</td>
<td>19</td>
<td>9%</td>
<td>36</td>
<td>12%</td>
</tr>
<tr>
<td>Unslipped wide-mouth jars</td>
<td>49</td>
<td>16%</td>
<td>46</td>
<td>22%</td>
<td>93</td>
<td>23%</td>
</tr>
<tr>
<td>total vessels:</td>
<td>301</td>
<td></td>
<td>214</td>
<td></td>
<td>395</td>
<td></td>
</tr>
</tbody>
</table>
I calculated percentages of four major vessel form classes from several of the most productive test-pit excavations from several small and large groups within the northern earthwork survey corridor in order to compare these with the frequencies calculated by Culbert and by Fry. My samples come from test-pits placed off plaza, not through structure platforms. These are presented in tabularized form in Table 9.4.4. We also found that serving vessels made up a considerable percentage of the recovered ceramic assemblages from both small and large groups. In fact, 42.6% of all rim sherds tabulated from PST Operations 9, 15, 37, and 115 (combined Ops.) represent serving vessels. This accords very well with Fry’s calculation of 41% serving vessels from both peripheral and central Tikal. I did find a discrepancy in serving vessel percentages between the ceramic collections of two of the small residential groups I tested. Fifty-three percent of the ceramic collection from Operation 15.1 at the single structure Group 11B was made up of serving vessel rim sherds. At the small structure Group 4 (Operation 9.1), just under 30% of the rim sherds were from serving vessels. Combining the two collections, about 39% of all the rim sherds recovered from these small structure groups represent serving ware forms. In contrast, I calculated that serving vessel form rim sherds accounted for 43.5% of the collection from the main large structure plaza at Group 45 (Operation 37.1) and only 27.6% at Operation 37.2 at the small structure plaza within the same extended plaza group. In addition, Operation 115.1 (which I interpret as a community midden) from the residential sector of Ramonal/Chalpate to the southeast of central Tikal produced a serving vessel form rim sherd percentage just over 47%.

Overall, these numbers support the previously attested trend of recovering more serving vessel forms from larger ‘elite’ structures, with the notable exception of elevated (53%) numbers of these at Group 11B. I have no explanation for this exception other than I calculated this number from a small number of sherds; I do not believe this one example is representative of any trend that has been missed or miscalculated by any researcher. Looking at the calculations using all the small and large groups tabulated (combined Ops.), 42.6% of the rim sherds represent serving vessels. Given the concurrence of this figure with Fry’s findings, it is safe to say that serving vessels (a
composite category) account for the majority of recovered pottery, and hence the majority of pottery consumed (and presumably circulated) throughout peripheral Tikal.

Table 9.4.4 shows that serving vessel sherds represent a greater percentage of any single or combined excavation by number than by weight. The reason for this should be intuitively clear; serving vessels tend to be smaller, thinner walled, and lighter than the other three categories tabulated. It should also be remembered that different form classes of pottery break and are discarded at different rates (Mills 1989). If anything, I would expect cooking vessels (wide-mouthed jars and large bowls) to be replaced more often than serving vessels. Of course this is a general expectation and the Classic Maya may have unintentionally or intentionally broken serving vessels more frequently. At present, I cannot suggest any correction factor for the rate of breakage and replacement for any vessel form class. The overall impression one gets from these numbers remains clear – serving vessels were used, discarded, and replaced frequently at peripheral households. The high percentage of these vessels recovered from both small and large structure groups combined with their lighter, more portable character suggest that serving vessels were exchanged frequently throughout the peripheries of Tikal. With this in mind, serving vessels are the focus of my ceramic distribution study.

**Rare or Unique Pottery**

The serving vessel category is a broad category that conflates a number of different forms. As such, it is important to note some of the specific specimens we recovered from our investigations in peripheral Tikal. A few sherds we recovered fall outside the expected range of paste and form for Tikal. One large sherd recovered from Operation 37.1 at Group 45 at the western bifurcation of the northern earthwork is a very precise copy or mimic of the well-known Chablekal Fine Grey type, Telchak Composite (Figure 9.4.3). This large sherd from a small beaker vessel (INAA ID KS0100) was sorted into my “Imix A” compositional reference group (see Chapter 9.5). The compositional profile of this vessel demonstrates that it was made locally in a foreign style. This single item does in fact relate to a distinct temporal and geographic trend.
Table 9.4.4 – PST Project vessel form class proportions by operation.

### Op. 37.1 (G45)

<table>
<thead>
<tr>
<th></th>
<th>Rims</th>
<th>%</th>
<th>Wt. (kg)</th>
<th>%</th>
<th>All Sherds</th>
<th>%</th>
<th>Wt. (kg)</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Serving Wares</td>
<td>50</td>
<td>43.5</td>
<td>1.23</td>
<td>20.1</td>
<td>112</td>
<td>32.5</td>
<td>2.98</td>
<td>22.6</td>
</tr>
<tr>
<td>Slipped Jars</td>
<td>9</td>
<td>7.8</td>
<td>1.26</td>
<td>20.6</td>
<td>51</td>
<td>14.8</td>
<td>2.00</td>
<td>15.2</td>
</tr>
<tr>
<td>Unslipped Jars</td>
<td>31</td>
<td>27.0</td>
<td>1.52</td>
<td>24.9</td>
<td>50</td>
<td>14.5</td>
<td>2.46</td>
<td>18.7</td>
</tr>
<tr>
<td>Basin/Large Bowls</td>
<td>25</td>
<td>21.7</td>
<td>2.1</td>
<td>34.4</td>
<td>132</td>
<td>38.3</td>
<td>5.72</td>
<td>43.5</td>
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<tr>
<td>Totals</td>
<td>115</td>
<td>100.0</td>
<td>6.11</td>
<td>100.0</td>
<td>345</td>
<td>100.0</td>
<td>13.16</td>
<td>100.0</td>
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### Op. 37.2 (G45)

<table>
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<tr>
<th></th>
<th>Rims</th>
<th>%</th>
<th>Wt. (kg)</th>
<th>%</th>
<th>All Sherds</th>
<th>%</th>
<th>Wt. (kg)</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Serving Wares</td>
<td>8</td>
<td>27.6</td>
<td>0.12</td>
<td>8.6</td>
<td>12</td>
<td>18.2</td>
<td>0.58</td>
<td>20.9</td>
</tr>
<tr>
<td>Slipped Jars</td>
<td>5</td>
<td>17.2</td>
<td>0.2</td>
<td>14.4</td>
<td>23</td>
<td>34.8</td>
<td>0.56</td>
<td>20.2</td>
</tr>
<tr>
<td>Unslipped Jars</td>
<td>15</td>
<td>51.7</td>
<td>1.06</td>
<td>76.3</td>
<td>25</td>
<td>37.9</td>
<td>1.36</td>
<td>49.1</td>
</tr>
<tr>
<td>Basin/Large Bowls</td>
<td>1</td>
<td>3.4</td>
<td>0.01</td>
<td>0.7</td>
<td>6</td>
<td>9.1</td>
<td>0.27</td>
<td>9.7</td>
</tr>
<tr>
<td>Totals</td>
<td>29</td>
<td>100.0</td>
<td>1.39</td>
<td>100.0</td>
<td>66</td>
<td>100.0</td>
<td>2.77</td>
<td>100.0</td>
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### Op. 15.1 (G11B)

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<thead>
<tr>
<th></th>
<th>Rims</th>
<th>%</th>
<th>Wt. (kg)</th>
<th>%</th>
<th>All Sherds</th>
<th>%</th>
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<th>%</th>
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<tbody>
<tr>
<td>Serving Wares</td>
<td>55</td>
<td>53.4</td>
<td>2.24</td>
<td>52.8</td>
<td>93</td>
<td>48.9</td>
<td>3.02</td>
<td>46.9</td>
</tr>
<tr>
<td>Slipped Jars</td>
<td>7</td>
<td>6.8</td>
<td>0.3</td>
<td>6.6</td>
<td>7</td>
<td>3.7</td>
<td>0.28</td>
<td>4.3</td>
</tr>
<tr>
<td>Unslipped Jars</td>
<td>22</td>
<td>21.4</td>
<td>1.04</td>
<td>24.5</td>
<td>38</td>
<td>20.0</td>
<td>1.40</td>
<td>21.7</td>
</tr>
<tr>
<td>Basin/Large Bowls</td>
<td>19</td>
<td>18.4</td>
<td>0.68</td>
<td>16.0</td>
<td>52</td>
<td>27.4</td>
<td>1.74</td>
<td>27.0</td>
</tr>
<tr>
<td>Totals</td>
<td>103</td>
<td>100.0</td>
<td>4.24</td>
<td>100.0</td>
<td>190</td>
<td>100.0</td>
<td>6.44</td>
<td>100.0</td>
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</table>
Table 9.4.4 continued – PST Project vessel form class proportions by operation.

### Op. 9.1 (G4)

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<tr>
<th></th>
<th>Rims</th>
<th>%</th>
<th>Wt (kg)</th>
<th>%</th>
<th>All Sherds</th>
<th>%</th>
<th>Wt. (kg)</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Serving Wares</td>
<td>47</td>
<td>29.6</td>
<td>1.12</td>
<td>18.0</td>
<td>76</td>
<td>36.9</td>
<td>2.20</td>
<td>26.8</td>
</tr>
<tr>
<td>Slipped Jars</td>
<td>20</td>
<td>12.6</td>
<td>0.72</td>
<td>11.6</td>
<td>20</td>
<td>9.7</td>
<td>0.72</td>
<td>8.8</td>
</tr>
<tr>
<td>Unslipped Jars</td>
<td>40</td>
<td>25.2</td>
<td>1.92</td>
<td>30.9</td>
<td>53</td>
<td>25.7</td>
<td>2.58</td>
<td>31.4</td>
</tr>
<tr>
<td>Basin/Large Bowls</td>
<td>52</td>
<td>32.7</td>
<td>2.46</td>
<td>39.5</td>
<td>57</td>
<td>27.7</td>
<td>2.72</td>
<td>33.1</td>
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<tr>
<td>Totals</td>
<td>159</td>
<td>100.0</td>
<td>6.22</td>
<td>100.0</td>
<td>206</td>
<td>100.0</td>
<td>8.22</td>
<td>100.0</td>
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</table>

### Op. 115.1 (East Ramonal)

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<th></th>
<th>Rims</th>
<th>%</th>
<th>Wt. (kg)</th>
<th>%</th>
<th>All Sherds</th>
<th>%</th>
<th>Wt. (kg)</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Serving Wares</td>
<td>136</td>
<td>70.8</td>
<td>2.66</td>
<td>49.1</td>
<td>224</td>
<td>50.3</td>
<td>4.22</td>
<td>43.9</td>
</tr>
<tr>
<td>Slipped Jars</td>
<td>15</td>
<td>7.8</td>
<td>0.4</td>
<td>8.1</td>
<td>70</td>
<td>15.7</td>
<td>1.22</td>
<td>12.7</td>
</tr>
<tr>
<td>Unslipped Jars</td>
<td>24</td>
<td>12.5</td>
<td>1.12</td>
<td>20.7</td>
<td>84</td>
<td>18.9</td>
<td>2.30</td>
<td>23.9</td>
</tr>
<tr>
<td>Basin/Large Bowls</td>
<td>17</td>
<td>8.9</td>
<td>1.2</td>
<td>22.1</td>
<td>67</td>
<td>15.1</td>
<td>1.88</td>
<td>19.5</td>
</tr>
<tr>
<td>Totals</td>
<td>192</td>
<td>100.0</td>
<td>5.42</td>
<td>100.0</td>
<td>445</td>
<td>100.0</td>
<td>9.62</td>
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</table>

### Combined Operations

<table>
<thead>
<tr>
<th></th>
<th>Rims</th>
<th>%</th>
<th>Wt. (kg)</th>
<th>%</th>
<th>All Sherds</th>
<th>%</th>
<th>Wt. (kg)</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Serving Wares</td>
<td>296</td>
<td>42.6%</td>
<td>7.37</td>
<td>27.3%</td>
<td>517</td>
<td>38.3%</td>
<td>13.00</td>
<td>29.7%</td>
</tr>
<tr>
<td>Slipped Jars</td>
<td>56</td>
<td>8.1%</td>
<td>2.92</td>
<td>10.8%</td>
<td>171</td>
<td>12.7%</td>
<td>4.78</td>
<td>10.9%</td>
</tr>
<tr>
<td>Unslipped Jars</td>
<td>132</td>
<td>19.0%</td>
<td>6.66</td>
<td>24.6%</td>
<td>250</td>
<td>18.5%</td>
<td>10.10</td>
<td>23.0%</td>
</tr>
<tr>
<td>Basin/Large Bowls</td>
<td>211</td>
<td>30.4%</td>
<td>10.07</td>
<td>37.3%</td>
<td>411</td>
<td>30.5%</td>
<td>15.95</td>
<td>36.4%</td>
</tr>
<tr>
<td>Totals</td>
<td>695</td>
<td>100.0%</td>
<td>27.02</td>
<td>100.0%</td>
<td>1349</td>
<td>100.0%</td>
<td>43.83</td>
<td>100.0%</td>
</tr>
</tbody>
</table>
which has been the subject of decades of targeted provenience research (Bishop et al. 2004, 2006; Foias 2005). Chablekal fine grey pottery is known to occur from about A.D. 730 and has been demonstrated to involve multiple production areas in the western portion of the Classic Maya lowlands and the Usumacinta River corridor. This particular Tikal vessel is extremely similar to actual fine grey specimens of Chablekal Ceramic group Telchak Composite type vessels from the Western Maya region (i.e., Palenque) excepting the courser tan paste (oxidized) and 1 – 2 mm iron inclusions (certainly natural, not purposefully mixed into the clay). KS0100 has an incised monkey figure within a zoned field with background dentate stamps. The potter responsible for manufacturing this bowl was certainly intimately familiar with form and style conventions for Telchak “monkey bowls” of the Chablekal Fine Grey ceramic group. I have seen imitation or mimic Telchak-style “monkey bowls” made in a local carbonate paste at the Late Classic Petexbatun site of Cancuen, although they are somewhat distinct from specimen KS0100.

Another rare sherd, also recovered from the same Group 45, KS0143, is a round-sided bowl of the Saxche Orange Polychrome type with a naturalistic insect painted in black and red (Figure 9.4.4). Insect bowls are incredibly rare at Tikal, a bit more common at Uaxactun (see Ricketson and Ricketson 1937:Figures 178, 183b, pl. 80f; Smith 1955:Figures 34c7, 39b1-3, 61a18-21, 73b9-11). At Tikal, ceramic vessels orsherds painted with naturalistic insect motifs have been recovered from Burial 191 in Group 7F-1, Burial 183 (Culbert 1993:Figure 49a1), Problematic Deposit 4 from the Lost World complex (Laporte 2000:Figure 30a), and a “sherd from the central acropolis” (Haviland 1981:113). These insect motifs occur on both Saxche and Palmar types at Tikal and Uaxactun. KS0143 appears to be identical to the Saxche Orange Polychrome sherd illustrated and described by Culbert from Burial 183, down to the interior black rim band on orange and the exterior red bar design (Culbert 1993:Figure 49a1 and caption). The compositional profile of KS0143 confirms that it was produced locally, and I have sorted it into my “Imix B” compositional reference group (see Chapter 9.5).
Figure 9.4.3 – KS0100, The mimick Telchak Composite monkey bowl (top – 50% scale, bottom - detail of incised monkeys within delimited zones with dentate stamping).
Figure 9.4.4 – KS0143, the Saxche Orange Polychrome sherd with naturalistic depiction of an insect recovered from Group 45 (top - 75 % scale; bottom – interior [left] and exterior [right]).
In addition to the two sherds just mentioned, we also recovered a rimsherd from a Saxche Orange Polychrome dish-plate with a painted glyptic band around the interior rim (KS0154) (Figure 9.4.5). Glyptic pottery was very rare in our survey and only two of the nine specimens recovered came from households along the northern earthwork corridor; these were two of the largest residential groups, Group 1 and Group 45. Specimen KS0154 could not be assigned to any of the compositional reference groups formulated from the PST Project ceramic samples submitted for INAA. It is likely that this sherd represents a locally made vessel, one that simply did not group with other specimens due to the small sample size submitted for INAA.

**Glyphic Pottery**

Only nine examples of glyphic pottery were recovered from our survey and excavation program (Table 9.4.5). Seven of these glyphic specimens were recovered from the southeast sector during our investigation of the Minor Center of Ramonal/Chalpate. Only two specimens of glyphic pottery could be assigned to a compositional reference group; KS0024, recovered from the acropolis at Ramonal, and KS0125, recovered from Group 1 along the northern earthwork corridor. Both these specimens were assigned to the statistically refined “Cylinder” compositional reference group (see Chapter 9.5).

**Glyphic Pottery at Ramonal/Chalpate**

Excavations in the Ramonal/Chalpate area 8 to 9 km southeast of Tikal’s epicenter produced a few isolated Late Preclassic and Early Classic sherds. Stratified deposits of Late and Terminal Classic ceramics were abundant in this sector. Excavations within the convoluted residential plaza-quad arrangement east of Ramonal produced a one-meter deep deposit of Edznab ceramic complex material (A.D. 850 –
Figure 9.4.5 – KS0154, Saxche Orange Polychrome dish with interior glyphic band recovered from Group 45 (top – sherd profile, 50% scale; bottom – detail of interior glyphic band).
Table 9.4.5 – Glyphic pottery recovered from the PST Project excavations, 2005-2006.

<table>
<thead>
<tr>
<th>INAA #</th>
<th>OP.</th>
<th>LOCALE</th>
<th>TYPE</th>
<th>FORM</th>
<th>GLYPHS</th>
<th>POSITION</th>
</tr>
</thead>
<tbody>
<tr>
<td>KS0007</td>
<td>113</td>
<td>Ramonal</td>
<td>Saxche Orange Polychrome</td>
<td>lateral-ridge dish</td>
<td>painted glyphic band</td>
<td>interior</td>
</tr>
<tr>
<td>KS0009</td>
<td>113</td>
<td>Ramonal</td>
<td>Zacatel Cream Polychrome</td>
<td>outflared-walled dish</td>
<td>painted glyphic band</td>
<td>exterior</td>
</tr>
<tr>
<td>KS0024</td>
<td>113</td>
<td>Ramonal</td>
<td>Unnamed</td>
<td>vertical walled cylinder</td>
<td>carved glyphic band</td>
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<tr>
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<td>E. Ramonal</td>
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<td>round-sided bowl</td>
<td>incised glyphic band</td>
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<tr>
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<td>114</td>
<td>E. Ramonal</td>
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<td>painted glyphic band</td>
<td>interior</td>
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These Terminal Classic ceramics had accumulated over a stucco plaza floor, with specimens at the bottom of the column embedded directly in the deteriorating plaza floor. This Terminal Classic deposit contained carved glyphic ceramics, indicating that elite Maya activity continued unabated minimally into the latter half of the ninth century in the Ramonal/Chalpate area.

These finely crafted vessels with glyphic inscriptions appear to be ‘unique’ – possibly commissioned and/or gifted token vessels. The compositional profile of one nicely model-carved and incised cylinder sherd with a rare hematite red rim band (KS0024) (Figure 9.4.6) indicates that the vessel was certainly made at Tikal. Another well-made vessel had been crafted with a unique brown paste, slipped white over its exterior and interior and red cinnabar was rubbed into the finely incised exterior glyphic inscription (Figure 9.4.7). A Sachaba model-carved rim from an elongated barrel-shaped vessel has finely carved glyphs (Figure 9.4.8), again, demonstrating that the inhabitants of the area around Chalpate had access to fine “elite” goods into Terminal Classic times.

**General Ramonal Pottery Differences**

Operation 115 penetrated what appears to me to be a community midden, used by multiple households, located in a flat open space between residential plaza groups in the residential sector east of Ramonal. I identified this midden from surface concentrations of sherds and obsidian blade fragments. A single 2 x 1 m test-pit was excavated to a depth of about one meter through this deposit. This excavation produced quantities of Manik ceramic complex composite silhouette vessels and bolstered-rim sherds. Although Manik ceramic complex pottery is underrepresented in our sample, the Op. 115 deposit displayed a recognizably distinct character not apparent in excavations in the northern corridor. Late Classic large bowls or basins, a ubiquitous form throughout peripheral Tikal, from this excavation consistently had medial appliquéd bands with impressed
Figure 9.4.6 – KS0024, no type designation, modeled-carved cylinder sherd with hematite red exterior rim band (top – 50% scale; middle and bottom – details of glyphic inscription.)
Figure 9.4.7 – KS0029, Sachaba Modeled-Carved barrel rim recovered from Operation 114.2.2 placed within settlement east of Ramonal (top – profile at 50% scale; bottom – detail photo and line drawing of exterior modeled-carved glyphic inscription.
Figure 9.4.8 – No type designation, round-sided bowl with incised glyphic inscription recovered from excavation unit east of Ramonal (top – profile, 50% scale; bottom – detail of inscription).
thumb fillets or occasionally with other repetitive impressed decorations produced with a circular tube or cut piece of shell. Although similarly decorated basins have been recovered from central Tikal, I was surprised to find these restricted entirely to the Ramonal/Chalpate area in our survey.

My initial impression was that pottery recovered from the Minor Center of Ramonal/Chalpate was distinguished by utilitarian forms characterized by slightly different paste colors and appliquéd designs not apparent in the pottery recovered from the northern earthwork corridor. At the same time, serving vessels of the Balanza, Saxche, and Palmar ceramic groups appeared indistinguishable between the two survey zones. Hence, compositional analysis of the serving ware pottery was imperative to discern any patterns in the production/exchange of pottery between the two survey zones.

9.5 – The Ceramic Distribution Study

My ceramic analysis at Tikal is focused on intraregional exchange patterns. Although provenience studies utilizing INAA are more reliable for interregional exchange patterns than intraregional exchange patterns (see Neff 1993:33-34), I was interested in testing the application of INAA with ceramics to get a first-hand opinion of how productive and useful the technique was at discriminating intraregional patterns around a single major Classic Maya lowland center. The indirect analysis of production and exchange patterns was also prompted by the lack of provenience information on production contexts. Physical production loci, or “workshops” have seldom been identified at Tikal or any other lowland Maya center, so the ceramic analyst must rely on the consumption contexts and actual ceramic sherds and vessels to indirectly investigate the organization of production and distribution of pottery.
I sampled pottery for analysis by Instrumental Neutron Activation Analysis (INAA) because it was the most accurate means of discriminating the ceramic products of different pottery production units. The five compositional reference groups formulated for this dissertation from the sample of sherds recovered by the PST Project working in peripheral Tikal reflect pottery manufactured from similar paste recipes or traditions. At the level of precision obtained, it is difficult to discern the products of a single workshop. These compositional reference groups likely reflect long-term traditions of pottery manufacture indicative of groupings of potters above the single workshop level, perhaps at the barrio or community level. In addition to the standardized paste recipes identified through INAA analysis, I calculated CV values for specific ceramic form classes as an indirect measure of relative standardization. These standardization measurements act as another indirect measure of the relative number of production units.

Instrumental Neutron Activation Analysis (INAA, see Bishop 2003; Bishop et al. 1982; Neff 1993, 2000 for application to archaeological materials; Harbottle 1991 for procedures and methods; Blackman and Bishop 2007 for history of the Smithsonian – NIST partnership) has proven to be a powerful tool in the analysis of ceramic production, distribution, and trade in Mesoamerica (Bennyhoff and Heizer 1965; Bishop 1975, 1980; Bishop and Rands 1982; Bishop et al. 1982; Foias and Bishop 2007; Hodge et al. 1993; Joyce et al. 2006; Neff 1989a, 1989b; Neff and Bishop 1988; Neff, Bishop, and D. Arnold 1988, 1990; Neff, Larson, and Glascock 1997; Olin and Blackman 1989; Rands 1967; Rands et al. 1974; Rands and Bargielski Weimer 1992; Rands and Bishop 2003; Reents-Budet and Bishop 2003) and elsewhere (Bishop et al. 1988; Blackman et al 1993; D’Altroy and Bishop 1990; Neff et al 1997; Sayre and Dodson 1957; Steponaitis et al. 1996). The results obtained through INAA and the theories which they have supported or refuted have caused considerable uproar at times, although on weak or false grounds (see Neff et al. 2006), or suspicions of the inability of the technique to discriminate true human behavior (see D. Arnold 2000; D. Arnold, Neff, and Bishop 1991; Cogswell et al. 1998; Costin 2000; Neff, Bishop, and D. Arnold 1988, 1990; Neff, Bishop, and Sayre 1988, 1989).
In 2006, Erin Leigh Sears and I sampled 170 ceramic artifacts from the PST Project collection. Six figurine fragments were selected by Sears for sampling. These represent all figurines recovered by the project which feasibly could be sampled given the limitations of drilling or burring into the fabric of these specimens. The 164 ceramic sherds were selected by Straight in non-random fashion, although they are stratified by type designations to some extent in order to provide additional samples of widespread ceramic types common in the Peten which have been a focus of previous research – to expand the comparative database. Other sherds were selected for analysis based on degree of preservation, ‘exotic’ paste or decoration, or recovery context (to get a reliable geographic spread). I also made an attempt to include any suspected imports to increase the chances of identifying trade pieces. The 170 vials of ceramic powder were returned to the United States to the Smithsonian Center for Materials Research and Education (SCMRE) and subjected to Instrumental Neutron Activation Analysis (INAA) by Dr. Ronald Bishop (Table 9.5.1).

**Background Theory**

“Implicit in the idea of using chemical analysis [i.e., INAA] to trace artifacts to their source, or to sort out and group together artifacts of unknown sources, is what may be termed the “Provenience Postulate,” namely, that there exist differences in chemical composition between different natural sources that exceed, in some recognizable way, the differences observed within a given source.” (Weigand et al. 1977:24)

Application of the “Provenience Postulate,” or “provenance postulate” (in order to avoid confusion arising from the fact that the term ‘provenience’ is also used as a synonym for archaeological context” [Neff 2000:24]), is essential to my study. Acceptance of this postulate is a pre-requisite for the success of any artifact distribution study based in compositional analysis. My study is predicated on discerning the products of different production units and charting the distribution of the pottery manufactured by these different production units one identified. In the absence of precise provenience
information for the physical manufacturing loci or for the location of raw materials used in production (i.e., clay and temper). I have grouped compositionally similar pottery together in order to reconstruct collections reflecting the products of different production units, however vague these may be. Consumption context is important for archaeologists because they work “back” from consumption loci to reconstruct distribution and production systems (Costin 2000:398). I should stress from the outset that I have not even attempted to analyze raw materials from the Tikal region in order to associate the compositional reference groups with physical locations on the ground. A dedicated program of raw material sampling would help to associate the compositional profile or ‘fingerprint’ of different production units with geological sources in the area. In the absence of such a study, I have relied on the fact that cross-culturally potters do not usually travel excessively far to obtain raw materials (D. Arnold 1985) and that, at Tikal, all materials were moved by human porters, not through advanced transportation systems.

My indirect approach to isolating the products of different ceramic production units results from the limitations imposed by the lack of knowledge of physical production loci. Without directly sampling the products of known production units, I was forced to reconstruct broader groupings of ceramics reflecting distinct paste preparation practices. Provenience studies of pottery circulation often begin by constructing very broad initial compositional groupings at the individual center level. It is assumed by the “criterion of abundance” (Bishop, Rands, and Holley 1982) that the numerically dominant pottery recovered from a site, center, or region must be locally made. The criterion of abundance “extends to compositional research the commonsense assumption that things are most frequent closest to where they originate” (Neff 2000:112). I have generally assumed that all pottery recovered from our excavations in 2005-2006 was locally made and circulated. Initial data mining by cluster analysis suggested that the overwhelming majority of my sample represented locally made pottery, not imported pottery.
Table 9.5.1 – Sherds submitted for Instrumental Neutron Activation Analysis (INAA).

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<th>Form</th>
<th>Ceramic Group or Type</th>
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Only occasionally did I compare the compositional profiles of specific sherds against the entire Smithsonian Archaeometric Research Collections and Records (SARCAR) database of over 18,000 Maya ceramic samples. A few specimens that did visually sort into type categories without any obvious indication of being imports were certainly made outside of Tikal. Without compositional analysis, I would not have identified these as imports based on visual or tactile inspections, or through statistical examination of metric attributes. Likewise, I suspected that several specimens recovered from our excavations were likely imports because their form and/or design did not fit well into categories known to be locally produced. These suspected imports turned out to be locally made and probably represent experimentation by Tikal potters or local production units with low volume output, underrepresented in Tikal collections.

**Formulation of Compositional Reference Groups**

“Two broad categories of processes, additive and subtractive, may contribute singly or jointly to enrichment or dilution of elemental concentrations in ceramic pastes during manufacture.” (Neff 2000:117)

Additive processes include adding temper, colorants, water, a second clay from a distinct source, or any other purposeful or accidental addition. Subtractive processes relates to the manual removal of inclusions or their removal by sifting or levigation. In one compositional study of Formative period Fine Red ware from southern Guatemala, two divergent compositional groups were found to have been made from the same source clay; two regional groups of potters exploiting the same clay resource each apparently utilized a different volcanic ash as purposefully added temper (Neff, Bishop, and D. Arnold 1988).

“Ethnoarchaeological studies make it clear that clays and tempers are not just picked up randomly; they are consciously procured for particular reasons.” (Costin 2000:380)
I take advantage of this situation and have a simple working hypothesis: the particular mix of clay(s) and temper (or any other purposeful or incidental additive) as well as post-depositional processes and firing method are less likely to confound interpretation than to aid it. Of course, the probability that a compositional signature will be duplicated by multiple production units increases with the diminishing scale of the provenience analysis. At the intraregional scale I have attempted, the homogeneity of geological resources in the vicinity of Tikal has made the identification of distinct production units quite difficult. Fortunately, the high-resolution of INAA did permit the construction of compositional reference groups indicative of different ceramic production traditions. The physical distribution of sherds and vessels within the sampled area pertaining to these compositional reference groups indicate the range of circulation for the products of different production units or traditions.

**Formulation of Compositional Reference Groups with the PST Project Ceramics**

The samples of paste powder from 164 ceramic sherds recovered from our 2005-2006 excavations were submitted for INAA, and 33 elemental concentrations were determined for each sample. We first looked for patterning in the data using a hierarchical cluster analysis using complete linkages of Euclidean distances among the elemental concentrations for 19 elements. The cluster analysis was run combining my samples with other pottery samples from Tikal and Uaxactun already in the extensive Smithsonian Archaeometric Research Collections and Records (SARCAR) database of Maya ceramic samples. This technique initially grouped pottery with similar compositional profiles into an unwieldy number of groups. A large number of the PST Project samples simply did not group together tightly with a number of others. After studying the hierarchical groupings produced through this method, we chose five clusters, each containing more than ten PST Project sherds, for further investigation.
“Ultimately there is an effort to form a ‘reference group’. Depending upon the scale of the investigation – regional, intra-regional or inter-regional – it may be possible to define a group of ‘related’ samples at some arbitrarily selected level of group inclusiveness and to illustrate their ‘separateness’ from other groups using a confidence ellipse (Bishop and Blackman 2002)” (Blackman and Bishop 2007:332)

We then proceeded to a Principle Component Analysis (PCA) to refine these into compositional reference groups (see appendix for details of extraction). Utilizing Mahalanobis distance from the group centroid for log transformed principle components (eigenvalues) derived from 19 elemental concentrations, three compositional reference groups were constructed. These three compositional reference groups could be statistically refined to the 90 percent confidence level; I named these “Blacks,” “Saxche” and “Cylinder.” When these three groups were plotted on a bivariate graph of the first and second principle components, they were characterized by discreet, non-overlapping distributions and we added 90 percent confidence ellipses around the three groups. Two other compositional reference groups were subsequently added to the graph; these are labeled “Imix A” and “Imix B” (see Figure 9.5.1). These two “Imix” reference groups did split fairly discreetly along the first principle component, although they do overlap slightly with the “Saxche” compositional reference group; again, 90 % confidence ellipses. Just over 40 % of my samples grouped into these five compositional reference groups. Each of the five compositional reference groups constructed contained an equal or greater number of samples from pottery previously excavated at Tikal and submitted for INAA in the past.

“Inevitably, some of the sampled unknowns will remain unassigned following pattern recognition and statistical analysis…Some such inconsistent samples may indeed be statistical outliers, that is, specimens that diverge from one of the recognized groups because of chance or some other effect. Others may pertain to groups that are so lightly represented in the sample that they cannot be recognized as groups.” (Neff 2000:110)
Given the size of Tikal and the small sample submitted for INAA, I am not surprised that more than half of the PST Project samples remained unassigned. I had expected a much “muddier” separation resulting from the principle component analysis, and find the discreet groupings encouraging. It does appear possible to differentiate among major ceramic production traditions at the intraregional level at Tikal through INAA of ceramics. Unfortunately, the homogeneity of the geological natural resources has likely blurred the distinctions between production units using similar clays and tempers. I fear that my compositional reference groups conflate multiple production units; such is the pitfall of the intraregional analysis. This is particularly apparent in the PCA graph (Figure 9.5.1) where there is slight overlap among my “Cylinder,” “Imix A,” and “Imix B” compositional reference groups.

Table 9.5.2 – number of samples assigned to compositional reference groups.

<table>
<thead>
<tr>
<th>Group</th>
<th>assigned</th>
<th>% (of 170)</th>
<th>% assigned (of 69)</th>
<th>also in DB</th>
</tr>
</thead>
<tbody>
<tr>
<td>Blacks</td>
<td>14</td>
<td>8.24%</td>
<td>20.29%</td>
<td>19</td>
</tr>
<tr>
<td>Saxche</td>
<td>17</td>
<td>10.00%</td>
<td>24.64%</td>
<td>16</td>
</tr>
<tr>
<td>Cylinder</td>
<td>15</td>
<td>8.82%</td>
<td>21.74%</td>
<td>17</td>
</tr>
<tr>
<td>Imix A</td>
<td>11</td>
<td>6.47%</td>
<td>15.94%</td>
<td>13</td>
</tr>
<tr>
<td>Imix B</td>
<td>12</td>
<td>7.06%</td>
<td>17.39%</td>
<td>26</td>
</tr>
<tr>
<td>totals=</td>
<td>69</td>
<td>40.59%</td>
<td>100.00%</td>
<td>91</td>
</tr>
</tbody>
</table>
Figure 9.5.1 – Principle Component Analysis graph for PST Project sherds with 90% confidence ellipses around five compositional reference groups.
**General Character of the Five Compositional Reference Groups**

It is unlikely that the compositional reference groups constructed in this manner represent individual workshops; they are groupings of a higher order, perhaps representing multiple related groups of potters or even entire communities specializing in pottery production. Likewise, different unrelated production units may have exploited very similar raw materials that do not contain enough variation to be discriminated into more specific groups. Determining what the compositional reference groups represent required a reexamination of the specific sherds grouped together through the analysis.

“This reference group, however, may represent little more than a group of utility for a particular problem application. That is, it need not represent a ‘natural’ group within a heterogeneous data set. Reference groups are likely to be transient, evolving as more analyses are carried out and areas of density in the multivariate space grow.” (Bishop and Blackman 2007:332, emphasis in original)

Our compositional reference groups represent long-term traditions of raw material procurement, paste preparation, and production. In this respect, the groupings reflect different resource use groups, not necessarily individual workshops or single potters. Two of the five groups have significant numbers of pottery specimens from both Early Classic and Late Classic sherds. In these two cases, we obviously tracked broad inclusive groups representing generations of potters utilizing consistent paste preparation traditions. This does suggest a degree of continuity within production units so that paste preparation practices remained consistent over long time periods. The “Blacks” compositional reference group is strictly Early Classic in date and focused on black surfaced pottery. Fifty percent of these specimens are near identical bowls with plastic designs. My “Saxche” and “Imix B” groups likely represent pottery produced from Late Ik into Imix times (i.e., A.D. 650 – 750), and possibly even longer time spans (i.e., A.D. 550 – 850, the entire Late Classic period).
Specific Character of the Five Compositional Reference Groups

The “Blacks” Compositional Reference Group

Of the 69 samples assigned to one of the five compositional reference groups, 20 percent fell into my “Blacks” group (Table 9.5.2). The majority of the “Blacks” compositional reference group members are black surfaced pottery, half of the sample from the Balanza ceramic group – bowl forms with plastic designs (Lucha Incised or Urita Gouged-Incised) (Figure 9.5.2). In addition to the Balanza ceramic group types, a comal, a small narrow-mouthed jar, and an outflaring-walled dish also have black surfaces. The remaining four specimens do not have black surfaces. One is a Manik Ceramic Complex basal flanged dish with an uncommon deep blood-red monochrome slip on its interior and exterior. The second is a Saxche Orange Polychrome lateral-ridged dish: round-sided variety. This vessel is the only specimen from the “Blacks” compositional reference group that falls into the Ik ceramic complex and is temporally later, although the lateral ridge is extremely faint and the deep round-sided form likely places this vessel very early in Ik or late Manik times. The third non-black surfaced vessel is a cream slipped bolstered-rim round-sided bowl, and the last is a bowl without slip preservation. A major concern with standardization studies relates to the range of vessel forms produced by a certain pottery production unit; does the production unit specialize in the production of just one or a limited range of vessel forms. The “Blacks” compositional reference group is restricted to the Early Classic period and half of the vessels assigned are so similar that I had already grouped them together by type and by form class before we initiated the INAA study. This compositional reference group stands apart from the others in this regard, and may well represent a different kind of production unit than the other compositional reference groups do. Nineteen other ceramic samples already in the Maya Ceramics database were assigned to the “Blacks” compositional reference group, including specimens recovered from Tikal that are Urita Gouged-Incised and San Clemente Gouged-Incised types. Another eight sherds from Balanza group pottery sampled for INAA did not sort into the “Blacks” compositional
reference group (Table 9.5.3); indicating that more than one paste recipe was used for the production of this ceramic group.

Table 9.5.3 BLACKS compositional reference group members.

<table>
<thead>
<tr>
<th>INAA ID #</th>
<th>PST ID #</th>
<th>AREA</th>
<th>CERAMIC TYPE or GROUP</th>
<th>COMPLEX</th>
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<tr>
<td>KS0046</td>
<td>114.1.1 #2</td>
<td>EAST</td>
<td>ACHOTE BLACK</td>
<td>EDZNAB?</td>
</tr>
<tr>
<td>KS0051</td>
<td>114 sc3 #6</td>
<td>EAST</td>
<td>BALANZA GROUP</td>
<td>MANIK</td>
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<tr>
<td>KS0055</td>
<td>114 sc1 #4</td>
<td>EAST</td>
<td>SAXCHE ORANGE POLYCHROME</td>
<td>IK</td>
</tr>
<tr>
<td>KS0060</td>
<td>114 sc1 #7</td>
<td>EAST</td>
<td>Unspecified</td>
<td>unspecified</td>
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<tr>
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<td>201.1.2 #2</td>
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<td>SAXCHE?</td>
<td>IK</td>
</tr>
<tr>
<td>KS0084</td>
<td>G45E1 #1</td>
<td>NORTH</td>
<td>LUCHA INCISED</td>
<td>MANIK</td>
</tr>
<tr>
<td>KS0085</td>
<td>G45E1 #2</td>
<td>NORTH</td>
<td>LUCHA INCISED</td>
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<tr>
<td>KS0086</td>
<td>9.1.2 #3</td>
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<td>URITA GOUGED-INCISED</td>
<td>MANIK</td>
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<tr>
<td>KS0103</td>
<td>115.1.4 #2</td>
<td>EAST</td>
<td>LUCHA INCISED</td>
<td>MANIK</td>
</tr>
<tr>
<td>KS0120</td>
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<td>7.3.7 #5</td>
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<td>Unspecified</td>
<td>MANIK</td>
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<td>KS0156</td>
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<td>LUCHA INCISED</td>
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<td>KS0157</td>
<td>7.3.9 #50</td>
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<td>BALANZA BLACK</td>
<td>MANIK</td>
</tr>
<tr>
<td>KS0163</td>
<td>???</td>
<td>EAST</td>
<td>POSITAS MODELED</td>
<td>MANIK</td>
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Table 9.5.4 Balanza group sherds not sorted in the BLACKS compositional reference group.

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<td>MANIK</td>
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<td>BALANZA GROUP</td>
<td>MANIK</td>
</tr>
<tr>
<td>KS0080</td>
<td>7.3.10 #1</td>
<td>NORTH</td>
<td>BALANZA BLACK</td>
<td>MANIK</td>
</tr>
<tr>
<td>KS0083</td>
<td>7.3.7 #1</td>
<td>NORTH</td>
<td>URITA GOUGED-INCISED</td>
<td>MANIK</td>
</tr>
<tr>
<td>KS0089</td>
<td>115.1.4 #1</td>
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<td>MANIK</td>
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<td>KS0104</td>
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<tr>
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<td>115.1.3 #3</td>
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<td>LUCHA INCISED</td>
<td>MANIK</td>
</tr>
<tr>
<td>KS0110</td>
<td>115.1.3 #1</td>
<td>EAST</td>
<td>LUCHA INCISED</td>
<td>MANIK</td>
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</table>
Figure 9.5.2 BLACKS compositional reference group, part I captions.


F. KS0120 – Urita Gouged-Incised. Round-sided bowl (barrel). Sub-labial circumferential line and design incised at leather-hard stage. Design is reminiscent of Urita Gouged-Incised motifs, but executed much more like incisions than gouged-incisions. Monochrome gloss black exterior and interior; remnants of orange slip (or paint?) over black gloss interior slip.

Figure 9.5.2 BLACKS compositional reference group, part I.
Figure 9.5.3 –BLACKS compositional reference group, part II captions.


I. KS0046 – Possible Achote Black. Slightly outflaring-walled dish. Monochrome black exterior (poor preservation) and interior.


Figure 9.5.3 - BLACKS compositional reference group, part II.
Figure 9.5.4 – Balanza group sherds not sorted into the BLACKS compositional reference group, captions.


E. KS0102 – Paradero Fluted. Wall sherd. Monochrome black exterior and interior smudged into orange slip, appears uniform and intentional.


H. KS0080 – Probable Balanza Black. Hollow support almost certainly from a tripod vessel. cf Culbert 1993:Figures 31b-f (Burial 48)

Figure 9.5.4 - Balanza Blacks not sorted into the BLACKS compositional reference group.
The “Saxche” Compositional Reference Group

Of the 69 samples assigned to one of the five compositional reference groups, one-quarter were assigned to my “Saxche” group. This group is dominated by polychrome pottery of the Saxche and Palmar ceramic groups of the Late Classic Period Ik and Imix ceramic complexes (Table 9.5.5). Only three of seventeen specimens appear to be Early Classic specimens: a slab-foot support almost certainly from a cylinder and two monochrome slipped rim sherds from round-sided bowls (Aguila Orange or Balanza Black types). The other fourteen sherds are split between Ik and Imix complex shape classes and types (Figure 9.5.5). Seven sherds are from the Saxche ceramic group of the Ik ceramic complex (Saxche Orange Polychrome or Desquite Red-on-Orange types). Two of these are near identical lateral ridge outflaring-walled dishes, two are miniature jars, two are barrels, and one is an outflaring-walled deep bowl. The seven sherds assigned to my “Saxche” compositional reference group from the Imix ceramic complex are either Palmar group polychromes or their slips are too weathered to make a determination. All of these Imix complex sherds with slip preservation have a cream underslip or primer. Three are outflaring-walled (tripod) dishes, two are barrels, one is an outflaring-walled deep bowl, and one is a vertical-walled cylinder with horizontal groove-flutes. A figurine head (KS0167) was also assigned to this compositional reference group.

My “Saxche” compositional reference group is dominantly comprised of Late Classic polychromes of the Saxche and Palmar ceramic groups. Although this group does contain samples from both the Ik ceramic complex (A.D. 550 – 700) and Imix ceramic complex (A.D. 700 – 850), it may, in fact, represent pottery produced during a relatively short temporal period straddling the two consecutive ceramic complexes (i.e., A.D. 650 – 750) or, alternately, a much longer time span (i.e., A.D. 550 – 850, the entire Late Classic period).
Table 9.5.5 SAXCHE compositional reference group members.

<table>
<thead>
<tr>
<th>INAA ID #</th>
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<td>EAST</td>
<td>PALMAR GROUP</td>
<td>IMIX</td>
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<tr>
<td>KS0010</td>
<td>113.1.1 #1</td>
<td>EAST</td>
<td>Unspecified</td>
<td>???</td>
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<tr>
<td>KS0025</td>
<td>115 sc1 #1</td>
<td>EAST</td>
<td>Probable AGUILA ORANGE</td>
<td>???</td>
</tr>
<tr>
<td>KS0032</td>
<td>114.4.2 #3</td>
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<td>PALMAR GROUP</td>
<td>IMIX</td>
</tr>
<tr>
<td>KS0033</td>
<td>114.4.2 #2</td>
<td>EAST</td>
<td>DESQUITE RED-ON-ORANGE</td>
<td>IMIX*</td>
</tr>
<tr>
<td>KS0036</td>
<td>114.4.1 #1</td>
<td>EAST</td>
<td>Unspecified</td>
<td>IMIX</td>
</tr>
<tr>
<td>KS0039</td>
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<td>IK/IMIX</td>
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<tr>
<td>KS0087</td>
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<tr>
<td>KS0088</td>
<td>115.1.4 #3</td>
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<td>AGUILA OR BALANZA GROUP</td>
<td>IK*</td>
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<td>KS0124</td>
<td>G1W1 #9</td>
<td>NORTH</td>
<td>PALMAR ORANGE POLYCHROME</td>
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<td>KS0127</td>
<td>113 sc5 #12</td>
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</tr>
<tr>
<td>KS0145</td>
<td>G1W1 #7</td>
<td>NORTH</td>
<td>SAXCHE ORANGE POLYCHROME</td>
<td>IK</td>
</tr>
<tr>
<td>KS0146</td>
<td>G1W1 #4</td>
<td>NORTH</td>
<td>SAXCHE ORANGE POLYCHROME</td>
<td>IK</td>
</tr>
<tr>
<td>KS0161</td>
<td>G47E1 #1</td>
<td>NORTH</td>
<td>SAXCHE GROUP</td>
<td>IK</td>
</tr>
<tr>
<td>KS0167</td>
<td>37.1.2</td>
<td>NORTH</td>
<td>FIGURINE</td>
<td></td>
</tr>
</tbody>
</table>

*by stratigraphic position.
Figure 9.5.5 SAXCHE compositional reference group captions.


B. KS0025 – Probable Aguila Orange. Slab support almost certainly from an hourglass tripod vessel. Faint orange (red) slip remnants. Unusual to have slab support slipped.

C. KS0127 – Palmar Orange Polychrome. Thick wall sherds. Exterior, black and red designs over gloss orange base slip over primer.


E. KS0145 – Saxche Orange Polychrome. Lateral-ridge dish. Exterior, matte red wash down to lateral ridge. Interior, black and red on gloss orange base slip.


G. KS0124 – Palmar Orange Polychrome. Miniature jar. Exterior, cream primer with gloss red over orange base slip; organic slip, inhibitor, or resin visible over lower half of sherd exterior. Interior, black rim band over light orange oxidized and burnished surface (unslipped); rim band wraps over exterior red gloss slip. cf. KS0003, KS0045 – exact slipping scheme match.


J. KS0036 – Type unassigned. Slightly outflaring-walled bowl or dish. No slip preservation.


N. KS0010 – Unspecified incised and modeled type. Straight-walled cylinder. No slip preservation.


Figure 9.5.5 SAXCHE compositional reference group.
The “Cylinder” Compositional Reference Group

Of the 69 samples assigned to one of the five compositional reference groups, almost 22 percent were assigned to my “Cylinder” group (Table 9.5.6) Both Early Classic and Late Classic form classes are represented by this compositional reference group. Basal-flanged dishes of the Manik ceramic complex, lateral-ridge dishes of the Ik ceramic complex, and some barrels or bowls of the Imix ceramic complex are all represented in similar proportions in this group. Monochrome, bichrome, and polychrome types are all present, including Caldero Buff Polychrome, Uacho Black-on-Orange (Red), and several probable Palmar group polychromes. This compositional reference group encompasses the greatest variety of shapes and types of any of the five groups formulated (Figure 9.5.6). It is the most difficult to interpret for this reason.

Table 9.5.6 – CYLINDER compositional reference group members.

<table>
<thead>
<tr>
<th>INAA ID #</th>
<th>PST ID #</th>
<th>AREA</th>
<th>CERAMIC TYPE or GROUP</th>
<th>COMPLEX</th>
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<td>MANIK</td>
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<td>DOS ARROYOS ORANGE POLYCHROME</td>
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<td>7.3.15 #1</td>
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<td>CHANTOURI BLACK-ON-ORANGE</td>
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<td>UACHO BLACK-ON-ORANGE</td>
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<td>MANIK</td>
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*by stratigraphic position.
**Figure 9.5.6 – CYLINDER compositional reference group captions.**


B. KS0159 – Probable Aguila Orange. Hollow slab support almost certainly from tripod vessel. Cream primer on exterior wall above support; probable orange interior slip on interior vessel base variegated to brown, no primer.


M. KS0045 – Palmar Orange Polychrome. Exterior, cream primer with black and red on gloss orange base slip. No interior slip preservation. Possible organic slip, inhibitor, or resin visible over lower portion of sherd exterior. cf. KS0003, KS0124, exact slipping scheme match.

N. KS0140 – Probable Palmar Group. Slightly outflaring-walled deep bowl. Remnants of cream primer on exterior wall and base and interior wall and base. Traces of red over primer on exterior wall. Traces of gloss orange slip over primer on exterior base. Traces of gloss orange slip over primer on interior wall and base.


Figure 9.5.6 - CYLINDERS compositional reference group.
The “Imix A” Compositional Reference Group

My “Imix A” and “Imix B” compositional reference groups separate along the first principle component of the PCA and likely represent groups that could be further subdivided with the addition of more sampling and subsequent increase in density within multivariate space. Of the 69 samples assigned to one of the five compositional reference groups, 16 percent were assigned to my “Imix A” group (Table 9.5.6). This group is dominated by Early Classic types and form classes of the Manik ceramic group (Figure 9.5.6). A single Urita Gouged-Incised bowl is a reminder that not all of the Balanza Black ceramic group pottery sorted into my “Blacks” group through examination of the INAA data. Five of the eleven members of this compositional reference group relate to basal-flanged dishes of the Manik ceramic complex (Dos Arroyos Orange Polychrome or Caldero Buff Polychrome). One rim to base sherd is from an Ik ceramic complex lateral-ridged dish with a ticked lateral ridge. This particular vessel is quite deep and thick walled for Ik complex dishes and I would place it earlier in Ik times rather than later. A few other sherds are difficult to assign a temporal designation by form or by type. One specimen is without a doubt Late Classic in date. This rim-to-base sherd (KS0100) is the imitation Telchak “monkey bowl” and must date to late Ik or early Imix times.

Table 9.5.7 - IMIX A compositional reference group members.

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<th>PST ID #</th>
<th>AREA</th>
<th>CERAMIC TYPE or GROUP</th>
<th>COMPLEX</th>
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<td>MIMICK TELCHAK COMPOSITE</td>
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<td>unassigned</td>
<td>???</td>
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Figure 9.5.7 - IMIX A compositional reference group captions.

A. KS0016 – Caldero Buff Polychrome. Almost certainly the rim of a basal-flanged deep dish. Entire exterior covered by gloss orange slip except for a 2-3 mm band left unslipped (buff); black rim band applied over gloss orange exterior. Interior, black and orange design on buff.

B. KS0023 – Caldero Buff Polychrome. Basal-flanged deep dish. Exterior, red on buff with black dots over red band on basal flange; unslipped below basal flange. Interior, monochrome red slip.

C. KS0019 – Caldero Buff Polychrome or Dos Arroyos Orange Polychrome. Basal-flanged deep dish. Exterior, red and black on unslipped (light orange). Interior, red and black rim bands on gloss orange slip.


E. KS0064 – Type unassigned. Large bowl with bolstered rim. Monochrome red slip exterior and interior.


H. KS0108 – Type not assigned. Slightly round-sided bowl. Unslipped, polished to high gloss (waxy feel) exterior and interior.

I. KS0100 – Unnamed incised type. Beaker. Incised monkey design within zoned field of dentate stamping delineated by incised borders. This is a mimic of a Chablekal Fine Grey Telchak Composite. Tan paste with abundant <.5 mm inclusions (temper) and <2 mm ferruginous aplastic inclusions (not purposefully added, never removed from clay). Exterior, monochrome orange variegated to brown. Interior, no slip preservation.


Figure 9.5.7 IMIX A compositional reference group.
The “Imix B” Compositional Reference Group

Of the 69 samples assigned to one of the five compositional reference groups, a little over 17 percent were assigned to my “Imix B” group (Table 9.5.8). Most of the pottery assigned to this group was recovered from the southest survey sector around the minor center of Ramonal/Chalpate. Three sherd were recovered from Groups 1 and 45 within the northern earthwork survey corridor, including the rare insect motif bowl (Saxche Orange Polychrome) from Group 45. Temporally, this group is made up of Late Classic forms and types of the Ik and Imix ceramic complexes (Figure 9.5.8). Three very similar lateral-ridged dishes of the Ik ceramic complex all came from the community midden located east of the Ramonal acropolis (Operation 115). A variety of Imix ceramic complex dishes surface collected from the Ramonal/Chalpate area make up half of this compositional reference group. The temporal assignment of these sherds parallels that of my “Saxche” compositional reference group. While both Ik and Imix complex vessels are represented, it is likely that my “Imix B” group represents pottery produced during a relatively short period of time, straddling the end of the Ik period and beginning of the Imix period (i.e., A.D. 650–750).

Table 9.5.8 - IMIX B compositional reference group members.

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<th>INAA ID #</th>
<th>PST ID #</th>
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<th>COMPLEX</th>
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*by stratigraphic position.
Figure 9.5.8 –IMIX B compositional reference group captions.


C. KS0137 – Type unassigned. Lateral-ridge dish. No slip preservation. Very fine chalk-like consistency paste comparable to fine grey or fine orange types.


E. KS0114 – Type unassigned. Lateral-ridge dish. Sub-gloss red slip exterior and interior. Probably monochrome red (or base slip). Fully oxidized medium texture sandy paste, thick wall, and triangular lateral ridge all unusual for Saxche Group vessels.


G. KS0041 – Type unassigned. Imix phase dish, slightly bolstered rim. Traces of gloss orange slip over primer exterior and interior.

H. KS0050 – Definite Palmar Group, either Zacatel Cream Polychrome or Palmar Orange Polychrome. Outflaring-walled dish with very slightly everted rim. Exterior, cream underslip (primer) with red stripes on gloss orange base slip. Interior, red, black, and orange over cream; black and red applied over orange gloss over cream underslip. Unsure if cream slip was completed covered or if portions remained visible. cf. Culbert 1993:Figures 53f, 64a1, 79d, 82a1, 83b1, 92h, 92i, 95b, 95c, and 97b1.

I. KS0132 – Type unassigned. Slightly outflaring-walled dish rim. Light matte red monochrome slip exterior and interior.


K. KS0143 – Saxche Orange Polychrome. Round-sided bowl. Exterior, black and red over gloss orange base slip. Interior, red over gloss orange base slip. Interior black rim band over red rim band. Rare depiction of an insect on a Tikal vessel. Vessel is local, not imported. cf. Culbert 1993:Figure 49a1; Laporte 2000:Figure 30a.

Figure 9.5.8 - IMIX B compositional reference group.
Trends in the Data

The compositional analysis demonstrates that ceramic vessel form classes were produced in different paste classes (i.e., compositional reference groups). Membership in each of the compositional reference groups is not restricted to one or a few forms. Except for my “Blacks” group, all the compositional reference groups contain a cross-section of multiple different form classes. There is some indication that compositional reference groups do correlate with ceramic groups (as defined through Type-Variety classification) as Ball (1993:345) once suggested.

Thirty-six lateral-ridge dishes of the Ik ceramic complex were recovered from our 2005-2006 excavation program (Table 9.5.9). I submitted samples from 26 of the specimens recovered (72 percent) and specimens were assigned to all five of the compositional reference groups; this form was made in all recognized paste traditions (Table 9.5.10). Furthermore, 65 percent of the sampled sherds from lateral-ridge Ik Complex dishes could not be assigned to one of the five compositional reference groups. This finding suggests that this particular form was made by numerous production units working in a number of distinct paste preparation traditions. Compositional analysis suggests that this specific form class was just one of several form classes produced in at least four of the identified paste traditions. These dishes, therefore, represent a community-wide form convention and do not represent the product of one or a few closely related production units (Figure 9.5.9 and 9.5.10).

Table 9.5.9 – Compositional reference group assignments for Ik complex lateral-ridge dishes.

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<thead>
<tr>
<th>INAA Samples (N=26/36, 72%)</th>
<th>Percentage</th>
<th>Compositional Groups</th>
</tr>
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<tr>
<td>5</td>
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<td>4</td>
<td>15.38%</td>
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Table 9.5.10 – Ik ceramic complex lateral-ridge dishes from the PST excavations.

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<th>Lot</th>
<th>Lot #</th>
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<th>Max.</th>
<th>Min.</th>
<th>W. Angle (in °)</th>
<th>Dia. (cm)</th>
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Figure 9.5.9 – Ik ceramic complex lateral-ridge dishes, part I captions.

A. 115.1.2#5 – Saxche Orange Polychrome. Lateral ridge dish. Interior, red and black on gloss orange base slip. Exterior, gloss orange slip.


C. 115.1.4 #7 – probable Saxche Orange Polychrome. Lateral-ridge dish. Interior, red and black on gloss orange base slip. Unslipped exterior.


E. 115.1.2 #7 – probable Saxche Orange Polychrome. Lateral-ridge dish. Interior, red and black on gloss orange base slip. Unslipped exterior.

F. 115.1.0 #2 – Type unassigned. Lateral-ridge dish. Interior, red monochrome or base slip. Unslipped exterior.


K. 115.1.0 #1 – Saxche Orange Polychrome or Desquite Red-on-orange. Interior, traces of red on gloss orange base slip. Lateral-ridge dish. Unslipped exterior.


M. KS0011 – Saxche Orange Polychrome. Lateral-ridge dish with everted rim. Interior, orange gloss slip (only visible towards interior base) overlaid by red gloss slip, black rim band over red gloss slip. Unslipped exterior.


Q. 37.1.2 #1 – Possible Saxche Orange Polychrome. Lateral-ridge dish. Interior, red and black on gloss orange base slip. Unslipped exterior.

Figure 9.5.9 - Ik ceramic complex lateral-ridge dishes, part I.
Figure 9.5.10 – Ik ceramic complex lateral-ridge dishes, part II captions.


C. KS0122 – Type unassigned. Lateral-ridge dish, related to round-sided variety. Dull red interior and exterior slip remnants.


E. KS0136 – Possible Saxche Orange Polychrome, although darker orange base slip and divergent paste suggest an unnamed type following Saxche Orange Polychrome conventions. Lateral-ridge dish rim. Unslipped exterior.

F. KS0130 – Possible Saxche Orange Polychrome, although interior orange base slip and reddish-tan paste are not typical and suggest this is an unnamed type following conventions for Saxche Orange Polychrome vessels. Lateral-ridge dish rim – squared lateral ridge and wall profile seem out of normal range of variation. Unslipped exterior.


I. KS0114 – Type unassigned. Lateral-ridge dish. Sub-gloss red slip exterior and interior. Probably monochrome red (or base slip). Fully oxidized medium texture sandy paste, thick wall, and triangular lateral ridge all unusual for Saxche group vessels.

J. KS0138 – Type unassigned. Lateral-ridge dish. Interior, monochrome deep red slip. Very fine chalk-like consistency paste comparable to fine grey or fine orange types, grayish tan to pinkish color.

K. KS0137 – Type unassigned. Lateral-ridge dish. No slip preservation. Very fine chalk-like consistency paste comparable to fine grey or fine orange types.

L. 115 s.c.0 #1 – Saxche Orange Polychrome. Lateral-ridge dish. Interior, red and black on gloss orange base slip. Unslipped exterior.


N. KS0147 – Probable Saxche Orange Polychrome. Probable lateral-ridge dish rim. Interior, gloss orange base slip mostly covered by gloss red slip; black bands applied over red and orange slips. Unslipped exterior.

O. KS0145 – Saxche Orange Polychrome. Lateral-ridge dish. Exterior, matte red wash down to lateral ridge. Interior, black and red on gloss orange base slip.


Q. KS0126 – Type unassigned, related to Saxche Group. Lateral-ridge dish with everted rim. Unusual color scheme. Interior, dark red and orange on grey base slip. Grey base slip illustrated as cream (blank) – this may be a corrupted cream or orange base slip. Unslipped exterior.

Figure 9.5.10 - Ik ceramic complex lateral-ridge dishes, part II.
Overall Geographic Distribution of Sherds from the Five Compositional Reference Groups

Just over 40% (N=69) of the samples submitted for INAA (N=170) were assigned to one of five compositional reference groups. These 69 assigned sherds come from all areas of our survey program, and I have assigned zone designations for blocks of the study area. Zones 1, 2, and 3 are from the northern earthwork corridor. Zone 1 is the farthest western portion of the corridor, west of the Uaxactun road. Zone 2 is the central portion of the northern earthwork corridor, east of the Uaxactun road past the north transect brecha. Zone 3 is the farthest eastern portion of the northern earthwork corridor, beyond Zone 2. Zone SE is the southeastern sector around the minor center of Ramonal/Chalpate, and Zone West is the western survey block located approximately 5 km due west of the site center (Figure 9.5.11). Table 9.5.11 shows the distributions of sherds from the five compositional reference groups by Zone.

Table 9.5.11 – Distribution of sherds from the compositional reference groups.

<table>
<thead>
<tr>
<th>Group or Operation</th>
<th>Zone</th>
<th>Balanza</th>
<th>Saxche</th>
<th>Cylinder</th>
<th>Imix A</th>
<th>Imix B</th>
</tr>
</thead>
<tbody>
<tr>
<td>G21</td>
<td>1</td>
<td></td>
<td></td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>G45</td>
<td>1</td>
<td>4</td>
<td>6</td>
<td>1</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>G48</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>G1</td>
<td>2</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>6</td>
<td>1</td>
</tr>
<tr>
<td>G4</td>
<td>2</td>
<td>1</td>
<td></td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>G11A</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>G46</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>G47</td>
<td>2</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>G52</td>
<td>3</td>
<td>1</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Op. 1 - Puleston “B”</td>
<td>3</td>
<td>1</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Op. 113</td>
<td>SE</td>
<td>3</td>
<td></td>
<td></td>
<td></td>
<td>3</td>
</tr>
<tr>
<td>Op. 114</td>
<td>SE</td>
<td>4</td>
<td>4</td>
<td>1</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>Op. 115</td>
<td>SE</td>
<td>1</td>
<td>3</td>
<td>1</td>
<td></td>
<td>3</td>
</tr>
<tr>
<td>Op. 201</td>
<td>West</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>totals =</td>
<td></td>
<td>14</td>
<td>17</td>
<td>15</td>
<td>11</td>
<td>12</td>
</tr>
</tbody>
</table>
Figure 9.5.11 – PST project Operations with Zone designations for geographic areas.
Zones 1, 2 and SE were the most heavily sampled. The paucity of assigned samples from Zone 3 and West is due to a lack of recovered ceramics. This distribution demonstrates that pottery from all five compositional reference groups was recovered from all heavily sampled sectors of our survey. The recovery contexts of sherds from all compositional reference groups demonstrate that none conforms to a geographically restricted pattern. Pottery assigned to all compositional reference groups was evidently available to residents from any sector of the peripheries we tested.

Table 9.5.12 – Distribution of sherds from the compositional reference groups by Zone designation.

<table>
<thead>
<tr>
<th>Zone</th>
<th>Balanza</th>
<th>Saxche</th>
<th>Cylinder</th>
<th>Imix A</th>
<th>Imix B</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>4</td>
<td>1</td>
<td>6</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>8</td>
<td>1</td>
</tr>
<tr>
<td>3</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SE</td>
<td>5</td>
<td>10</td>
<td>2</td>
<td>1</td>
<td>9</td>
</tr>
<tr>
<td>West</td>
<td>1</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>total=</td>
<td>14</td>
<td>17</td>
<td>15</td>
<td>11</td>
<td>12</td>
</tr>
</tbody>
</table>

At a gross geographic scale the distribution of sherds from the different compositional reference groups does evidence a proportional distinction between the northern periphery (Zones 1, 2, and 3) and the southeastern area around the minor center of Ramonal/Chalpate (Zone SE). Sherds assigned to the “Cylinder” and “Imix A” compositional reference groups are heavily represented in the northern periphery and only lightly represented at Ramonal/Chalpate. The “Imix B” compositional reference group is more heavily represented at Ramonal/Chalpate than within the northern periphery. I suspect that more sampling would allow a greater degree of precision in determining the geographic areas of production for pottery with similar compositional signatures. At present, I cannot make a more accurate determination of where on the ground pottery from different compositional groups was made.
Table 9.5.13 – Comparison of the distribution of sherds from the compositional reference groups between northern peripheral Tikal and the minor center of Ramonal/Chalpate.

<table>
<thead>
<tr>
<th>Area</th>
<th>Balanza</th>
<th>Saxche</th>
<th>Cylinder</th>
<th>Imix A</th>
<th>Imix B</th>
</tr>
</thead>
<tbody>
<tr>
<td>Northern Periphery</td>
<td>8</td>
<td>6</td>
<td>13</td>
<td>10</td>
<td>3</td>
</tr>
<tr>
<td>Ramonal/Chalpate</td>
<td>5</td>
<td>10</td>
<td>2</td>
<td>1</td>
<td>9</td>
</tr>
</tbody>
</table>

Single Operation Analysis

Sixty-nine of the sherds sampled for INAA come from just three operations that produced abundant ceramics. Table 9.5.14 shows group membership for all sherds recovered from three exceptionally productive operations and submitted for INAA. Groups 45 and 1 are large multiple plaza residential groups located within the northern earthwork corridor, and Op. 115 is the ‘community’ midden from the residential sector east of Ramonal.

Table 9.5.14 – distribution of sherds from the five compositional reference groups recovered from single middens.

<table>
<thead>
<tr>
<th>Middens:</th>
<th>Zone</th>
<th>Balanza</th>
<th>Saxche</th>
<th>Cylinder</th>
<th>Imix A</th>
<th>Imix B</th>
<th>unassigned</th>
</tr>
</thead>
<tbody>
<tr>
<td>G45</td>
<td>1</td>
<td>4</td>
<td>6</td>
<td>1</td>
<td>2</td>
<td>13</td>
<td>13 (50.0%)</td>
</tr>
<tr>
<td>G1</td>
<td>2</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>6</td>
<td>1</td>
<td>9 (36.6%)</td>
</tr>
<tr>
<td>Op. 115</td>
<td>SE</td>
<td>1</td>
<td>3</td>
<td>1</td>
<td>3</td>
<td>10</td>
<td>10 (55.6%)</td>
</tr>
</tbody>
</table>

Half the sherds from Group 45 submitted for INAA remained unassigned after pattern recognition and compositional reference group formation. The other 50 percent of sherds recovered from this group and submitted for INAA were assigned to four of the five compositional reference groups. An even higher percentage of group assignment was achieved for the Group 1 collection. Only 9 of the 25 sherds analyzed from Group 1 remained unassigned after pattern recognition and compositional reference group
formation. The 16 assigned sherds were distributed across all five compositional reference groups. Less than half of the Op. 115 sherds submitted were assigned to four of the five compositional reference groups, while almost 56 percent remained unassigned upon completion of the analysis.

Table 9.5.15 – distribution of sherds from the five compositional reference groups recovered from areas of the Ramonal/Chalpate survey zone.

<table>
<thead>
<tr>
<th>Operation</th>
<th>Zone</th>
<th>Balanza</th>
<th>Saxche</th>
<th>Cylinder</th>
<th>Imix A</th>
<th>Imix B</th>
<th>unassigned</th>
</tr>
</thead>
<tbody>
<tr>
<td>Op. 113</td>
<td>SE</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>9 (60.0%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Op. 114</td>
<td>SE</td>
<td>4</td>
<td>4</td>
<td>1</td>
<td>1</td>
<td>3</td>
<td>24 (64.9%)</td>
</tr>
</tbody>
</table>

Operation 113 sampled the residential acropolis of Ramonal with two 2 x 2 m test-pits and a number of surface collections. Four 2 x 1 m test-pits and a number of surface collections from the residential sector east of this acropolis are subsumed under the Operation 114 designation. Although almost 65 percent of the sherds from Op. 114 submitted for INAA could not be assigned to one of the five compositional reference groups, a little over one-third of the analyzed sherds could. All five groups were present. The 40 percent of analyzed sherds from Operation 113 that could be assigned membership were grouped into just two of the five compositional reference groups. I suspect that the lack of sherds corresponding to the remaining three compositional reference groups is a function of sampling and chance, not any indication of the restricted consumption of pottery from a particular paste tradition. The fact that the majority of sherds analyzed remained unassigned and that all five compositional reference groups are well represented nearby support this conclusion. From a household consumption perspective, pottery from multiple different paste traditions was acquired by the same consumption units. There is no indication of reliance upon just one or two paste classes by a single household or geographic grouping of households.
Standardization of Metric Attributes for Specific Form Classes of Pottery

I reviewed the reporting of standardization measures for metric attributes from pottery in Chapter 6.2. As a second form of inquiry into the relative number of production units, I calculated CV values for metric attributes from sherds and vessels in three different categories: Balanza Black ceramic group bowls of the Manik ceramic complex, lateral-ridge dishes of the Ik ceramic complex, and Imix ceramic complex slightly outflaring-walled dishes. I used all recovered specimens from our 2005-2006 excavations, not just the specimens submitted for INAA. Although standardization measures are relative and must be compared against some other collection, whether ethnographically or archaeologically derived, there is a growing appreciation that standardization measures reflect the relative number of production units producing a form class, ceramic type, or mixed assemblage (e.g., Foias and Bishop 2007).

“By looking at the degree of standardization within a single style zone or regional variant, it may be possible to further approximate the degree of specialization by estimating the relative number of production groups for each variant.” (Costin 1991:42)

Many of the recovered Balanza ceramic group bowls appear highly “standardized,” conforming to a consistent paste preparation tradition, form, surface finishing, and plastic design. I calculated CVs for the metric attributes of rim diameter and wall thickness for these vessels. The CV for rim diameter was 8.9, for wall thickness it was 9.3. These values (under 10 percent) stand out in contrast to the CVs calculated for the other two form classes. After removing a single outlier I re-calculated a CV of 4.3 for rim diameter. Given the apparent greater standardization of these vessels and the fact that my “Blacks” compositional reference group contained a number of Balanza Group pottery previously recovered from Central Tikal, including the Lost World excavations conducted by Juan Pedro Laporte’s Project National Tikal (Ronald Bishop, personal communication 2007\(^{26}\)), I suspect that these vessels were produced by a fewer number of

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\(^{26}\) I confirmed this observation in 2007 while reviewing the Smithsonian Archaeometric Research Collections and Records (SARCAR) database of Maya ceramic samples. Due to a lack of time and the untimely death of Dr. Juan
specialists, possibly on a more frequent or intense basis (i.e., full-time), than other vessel types or form classes.

The INAA of sherds from lateral-ridge dishes of the Ik ceramic complex demonstrate that they were manufactured in all five paste traditions that I isolated and other, more lightly sampled paste traditions for which compositional paste reference groups could not be constructed (Table 9.5.16). The INAA results suggest that this form represents a Tikal-wide (and beyond) vessel form class convention, not the product of one or a few closely related production units. For these sherds I calculated CV values for the metric variables of rim diameter, maximum wall thickness, minimal wall thickness, distance from lateral ridge to rim, and wall angle orientation.

Table 9.5.16 – CV values for Ik ceramic complex lateral-ridges dishes.

<table>
<thead>
<tr>
<th>metric attribute</th>
<th>CV</th>
</tr>
</thead>
<tbody>
<tr>
<td>rim diameter</td>
<td>12.6%</td>
</tr>
<tr>
<td>max. wall thickness</td>
<td>12.3%</td>
</tr>
<tr>
<td>min. wall thickness</td>
<td>16.5%</td>
</tr>
<tr>
<td>lateral ridge to rim</td>
<td>42.8%</td>
</tr>
<tr>
<td>wall orientation</td>
<td>21.5%</td>
</tr>
</tbody>
</table>

After constructing a histogram of rim diameter frequencies for this subset of vessels, five very large (40-42 cm) dishes were removed and CV values re-calculated for just the remainder of the collection (rim diameter range = 26-38 cm) (Table 9.5.17).

Pedro Laporte, I was unable to revisit this important topic; one that will hopefully be addressed in the future – I mention this observation here in an attempt to stress the possibilities of ceramic INAA that remain unfulfilled.
Table 9.5.17 – CV values for Ik ceramic complex lateral-ridged dishes with outliers removed.

<table>
<thead>
<tr>
<th>metric attribute</th>
<th>CV</th>
</tr>
</thead>
<tbody>
<tr>
<td>rim diameter</td>
<td>9.2%</td>
</tr>
<tr>
<td>max. wall thickness</td>
<td>11.1%</td>
</tr>
<tr>
<td>min. wall thickness</td>
<td>14.9%</td>
</tr>
<tr>
<td>lateral ridge to rim</td>
<td>21.0%</td>
</tr>
<tr>
<td>wall orientation</td>
<td>21.5%</td>
</tr>
</tbody>
</table>

Re-calculation after the removal of the five outliers did bring the CV values for metric attributes down lower, but only rim diameter fell below the 10 percent level. Even after cropping outliers from the collection, the CV values indicate a relatively unstandardized set of vessels.

The third series of sherds for which I calculated CV values was comprised of Imix ceramic complex slightly outflaring-walled dishes. The metric attributes measured were rim diameter, wall thickness (at midpoint between rim and base), and vessel height from rim to base (tripod supports not included). The resulting CV values were 10.3 for rim diameter, 15.1 for wall thickness, and 9.9 for vessel height. Again, these dishes are not highly standardized to the degree expected if they had been manufactured by one or a few closely related production units.

In general, I was surprised that the CV values were so low. I had expected much less ‘standardization’ in small collections of pottery known to have been made in numerous paste preparation traditions. The calculation of rim diameters from sherd collections is problematic for a number of reasons. First, it is difficult to get an accurate read on a sherd’s diameter from small specimens. Second, using a diameter chart to reconstruct the original rim diameter of the vessel introduces a degree of inaccuracy (see Plog 1985) although measurements tend to be internally consistent for a single analyst (i.e., a single analyst tends to underestimate all the time, or overestimate all the time, see
DeBoer 1980). I typically tilt inverted sherds on a rim diameter chart with one centimeter graduated rings. In this manner, a sherd is assigned a rim diameter in two centimeter increments. Even with a “cumulative blurring” (Blackman et al. 1993) of variation introduced by multiple potters’ hands during manufacture, CV values for rim diameter are consistently the lowest for any metric attribute measured. I suspect that the combined effects of calculating measurements for vessels in circulation for time periods over one hundred years and the physical measurement process for sherds combine to make this statistic less than reliable.

The CV values do suggest that the Balanza Black bowls were relatively more standardized in metric attributes. Given the uniformity of paste preparation, surface finish, and plastic design within this group, I have a strong suspicion that these represent one product that was manufactured by fewer specialists than any other type or form class analyzed in my study. As a reflection of the relative number of production units, the CV values calculated from Late Classic period dishes support the conclusion that multiple production units manufactured similar vessels, not a limited number of high-output production units. The combined typological classification, metric standardization, and compositional analyses support the conclusion that serving ware pottery was manufactured by numerous, redundant production units, producing very similar vessels. These analyses do not support the conclusion that any specific type or form class represents the product of a single workshop.
Chapter 10 – Marketplace Exchange Embedded within Ancient Economic Systems

10.1 – Introduction to Ancient Marketplace Exchange and Economic Systems

The New World

The importance of pre-Columbian marketplace exchanges within the core of the Aztec Empire in the Basin of Mexico during the Postclassic epoch [ca. A.D. 1300 – 1520], reported in eyewitness accounts (see Anonymous Conqueror 1971:392; Cortes 1962:87-89; Diaz 1963:232-234; Sahagun 1950-1982, [Book 8]:67-69) and investigated by modern researchers (e.g., Berdan 1982, 1983, 1985, 1986, 1987; Blanton 1996; Brumfiel 1980; Carrasco 1978; Evans 1980; Hassig 1982, 1985; Hicks 1994; Isaac 1986b; Santley 1986; M. Smith 1979, 1980, 1987) has greatly influenced Mesoamerican scholars’ conceptions of market systems. The markets at Tenochtitlan, Tlatelolco, and Texcoco are reported as being enormous vibrant affairs involving scores of thousands of people exchanging a multitude of local and foreign products in administrated, centralized marketplaces. This historical phenomenon has perhaps overshadowed the need to investigate the existence of market systems in Classic Maya society from an objective archaeological perspective. The existence of markets at Maya centers has mostly been inferred through analogies with other societies and/or the archaeological evidence for exchange of goods without critical examination of the specific mode(s) of exchange responsible for the documented artifact distribution patterns. The functions that markets play in the formation of states and the rise of differing forms of political control remains a neglected subject as well (West 2002:143).

Bishop Diego De Landa remarked on the contact period Yucatecan Maya penchant for marketing behavior. His brief statements may be interpreted a number of ways, and do not shed considerable light on Postclassic Maya economics, although he
does attest to marketplace exchange as well as trading in salt, cloths, and slaves and the mediums of exchange employed in bartering.

“Their favorite occupation was trading, whereby they brought in salt; also cloths and slaves from Tabasco and Ulúa. In their bartering they used cacao and stone counters which they had for money, and other fine and beautiful stones, such as chiefs wore as jewels on festal occasions. They had also certain red shells for use as money and jewels for wearing; these they carried in network purses. In their markets they dealt in all the products of the country; they gave credit, borrowed and paid promptly and without usury.” (Landa 1978[1566]:37)

In her review of the ethnohistoric documentation of Postclassic Maya economic systems, Chapman (1957) was careful to distinguish between state-administered trade and marketplace exchange. In fact, she felt that two non-overlapping systems were in effect simultaneously; two distinct institutional arrangements that were not to be confused with one another because they rarely if even intersected.

“To the modern mind this may sound paradoxical. But long-distance trade was an institution apart: geographically, it was trade beyond the borders; its personnel formed a distinct social group; its members only exceptionally made their appearance in the markets; both the organizing of caravans and the negotiating of exchange in foreign countries formed part of this specialized occupation. This particular form of administered trade should not be confused with any other form of exchange, such as the important local market complex itself, corner food-stalls, peddlers, the sale of services, or the variants of neighborhood trade.” (Chapman 1957:115)

Ethnohistoric documents mention a lack of marketplaces in the Maya area as the primary reason behind the development of the port of trade institution (Isaac 1986a:333; see also Berdan 1975). Aztec pochteca are known to have exchanged directly with the rulers of foreign polities for precious items – jade, shells, turquoise, tortoise shell, animal skins, and feathers – outside of marketplaces (Berdan 1986:286). Landa’s writing does not specify the agents involved in the exchange of salt, cloths, or slaves or if this trade was conducted in the same marketplaces as was the exchange in all the products of the country. He does immediately follow his comments on Postclassic Maya trade by
describing cooperative work-groups for maize field preparation, redistribution of meat from cooperative hunting trips, and the widespread practice of reciprocal gift-giving (Landa 1978[1566]:38-39). He may also have conflated long-distance trade and marketplace exchange in his short statement or long-distance goods may have been available alongside local goods in marketplaces.

Not all exchanges in Classic Maya society were necessarily transacted in a marketplace setting. Complex marketplace exchange systems involving tens of thousands of participants in Central Mexican contact period communities performed several important functions. Not only did these marketplaces supply households with the necessities of life they did not produce themselves, but also acted as locales for converting commodities into other commodities through exchange; a process which greatly enhanced the ability of the state to exact tribute from the populace (Brumfiel 1980; Hirth 1998; Trigger 2003:346). Communities were often required to pay tribute in goods they did not produce themselves (Isaac 1986b:334). Marketplace exchange in the Aztec Empire was intertwined with a centralized imperial tribute system, professional long-distance traders, corveé labor, state redistribution, and gift exchange. Demonstrating the presence of marketplaces is only the first step in understanding the complex economic systems of New World societies.

No consensus has been reached as to the precise form or forms of economic redistribution in effect at any Classic Maya center or across any specific Maya region. Given the range of size and, presumably, internal organization of Maya centers it is likely that considerable economic variation existed from one center to the next. At Tikal, Stanton and Gallareta N. (2001) posit a mixed system of centralized redistribution, itinerant peddling, gift-giving and non-centralized redistribution. Prudence Rice (1987a:77) sees no evidence for markets at Classic Maya centers and favors a model of a kin-based redistribution system. P. Rice (1981) also notes that, when identified, production loci are always outside epicenters and that no barrios or manufactories implying full-time specialization have ever been located at any Maya site; nor have
structures indicative of storage facilities or markets been conclusively identified. Citing ceramic distribution radii of 5, 6, 8, 15-20 km, the non-central location of production, and the lack of capital investment, P. Rice (1981:78) concludes that potters probably worked part-time, allowing for participation in agricultural subsistence production.

The absence of large central storage facilities, especially for staple foods, is well documented for the Maya region (Tortellot 1993), though these may be difficult to detect archaeologically. Grain storage may have utilized more abundant perishable storage structures that have not survived, leaving only ephemeral evidence of their existence (see Smythe 1991 for an ethnographic survey of maize storage among the modern Maya of the Yucatan). Feinman and Nicholas, among others working in the Valley of Oaxaca (i.e., Appel 1986:381; Feinman 1986; Feinman, Blanton and Kowalewski 1984; Feinman and Nicholas 2004, 2007a), have stressed the lack of centralized storage facilities as a strong indication that goods were circulated through a market system and not through centralized redistribution.

The Inka Empire

The Inka state provisioning system was extensive and the physical storage structures built at the height of this empire represent one of the largest storage systems in the New World (Browman 1970; Cieza 1967[1553]; D’Altroy 1992; D’Altroy and Earle 1982; Morris 1967). Cieza (1967[1553]) described the vast state system of administrative facilities, lodgings, and storehouses used for support of the army as well as administrative and religious personnel, state specialists, and corveé laborers. Cloth was a major tribute good used to support the army and staple foodstuffs could be stored for a year or two without degradation, twice as long if freeze-dried (Morris 1981). This state storage system was vital to the centralized political authority considering the primitive state of transportation and the lack of a standardized currency. It was not entirely centralized at the capital of Cuzco, but involved facilities and attendants in major
provincial centers, throughout the Mantaro Valley (the agricultural ‘breadbasket’ of the empire), and along roads at *tampus* [road stations] (D’Altroy 2002:280-281). Even within the extensive redistributive economy of the Inka, other forms of exchange, including marketplace exchange, may have coexisted.

The residential core of the Inka provincial center of Huánaco Pampa is situated around an enormous central plaza, approximately 180 x 250 m in dimension. This was not a marketplace, although it fits the configurational aspect of a marketplace. It is estimated that the center could house 15,000 people, but not all occupants were permanent residents; the permanent population was much lower and rotational labor caused the population of the center to swell periodically. On the hillslope above the settlement, rows of state storage facilities (*qollqa*) are situated and it is estimated that the nearly seven hundred *qollqa* provided about 30,000 m³ of storage space (D’Altroy 2002:251, Figure 10.2; Moseley 2001:Figure 31).

The Spanish conquistadors and missionaries remarked that marketplace exchange at Cuzco mostly involved agricultural staples and ‘trifles’ [*miseriá*] of low-value acquired in small quantities (Murra 1980[1956]:147). Father Bernabe Cobo (1979[1653]:34-35) described the Inka peasant non-verbal technique of ‘haggling’ during *rescates* in some detail, which he witnessed firsthand during his stay in Cuzco from 1609 to 1613. The Inka Empire has long been designated the prime example of a redistributive society and markets were allegedly rare or non-existent. A few ethnohistoric documents appear to substantiate some market activity, although the extent and organization of marketing are not clear. Evidently, women were the dominant vendors in marketplaces, and market exchanges were not taxed (Earle 1985; La Lone 1982; S. Moore 1958:86, 153; Murra 1980[1956]:142-147, cited in Trigger 2003:353).

Noted Inka authority John V. Murra (1980[1956]) has pointed out that there were wildly conflicting reports made by Spanish conquistadors in the sixteenth century concerning marketing within the empire. Garsilaso (1960[1690]) denied marketplace
exchange, stating that household or community self-sufficiency obviated the need for markets (as Fariss (1984) has for the Late Postclassic Maya). Martín de Murúa reported being informed of a market (*ccatu*) held every five days at Cusipata in Cuzco, “which accommodated 100,000 persons: each craft and merchandise in its proper place…there was no coin in Inka times so they bartered one thing for another” (cited in Murra 1980[1956]:142). Eyewitnesses to the conquest, Estete (in Xerex 1947[1534] and Borregán (1948[1562-1564]), also reported markets within the Inka empire in the sixteenth century. Estete estimated 100,000 persons in attendance at the alleged marketplace at Xauxa, a large Inka urban administrative center (Murra 1980[1956]:145). This often repeated eyewitness account has been seriously questioned; the event may not have been a marketplace gathering at all (La Lone 1982).

“Specifically, I believe that the study of the Inca economy is not the study of a market economy. This is not to deny that Spanish colonial sources on the Inca empire do occasionally mention markets. However, when documents use the familiar terms *market* or *marketplace*, we cannot assume that what is called a “market” was in fact a market gathering.” (La Lone 1982:291)

The first step in evaluating the the Spanish eyewitness accounts of the alleged market gathering at Xauxa is to ask why the Spanish conquistadors were there at all and what their primary goals were. Of course, the Spanish chroniclers were not always concerned with the objective documentation of indigenous institutions. In fact, at the time of his arrival at Xauxa, in the Mantaro Valley, Miguel de Estete was accompanying Hernando Pizarro on the mission to acquire gold for Atahualpa’s ransom (La Lone 1982:303). The following transcription and translation of the crucial passage written by the firsthand eyewitness Estete come from La Lone (1982).

“se juntaban cada día en la plaza central cien mil personas, y estaban los mercados y calles del pueblo tan llenas de gentes, que parecía que no faltaba persona.” (Estete 1974:341)

[“Each day 100,000 persons gathered in the main plaza, and the markets and streets of the town were so full of people that it seemed everyone was there”] (more precise: “seemed no one was missing”)

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The next line reads:

“Había hombres que tenían cargo de contar toda esta gente para saber los que venían a server a la gente de Guerra”

[“There were men charged with counting all these people, so that they might know those who came to serve the warriors”]

Contextually, the colonial documents are relaying information concerning military ventures and assessing the strength of the Inka armies under Challcochima when attempting to subjugate the rebellious Mantaro Valley inhabitants during a time of civil war.

“To focus attention on the mere word market and to ignore the military context of the event distracts attention from an obvious alternative interpretation: What the Spaniards came upon was not a marketplace, but rather the mobilization and provisioning of a military force.” (La Lone 1982:304)

Hartmann (1971), champion of the market-exchange model for the Inka Empire, also interprets the Xauxa gathering as a military mobilization. La Lone (1982:304) makes several other poignant comments concerning the Xauxa gathering. First of all, Pizarro does not refer to this same gathering as a “market” [mercado], stating instead that the indigenous people “did nothing but dance and sing and make great drunken celebrations” (Pizarro 1959:90), and even Estete (1947:341) mentions “townspeople who had gathered to hold fiestas.” La Lone (1982:303) also notes that the number 100,000 appears often in colonial documents relating aspects of the Inka bureaucratic system and should not be taken literally as an accurate count. Whether or not this is a reflection of the Inka decimal system of counting or not, the number seems to be employed only to imply a very large number of individuals and not to indicate a precise tally.

In conclusion, La Lone (1982:307) suspects that the Inka exchange system differed regionally within the empire, with more frequent marketplace exchange occurring in peripheral areas and virtually or completely nonexistent in the core of the
empire. He perspicaciously reminds us that the presence of marketplace gatherings within the empire does not indicate that the any portion of the economic system should be defined as a market economy.

“We can avoid much confusion by making it clear from the outset that marketplace and market economy are not synonymous. My argument that the Inca economy was a nonmarket economy does not imply that exchange, including some degree of marketplace exchange, was entirely absent. We must distinguish between market and marketplace. In economics a market is not a place, but a situation in which a good is supplied by some ("sellers"), demanded by others ("buyers"), and the value ("price") of that good is determined by the decisions of all the buyers and sellers.” (La Lone 1982:300)

In general, Murra (1980[1956]) believes that marketing decreased (was suppressed) after Inka conquest, but questions the known source literature on the absence of private trade and commercial activity, noting conflicting statements about paying tolls and using “commoner” bridges and tambos [tampus].

“Still, despite all such efforts by Cuzco [to promote redistribution], some barter and trade apparently went on. While the evidence is mostly indirect and spotty, there is enough of it to raise some interesting queries about the nature and extent of ‘free enterprise’ proceeding within or marginally to the framework of the redistributive economy.” (Murra 1980[1956]:145)

“There is no doubt that trade existed long before any Inca king, but still a system of state-approved ‘markets’ may have been introduced in the first quarter of the sixteenth-century when it became obvious that the redistributive machinery was inadequate to provide for all needs felt by the community.” (Murra 1980[1956]:146)

Murra also cites several chroniclers who mention marketplaces set in motion through royal decree; Blas Valera reported a ccatu held thrice per month (every nine days) royally decreed by Pachacuti, to coincide with a feast. Murúa states that public executions and punishments occurred in the marketplace (Murra 1980[1956]:146). Were local marketplaces more frequent far from the influence of the capital of Cuzco or was the capital home to the largest and most diversified marketplace in the empire? Could redistribution in great plazas have been confused with marketplace exchange by
eyewitnesses? Was redistribution from state storehouses followed by marketplace exchange, as in the Aztec Empire?

“The market in Cuzco is in a way the most interesting one. The capital was the largest urban agglomeration in Tahuantinsuyu and thus presumably more in need than any other of a market which would supply the nonagricultural population. At the same time, most of this population were royals, priests, bureaucrats, and retainers who all fed from the state warehouses and who according to Betanzos were issued ample rations every fourth day. It is conceivable that these piles of foodstuffs being issued from the warehouses were confused by the observers with markets, but if the latter really existed, what were the commodities offered, and who needed them?” (Murra 1980[1956]:146)

While it is logical to contrast market systems with redistributive systems, a strict dichotomy is unwarranted. Systems of taxation, tribute, or long-distance acquisition can operate alongside (or be integrated within) systems of redistribution or marketplace exchange. Redistribution and marketplace exchange are not mutually exclusive transactional modes.

Old World

Bruce Trigger (2003:342-344) has noted the lack of evidence for any kind of large scale, spatially distinct marketplaces in Mesopotamia. Instead transactions were negotiated near the city gates, in small shops, and along a ‘street of purchases.’ The “street of merchandise” reference comes from a seventeenth century B.C. text from Sippar and probably references a periodic or infrequent street barter market (Renger 1984:99). The so-called “market-scenes” from Old Kingdom Egyptian tombs dating from the 25th to 24th centuries B.C. depict “sellers” squatting beside goods held in baskets; food is exchanged for food or for craft goods, but craft goods are never exchanged for other craft goods or purchased with a universal medium (i.e., currency or money) (Renger 1984:54-57). These Mesopotamian painted scenes are somewhat reminiscent of the Late Classic Maya “murals” from the Chik Naab Complex at the
center of Calakmul; no one is identified as a merchant or vender, but rather as a craftsperson or producer-seller rather than a professional salesperson.

The arrival of a caravan in Mesopotamia often occasioned a market gathering (Renger 1984:79-80), lending support to the endogenous theory of marketplace genesis there (see B. W. Hodder 1965:97). In general, ‘marketplaces’ were late to develop in Mesopotamia and remained peripheral in nature, always linked to urban settlements (A. L. Oppenheim 1964, see also Renger 1984). Even so, goods were moved over long distances by professional merchants belonging to merchants’ associations (damgar). At least by the the end of Early Dynastic times these professional merchants conducted regional and interregional trade for profit as independent agents. Merchants established trading posts in other centers and acted as firms, keeping elaborate records of debt and credit.

“A merchant living in Ur could have what he owed to a merchant in Lagash paid by a third merchant in Nippur who was indebted to him. The successful operation of such a credit system required elaborate record-keeping, including detailed contracts and receipts. Given the lack of a single unit of account, it also required complex accounting techniques.” (Trigger 2003:344)

In this respect Mesopotamian merchants were not entirely “independent” agents, but relied on a network of trading partners in foreign centers as well as their own local merchants’ association. Merchants probably sold goods from their homes as well as delivering bulk orders to temples, palaces, and estates on consignment. In addition to trading on their own account, they conducted trade on commission for temple institutions, kings, wealthy elites, or kin groups.

Egyptian marketplaces were small, informal arrangements, yet provided tax revenue for elite endeavors. In Old and New Kingdom Egypt, the central government sponsored and controlled long-distance trade, including seafaring expeditions to acquire silver, lapis lazuli, and cedar wood. The Egyptian government also sponsored the direct procurement of precious materials through expeditions to quarry various kinds of stone or to mine gold, electrum, and platinum in adjacent territories. In Old Kingdom times,
government officials controlled foreign trade at border stations; only in New Kingdom times are there indications that Asian traders were doing business directly with elites not directly tied to the government (Trigger 2003:351).

Africa

In sub-Saharan Africa, Yoruba long-distance traders traveled in caravans for safety and were provided with lodging and food on trading trips by government officials or local merchants’ associations. Trading was not a restricted occupation but it was dependent upon the ability to amass enough capital to begin the venture. Hence, in actuality, the occupation of long-distance trading was largely limited to wealthy elites (Lloyd 1953). Local exchange was in the hands of women, as is it today (Lloyd 1953; Sudarkasa 1973), who bought goods at main marketplaces and resold them for profit as they traveled to smaller community marketplaces. The dispersed settlement pattern of Yoruba communities encouraged peripheral farmers to sell their produce in bulk at major marketplaces in centers and use the profits to purchase food at local marketplaces on a daily or weekly basis; much of the local market-exchange involved both raw and cooked foods.

“Yoruba cities normally had several markets (oja). The main market was located in the centre of the community, usually in front of the royal palace. It was referred to as the oja oba (king’s market), and it normally met twice daily or every second day. Smaller markets, each controlled by a local official called a bale oloja, met in various wards of a city and in smaller communities every eight or sixteen days. In general, local products predominated at neighborhood markets, while local and imported goods were traded at the central urban markets and at other major ones that developed along important trade routes, especially near the borders of states and at transition points between ecological zones. The establishment of a new market had to be approved by the local king (Basom 1969:25-26; Hodder and Ukwu 1969:19-96).” (Trigger 2003:348)

The King of Benin controlled trade with Europeans at the seaport of Ughoto (Gwatto), claiming a monopoly over the international trade in the products of his country:
slaves, ivory, palm kernel or oil, and pepper (Trigger 2003:348). The kings of Dahomey also pursued monopolistic administered trade with European ships at the coastal port of Whydah (Oidah) as well as indirectly controlling marketplace exchange conducted with cowrie shells whose importation and redistribution were directly controlled by the king (R. Arnold 1957; Dalzel 1967[1793]; Duncan 1967[1847]; Polanyi 1966). Marketplaces within the Kingdom of Dahomey were state sanctioned and monitored and controlled by state agents; infractions against state policy were punished by death on the spot. During the reign of Agaja [aka Guadja Trudo], who took the throne in 1708, the maritime states of Whydah and Allada [aka Ardrah] were incorporated into the Dahomey Kingdom (see Ross 1987, 1989), in order to control trade passing from the interior of the continent to these coastal trade ports. Conquest followed only after negotiations failed, which were, in fact, only pretexts for gaining total control through military advance (Dalzel 1967[1793]:2, 8).

Even in the seventeenth century A.D., before conquest by Dahomey, the kings of Allada and Whydah had trade policies indicative of state administered trade. Some of these policies were continued under Dahomean control, including charging European ships fees to engage in trade, decreeing that the king had first rights to sell slaves to Europeans, and mandatory higher prices for these ‘royal’ slaves owned by the king. In the early eighteenth century A.D. there are indications of increasing centralization of trading in the hands of the kings of the indigenous nations holding trading ports along the Bight of Benin. The king of Allada decreed that all cowrie imported by European vessels should be sold to him exclusively. In 1718, the king of Whydah (Hueda) appointed a single caboceer (chief) to dispose of all slaves passing from Whydah to European traders (Law 1977).

King Agaja reversed the open trade port at Whydah; instead of a flourishing trade between Europeans and the Mahee, Nagroes, Oyos, and others, he wanted a monopoly in order to control export of slaves and import of powder and firearms for further military might and conquest (Arnold 1957:170). His political maneuverings were perhaps
misunderstood by European traders who wished to increase all trade with the African continent. Historical accounts suggest Agaja was most interested in establishing administered state trade, not in opening his country’s borders to an influx of foreign merchants. In 1726 Agaja sent a personal letter, dictated to Bulfinch Lambe, along with forty slaves, to King George I of England as a diplomatic present, promising forty times forty more slaves if desired. His intent was to initiate direct administered trade between the kings of, what he believed were, the two most powerful kingdoms on the planet (Law 1990, 2002).

“That [Guadja] Trudo [aka Agaja] had ideas of the advantages of trade to himself and his people, appears in many instances. He had commenced these wars with both the maritime nations [Whydah and Ardra], from having refused him a part in their commerce. He had an eager desire for European arms, and for such of the commodities as he thought were suitable to his dignity. He had told [Bulfinche] Lambe, some years before, that he could wish to have ships come to some place to trade for his slaves only, and to bring him what was fit for such a king as he. Yet, with all those prepositions, all these desires, Trudo and his Dahomans were equally ignorant of the principles on which trade must be conducted. The haughty ferocity of a people, bred solely to war and rapine, is incompatible with the mild and steady spirit of commerce. Hence, by their harshness and violence on the one hand, and their fraudulence and ignorance on the other, they, in time, so far lost their connections, that, from two thousand slaves a year transported from Whydah only, in 1726, the greatest number now sent off from this and the two great kingdoms of Ardra and Dahomy, together with several other small ones united to them, is only five thousand five hundred; little more than one-fourth part of the former.” (Dalzel 1967[1793]:26-27)

Argyle (1966) argued that the king of Dahomey was a major slave trader, although there were other agents involved in this trade. It was not entirely a monopoly in the hands of the king of Dahomey. Robin Law’s (1977:561-562) review of the extent of king Agaja’s involvement in the slave trade indicates that he was the paramount slave trader, if not the only trader. Although “war chiefs” did have rights to captives taken in state-sponsored raids, there is evidence that the king also bought many of these slaves from the war chiefs, and that many of the war chiefs were in fact the king’s personal slaves in the army. Obviously, the king had many avenues from which to acquire slaves. The king of Dahomey’s profits from selling slaves himself (perhaps 40% of all sold), plus taxations on traders and export fees brought him a great wealth (Law 1977:567).
Agaja’s son and subsequent king of Dahomey, Tegbesu, had the slave traders put to death at the trade port of Oidah (Whydah) in 1746 and had his principle sub-chiefs replace these agents with two or three agents more closely aligned with the state (Law 1977:563). King Kpengla [r. 1774-1789] did attempt a state monopoly on the slave trade, by setting the price for slaves low and them decreeing preeminence in purchasing them (Law 1977:566). The history of Dahomey’s international trade at the ports of the Bight of Benin certainly bespeak a heavy interest in controlling and profiting from this largely state-administered venture.

Some historians suggest that the British crown was interested in stopping the slave trade, and accompanying constant state of war, in favor of developing more reliable and considerable trade in West Africa. Frederick E. Forbes resided at the capital of Abomey in 1849 and 1850 and wrote an account of his stay almost sixty years after Dalzel’s visit to the country. Forbes held the opposite opinion, that slave trading, in the reign of Gezo, had become so rampant that he wondered if slave labor couldn’t have been put to better use within the kingdom.

“We again observed that he was parting (for a small pecuniary recompense) with the source of all riches, labour; that, if he retained his slaves and made them cultivate the soil, Dahomey (its resources once developed) would become a great nation, and himself a great king.” (F. E. Forbes 1966[1851]:188)

It does appear that New World peasants or folk segment of society (even those living in complex stratified states) with limited wealth were quite capable and willing to engage in exchange on a face to face basis, often consuming much time for what an anthropologist might consider trivial acquisitions. This is qualitatively and quantitatively incidental to large scale, institutionalized market exchange conducted under the market principle (especially involving concentrated capital, credit, deferred payment, pricing based on supply and demand, and economies of scale). Likewise, local haggling markets are quite different in scale and organization than full-blown institutional trading relationships. It is unlikely that marketplace exchanges account for all or even the
majority of transactions within ancient societies. The role of marketplace exchange should be situated within the wider economic framework of each society. The remainder of this chapter will explore the various concomitants of marketplace, or other transactional mode, exchange and delve into the documented structure of ancient economic systems – in both Old world and New World contexts.

10.2 – Economic Exchanges in Complex Societies

Equivaleces, Shell Money, and Marketplace Exchange in the Kingdom of Dahomey

“There have also been marketplaces without money of any sort. If the simplest definition of a marketplace is a space where people exchange goods along terms other than kinship or tribute…” (Plattner1989:179)

Marketplace exchange does not depend upon a monetized economy, although a standardized medium of value does facilitate transactions in the marketplace. The widespread use of a single all-purpose currency does not guarantee that marketplace exchanges will necessarily lead to the development of a market economy. Marketplaces were not unknown in the seventeenth through nineteenth century A.D. Kingdom of Dahomey, but in accord with the general redistributive thrust of state administration, they were oriented toward household provisioning and not profiteering. Even with an all-purpose currency and marketplace exchange, the overall economy of the Dahomey Kingdom cannot be characterized as a market economy. The use of cowrie shell ‘money’ and marketplace exchange were subservient to the overriding state economy dominantly based on the principle of redistribution.

“The king’s responsibility for the food supply of the kingdom was manifested in the relation of the crown to local markets. The market-place had to be consecrated by human sacrifice, and since none but the king could take human life, the market had to be directly instituted by the crown. All markets were established by authorization of the king, and officials stood in attendance in the market-place to insure order and obedience to the regulations. No food could be purchased except for cowrie in the market, as
noted. The distribution of cowries from the royal hand during the Annual Customs was the means of providing the general population with the currency to buy food.” (Polanyi 1968[1966]:215)

While the modern investigator may view shell ‘money’ as a distinctly primitive form of exchange equivalency, Polanyi (1966) effectively argued quite the contrary. In Dahomey, cowrie shells acted much like modern currencies, or like pre-modern precious metals or struck coin. It was the institutional use of cowries which imbued them with the quality of currency within this economic system. The physical properties of cowrie shells made them well-suited to the needs of the state and the general populous under the state system which arose toward the end of the seventeenth century A.D. after the formation of the Dahomey state ca. A.D. 1625. Cowries are virtually indestructible, cannot be counterfeited, are usable as single units or can be strung together into very large units; they are susceptible to measure by weight or by volume. Impervious to the elements, they can be endlessly traded and transported, then buried and horded almost indefinitely, never losing their original properties.

Historically, cowries used as currencies come in two varieties, *cypraea moneta*, originating in the middle and upper Niger River, and *cypraea annulus*, from the east coast of Africa. Before the formation of the Dahomean Kingdom, cowrie competed with gold and struck coin as a standard of exchange, even in long-distance exchanges between international traders (Islamic Arabs, Portuguese) in the middle of the second millennium. Marco Polo witnessed the use of cowries in exchanges in China in the late thirteenth century A.D.; Ibn Batutah reported the use of cowrie currency at Gogo, on the middle Niger in A.D. 1352 and later witnessed the shells’ use as an exchange medium in the Moghol Empire of India. Stringed cowries were already in use at the West African trading center of Whydah well before its incorporation into the Dahomean Kingdom as a result of conquest (Polanyi 1968[1966]:288-289).

Oral history supports the connection between state formation, cowrie shell money, and marketplaces. In this quote from a twentieth century Dahomean informant the
replacement of bartering by state instituted marketplace exchange is clear, as are the connotations of the foreign ideas of kingship and marketplace exchange at the initial formation of the Dahomey Kingdom. The idea of marketplace exchange being a foreigner introduced concept is intriguing.

“In those days [ca. 1715 A.D.] there was no money. If you wanted to buy something, and you had salt and another man had corn, you gave some salt and he gave you some corn…In those days there was only exchange. No money. Each gave what he had to the other, and got from him what he needed. Now, as Te Agbanli [brother of the first king of Dahomey] was a stranger, he said to the people of Akono, ‘I see you have no market here. I want to invent a market for you.’ There was an Akono man there, who said, ‘Why should one give everything to a stranger? We gave him a place to live, and now he is asking for land for a market.’” (Herskovits and Herskovits 1958:364, quoted in Polanyi 1968[1966]:294)

As the tale continues, the objecting Akono man becomes the first state-ordained sacrifice consecrating the first marketplace established within Dahomean territory. The value of the cowrie shell would remain strong throughout the life of the Dahomey Kingdom due to the inherent interest of the state in maintaining economic stability. However, with the incursion of European colonial interests and the advent of the world market system, cowrie would physically survive the transition, but not as viable economic currency. For the cowrie shell, supply would far exceed demand, leading to a steep devaluation and eventual replacement by other currencies. By the end of the nineteenth century A.D. the mass importation of cowrie shells to Africa had caused an irreparable imbalance in the once fairly stable economic system. The major obstacle in this systemic breakdown was transportation costs, of the very currency itself. While tens of millions of shells could be imported by ship, the physical movement of the shells over land routes proved the death of the cowrie when their value actually exceeded portage costs of moving them (Polanyi 1968[1966]:301-302).

The anthropological literature is not devoid of references to ‘shell money.’ The use of shells and shell objects has a long recorded history. However, it is the job of the anthropologist or economic historian to judge just how these shell monies were used in a
given society. Karl Polanyi viewed cowrie shells, as they functioned within the Dahomey Kingdom, as distinctly non-primitive.

“Technologically, Dahomey’s cowrie was by no means primitive money. Paradoxically, it differed from the shell moneys of Oceania by being closer to the state of nature than the moneys of ‘savage’ peoples, which are all artifacts. The cowrie that was strung on threads was otherwise unworked and still in its natural condition as when it was ‘harvested’…The shells of the primitives were polished, cut, carved with skill and perseverance, often by strenuous communal labor. Hence the ‘scarcity’ of the natives’ money. Its value derived both from that scarcity and from the emotional response to the human effort that went into its making. Cowrie, on the other hand, gained the status of a currency by virtue of state policy, which regulated its use and guarded against its proliferation by preventing shiploads from being freely imported.” (Polanyi 1968[1966]:298-299)

One early interpretation of shell ‘money’ comes from Armstrong’s (1924) article concerned with the shell artifacts in use on Rossel Island. In the case of the Rossel island ‘shell currency’ (or ‘coins,’ in Armstrong’s words), Dalton has convincingly pointed out the discrepancies between all-purpose money and limited-purpose money (Dalton 1967[1965]:267-276). In the Rossel Island “money” case, the economic terms used by Armstrong hide the fact that we are not talking about the same things for which the terms were invented (i.e., all-purpose money or currency).

Even in the United States and other countries with market economies we still use money in non-commercial transactions. The same dollars, pesos, yen, and quetzales are used in reciprocity and redistribution; they are all-purpose (Dalton 1967[1965]:260). Even though cowrie had a known exchange value some goods were restricted from open exchange through government decree or by sumptuary law, including ivory, which was state controlled.

“For an officer of the state, the club is of ivory, which is a very expensive ornament, on account of the great waste in making it; a whole elephant’s tooth, and that not a small one, being destroyed in the fabrication of this badge of dignity.” (Dalzel 1967[1793]:xvi-xvii)
The entire Dahomean economy was meticulously monitored by state institutions, starting with agrarian production. Palm oil for export and even the raising of pigs for local consumption (and presumably all other ‘wealth’ uses of swine) was also state-regulated. Slaves taken in the annual war events were primarily kept by the king, for administered export trade (see Ross 1989) or to be put to work on the king’s estates (Polanyi 1968[1966]:212-215). Effective use of labor and redistribution were more important than the market exchange of any goods, even when an all-purpose currency was commonly circulated. Even so, some cowrie money did take on special attributes deriving from its association with the central government.

“Cowries, generally, are paid away in their original state; but those emanating from his majesty are strung by the ladies of the harem, who charge a percentage of fourteen per cent.” (F. E. Forbes 1966[1851]:183-184, see also Dalzel 1967[1793]:xii)

While the historical record for Dahomey may seem to indicate an abnormal degree of state intervention, it should be remembered that European nations also enacted similar laws in response to economic dilemmas during the same period of history. John Law’s acceleration of paper money minting caused such deflation in France that in September of 1720 prices in Paris were about twice what they had been two years earlier. The arrêt of February 27, 1720 banned the export of gold and silver and made it illegal for any private citizen to possess more than 500 livres of metal coin; authority was issued to search private homes in order to enforce this edict (Ferguson 2008:150-151).

Other Media of Exchange

“Cacao beans and other prized goods, such as obsidian pieces, may have had certain levels of interchangeability with other items. However, this does not mean they functioned in the same way as today’s general-purpose money. Unlike coins or bills, Maya goods were not tied to an absolute standard of value. Their worth fluctuated according to local supply and demand or the intangibles of quality, some kinds of jade, obsidian, or cacao being favored over others. ‘Value’ tends to elude archaeologists for the simple reason that such a variable concept cannot be accessed by applying present-day notions of worth. In
many societies people’s notions of value are indissolubly connected with their social relations: they esteemed certain objects according to who made them and who possessed them.” (Houston and Inomata 2009:250)

While stone counters or cacao beans are sometimes cited as all-purpose ‘currencies’ used by the Classic Maya (e.g., Becker 1983; Dahlin et al. 2007:266), their economy was not highly commercialized. The Classic Maya economy was not characterized by efficient transport, large-scale manufacturing industries, export agriculture, or a hierarchical market system integrated by the market principle (Mann 1973). The Classic Maya did not use universal money. Following Neale (1976:8, cited in Plattner 1989), true money has the following properties: fungibility, durability, portability, divisibility, and recognizability.

“Money, it is conventional to argue, is a medium of exchange, which has the advantage of eliminating inefficiencies of barter; a unit of account, which facilitates valuation and calculation; and a store of value, which allows economic transactions to be conducted over long periods as well as geographic distances. To perform all these functions optimally, money has to be available, affordable, durable, fungible, portable and reliable.” (Ferguson 2008:24-25)

Discussions of Classic Maya ‘economics’ tend to focus on just one use of money (usually cacao beans) as a medium to facilitating direct exchanges. It should be remembered that even in the Aztec economy, often characterized as a highly commercial society, the conversion of one thing into another was facilitated by marketplace exchange. Subject peasants were often required to pay tribute to the imperial capital in goods that they did not produce themselves (Isaac 1986a:334). It should not be overlooked that imperial tribute was not required in any universal medium or money; all tribute funneling into the capital of Tenochtitlan (as principle of the Triple Alliance) from subjugated communities was not consistently paid with obsidian blades or cacao beans. Instead, a variety of goods and services were required from various communities; not equivalencies, but actual quantities of prescribed goods were exacted as tribute. Likewise, marketplace exchange was not exclusively money-oriented; the majority of transactions in Aztec marketplaces were not routinely performed with cacao beans.
“Much of the marketplace exchange in pre-Spanish Mexico was conducted by direct barter (Berdan 1982:43; Duran 1967:v.1:178-179; Las Casas 1958:236; Paso y Troncoso 1905:v.6:265); possibly the majority of it was.” (Hicks 1994:101)

All-purpose Money

“All economists learned as students that money serves at least three purposes. It is a means of exchange, it is a mode of payment, it is a standard of value. Depending on the vintage and persuasion of the author of the book one consults, one may find another money use – storage of wealth. In newer books, money is defined as merely the means of unitizing purchasing power, yet behind that definition still lie the standard, the payment, and the exchange uses of money.” (Bohannan 1967[1959]:123)

Bohannan goes on to note that many economists, in discussing ‘primitive money,’ discard one or more of these properties. The key point here is that, in many ‘primitive’ societies, one substance or item may be used as ‘money’ in one of Bohannan’s three uses, while another use is supported by a different ‘money’-item (Bohannan 1967[1959]:124). Each of the cited uses of money carries important implications for marketplace exchange in preindustrial societies. Maya ‘buyers’ and ‘sellers’ of goods would have had to deal with exchange equivalencies and bartering on a face to face basis first and foremost. This is not to say that barter exchange precludes the development of marketplaces and market systems. Nor is exchange through barter necessarily devoid of profit motivation. In fact, both barter and commercial commodity exchanges have a “commonality of spirit” in that both systems optimally involve exchange devoid of social obligations. The impersonal market exchange involving money is paralleled by impersonal barter exchange, perhaps also in a marketplace, where two parties attempt to make an exchange without the entanglements of future obligation or influences of past social (or exchange) conditions (Appadurai 1986:10).
Markets as Socially Embedded Economic Institutions

While anthropological theory often contrasts socially charged reciprocal exchange or redistribution with impersonal marketplace exchange, marketplaces in agrarian societies often have a distinct social dimension.

“Markets are essential to the integration of commercial societies. Just as the great stock exchanges of New York and Chicago exemplify the industrial-capitalist structure of North American society, periodic marketplaces are the commercial life of agrarian or peasant society. The markets usually meet once every few days; crowds come from the countryside to sell their farm products and buy manufactured goods and foodstuffs from other areas. Government officials often visit on market days, and local places of worship hold services so that farm families can combine economic, political, and religious activities at one time and place. Peasant markets are also lively arenas of social interaction. They have much of the excitement of a fair, with friendships made, love affairs begun, and marriages arranged. In many societies, the end of market day is often marked by drinking, dancing, and fighting.” (Plattner 1989:171)

Even in highly commercialized economies, marketplace exchanges may be transacted through personalized relationships, not within an impersonal milieu. A productive anthropological theory should explain behavior in a universal manner, regardless of geographic or temporal spacing. Personalized trading relations do not entirely fall out of style in more complex societies. While many researchers are comfortable with the idea of trading partners in ‘primitive’ exchange systems such as the famed Kula Ring of the Trobrianders (Malinowski 1922; Weimer 1992), they underestimate the importance of such social relationships in other, seemingly more commercially-oriented exchange situations, especially in a marketplace or market economy context. Dyadic, reciprocal relationships have been found in many societies including pratik (Mintz 1961), suki (Davis 1973; Stark 1992), onibara (Trager 1981) or generalized reciprocity (Sahlins 1972).

Personalized relationships often persist even during the exchange of utilitarian goods or commodities. These personalized relationships may in fact be highly rational and economically motivated. Attempting to document the rationality of personalized
relationships between consumers and sellers in the marketplace, Stuart Plattner (1982) conducted a stimulating analysis in the Soulard Market, St. Louis, Missouri. He begins by explaining the rationality of a purely competitive marketplace in the absolute theoretical sense.

“If one vendor (including producers who sell their products) makes extraordinary profits, other vendors know it and are free to shift their activities to take advantage of the causes of those profits. If one seller offers better terms, services or a better “product” in any significant way, buyers know it and are free to shift their purchases to take advantage of that offer. Over time, less-efficient vendors will find themselves without customers and will drop out of the market.” (Plattner 1982:400)

This logic leads to the purely rational economic belief that competition in the marketplace combined with individual participant rationality inevitable leads to the development of exchange institutions in which maximum efficiency prevails and vendors’ sales are determined solely by supply, demand, price, and capital investment. Even in highly rural contexts marketers can be extremely rational and calculating (see Tax 1963[1953]) because “the marketplace gives merchants immediate, concrete, and frequent responses to their economic decisions” (Plattner 1982:416). Despite the impersonal character of the setting in general, a high degree of personal cooperation characterized the Soulard Market. This study demonstrates that social relationships in the marketplace actually enforced economic maximization in the long run.

“[S]ellers and buyers must cooperate with each other to achieve their respective goals of income and consumption. The more routine the relationship, the more regular their goal attainment.” (Plattner 1982:409)

Statements made in the marketplace by the vendors themselves support this assumption.
“I just try to deal in everything because I try to get a whole customer. I try to get a customer exclusive. I want to sell him so that when he gets done with me he’s going to have everything he needs and walk away. Then, when he comes back next week, he’ll come to me.” (an informant in Plattner 1982:410)

“If bananas are high, like they were Saturday, we had four or five boxes. We didn’t even have them on the stand, we just bought them and G.S. wanted one. And we said, ‘I can’t give it to you,’ and he said, ‘I need one for an order,’ and I said [to his son], ‘J., you are crazy if you give it to him, we only have two bananas and we need them for our customers.’ Sure, they were scarce!” (an informant in Plattner 1982:400)

Plattner repeatedly found that sellers would purchase specific goods for resale for which the profit margin was small or non-existent simply to maintain positive exchange relations with loyal, steady customers. These goods were frequently not put on display and only sold when repeat customers asked for them. Plattner’s statistical analysis of profit supports the finding that long-term economic viability is of greater importance to sellers (and buyers) than economic rationality as characterized by formal microeconomic theory. The modern setting of this ethnographic study also supports the contention that social factors do bear on the economic decision making of marketers and consumers in a market setting, that there is continuity among pre-industrial and post-industrial societies.

The overall conclusion was that customers traded temporary gains from scouting the marketplace in search of a better ‘deal’ for consistent relationships with merchants ensuring a reliable supply and fair exchange in the long term. This relates to the notion of ‘experience quality,’ whereby the customer can only know the quality of purchased merchandise after it has been used or consumed. A stable and exclusive arrangement between a buyer and a seller is strengthened by the highly personalized nature of the exchange and the seller’s willingness to make up for any inequality of exchange on future visits in return for the customers continued business. In this system, the buyer is in effect choosing trust over short-term profit in an arena (the marketplace) where knowledge is incomplete. Because of the delayed effect in evaluating the quality of a purchased product, consumers tended to favor longer term economic relations over impersonal
single impersonal exchanges in order to keep a running tally of discrepancies or inequalities to be mediated over the long run (Plattner 1983:850). The ability to ‘return’ unsatisfactory goods or to be compensated in other ways for ‘bad purchases’ tended to create steady and loyal social relationships. Nonetheless, consumers in the marketplace are not necessarily exclusively short-term maximizers or long-term trust linked social economizers.

“Any particular shopper can be a pure price-searcher for one item and a habitual, steady customer for another.” (Plattner 1983:853)

This dichotomy is further complicated by the fact that in most agrarian or peasant societies marketgoers are usually both buyers and sellers simultaneously. Plattner’s research provides empirical evidence that this form of personalized relationship between customer and seller pays off in the long run. Holding other factors constant, sellers actually maximize profit using this system.

**Gift Exchange versus Commodity Exchange**

Besides state intervention in economic affairs and redistribution through the centralized state apparatus, other levels of exchanged within society are often structured through the transactional modes of redistribution, on a local or neighborhood scale, or reciprocity, from the community level to an individual basis (see Dillehay 1990; Halperin and Olmstead 1976; Monaghan 1990; also Bayman 1995; Santley 1993 for critical reviews of redistributive models). Non-market exchanges may be just as profit motivated as are impersonal marketplace exchanges even when transacted without all-purpose money. Appadurai (1986:12), following Mauss (1976:70-73) and Bourdieu (1977:171), sees certain strategic parallels between gift exchange and commodity exchange. Namely, that the lapse in time between gift and counter gift masks the calculative aspect of gift exchange and, if this is the dominant mode of exchange in a society, de-emphasizes the
‘rational’ aspects of economic exchanges which focus on the immediate calculation of value and exchange rate between the two parties involved.

“Gifts, and the spirit of reciprocity, sociability, and spontaneity in which they are typically exchanged, usually are starkly opposed to the profit-oriented, self-centered, and calculated spirit that fires the circulation of commodities. Further, where gifts link things to persons and embed the flow of things in the flow of social relations, commodities are held to represent the drive – largely free of moral or cultural constraints – of goods for one another, a drive mediated by money and not by sociality.” (Appadurai 1986:12)

Gifts must be paid back, and a profit, not an equivalency, is often sought. Gift-giving in anthropological terms is synonymous with delayed reciprocity, nor altruism. Gift-giving is a specific economic institution, heavily embedded within social contexts. To refuse an initial gift, and hence ovoid entering into a reciprocal agreement, or to fail to reciprocate a gift once one has been proffered are serious decisions with social consequences (Mauss 1990[1925]).

“The word ‘gift’ is not to be misconstrued. It may be stated as a flat rule of both primitive and archaic society that no one ever gave anything, whether goods or services or honors, without proper recompense, real or wishful, immediate or years away, to himself or to his kin. The act of giving was, therefore, in an essential sense always the first half of a reciprocal action, the other half of which was a counter-gift.” (Finley 1967[1954]:409)

In the opening book of Homer’s Odyssey, when Telemachus attempts to give a “…gift, valuable and very beautiful, which will be your treasure from me, such as dear guest-friends give to guest-friends” to the goddess Athena (appearing to him as Mentes, a Taphian chieftain), her (his) response is phrased in terms of the reciprocal gift exchange practice of the day.

“Do not detain me any longer as I am eager to be on my way. The gift, which the heart of a friend prompts you to give me, give it to me on my return journey that I may carry it home; choose a very beautiful one, that will bring you a worthy one in exchange.” (Odyssey 1.3,11-18, emphasis added)
Finley interprets this passage as an indication of the ethos of gift-giving in the day.

"Telemachus had said nothing about a counter-gift. Yet he and ‘Mentes’ understood each other perfectly: the counter-gift was as expected as the original gift in this society. The return need not be forthcoming at once, and it might take several forms. But come it normally would. ‘In a society ruled by respect for the past, a traditional gift is very near indeed to an obligation’ (Bloch 1941:262).” Finley (1967[1954]:410)

Marketplace Exchange and the Market Economy

“There is no doubt that market-like trade gatherings occurred in parts of Middle America and the Andean highlands before the Spanish conquest. Conquistadors and early historians often mentioned such gatherings in their writings, and usually described them as markets. Information available however, does not permit a detailed assessment of the spatial distribution, temporary periodicity, the quantitative importance of these gatherings, or of the organization of the gatherings and the means by which transactions were completed.” (Bromley and Symanski 1974:5)

Several scholars have suggested that marketplace exchange was extremely important at different times in different regions. Feinman and Nicholas (2004, 2007a) argue from archaeological evidence of community specialization, unfettered access to utilitarian goods, and the lack of centralized storage facilities, that market-systems moved goods throughout the Valley of Oaxaca in pre-Columbian times. Dahlin et al. (2007) emphasize the need for marketplace exchange at Classic Period Chunchucmil in the Maya lowlands of the Yucatan peninsula. In their reconstruction, the high population density of this center necessitated the importation of staple foodstuffs (Dahlin et al. 2005). In characterizing the economy of Chunchucmil, Dahlin and colleagues employ the term “market economy” to indicate the exchange of surplus production.

“As we use the term here, a market economy means the production of goods or services with the express purpose of receiving goods or services of approximately equal or greater value in return; that is, at least some surplus production is generated and destined for exchange for other needed or highly desirable
items or services rather than for consumption within the household or to pay taxes and tribute. Market exchange further implies that livelihoods are dependent to some degree on production for exchange in a relatively impersonal milieu.” (Dahlin et al. 2007:364)

This definition of a market economy is inconsistent with a long and distinguished tradition of the use of the term. In fact, the preceding passage would make better sense if the terms market economy and market exchange were reversed. I prefer to reserve the term market economy to refer to a much more capitalist or commercial phenomenon than the simple exchange of goods or services. Although not an economist or an anthropologist (Sárkány 1990; Somers 1990), Karl Polanyi’s writings have had an important and long-lasting influence on economic anthropology, a term he did not embrace. Polanyi’s writings are based in a comparative historical approach (Berthoud 1990), and his definition of a market economy is not at all congruent with that proposed by Dahlin et al. (2007:364).

“A market economy is an economic system controlled, regulated, and directed by markets alone; order in the production and distribution of goods is entrusted to this self-regulating mechanism. An economy of this kind derives from the expectation that human beings behave in such a way as to achieve maximum money gains. It assumes markets in which the supply of goods (including services) available at a definite price will equal the demand at that price. It assumes the presence of money, which functions as purchasing power in the hands of its owners. Production will then be controlled by prices, for the profits of those who direct production will depend upon them; the distribution of the goods also will depend upon prices, for prices form incomes, and it is with the help of these incomes that the goods produced are distributed amongst the members of society. Under these assumptions order in the production and distribution of goods is ensured by price alone.” (Polanyi 1944:68-69, see also Polanyi 1968[1947]:68 for the three tenets of economic liberalism27)

27 Polanyi temporally placed the institution of the market economy in England toward the second half of the nineteenth century, after the passing of the Poor Law Reform (1834), the Bank Act (1844), and the repeal of the Corn Laws (1846). He proposed that these measures formalized the tenets of economic liberalism.

“Thus were established the three tenets of economic liberalism, the principle on which market economy was organized; that labor should find its price on the market; that money should be supplied by a self-adjusting mechanism; that commodities should be free to flow from country to country irrespective of the consequences – in brief, a labor market, the gold standard, and free trade. A self-inflamatory process was induced, as a result of which the formerly harmless market pattern expanded into a sociological enormity.” (Polanyi 1968[1947]:68)
Dahlin et al. (2007) flatly state that the existence of a marketplace implies the existence of a market economy. This directly contradicts a body of work situating marketplace exchange within the broader context of the economy.

“We have addressed these issues at Chunchucmil according to the axiom that market economies can exist without marketplaces but marketplaces cannot exist outside of market economies. Because the presence of a marketplace at a site automatically implies a market economy, research priority should therefore be given to discovering archaeological traces of marketplaces.” (Dahlin et al. 2007:368)

The “axiom” that marketplaces cannot exist outside of market economies is only true if one accepts Dahlin et al.’s novel definition of a market economy. In fact, if marketplace exchange is synonymous with a market economy then there is no reason to employ a separate term. Fifty years ago, Bohannan and Dalton (1962) discussed the difference between a market economy in which the market principle is a society-wide, all-encompassing ethical principle and economies where the market principle is restricted to a limited transaction sphere (the marketplace) without expanding to all dimensions of a multicentric economy. Even the existence of the market principle, by which supply and demand forces are largely self-regulating, does not indicate a market economy. The market principle may structure marketplace exchanges within society, while being limited to the goods that appear within the marketplace (Bohannan and Dalton 1962:7).

“As we have proceeded with this analysis, we have come upon what at first appeared to be a paradox. Put briefly, it is this: the market place is a characteristic of economies in which the market principle is peripheral. The more pervasive the market principle [is], the less the economic importance of the market place [is].” (Bohannan and Dalton 1962:25)

The term ‘peripheral’ designates that no land or labor are transacted through the market and that the bulk of any individual’s income does not result from commercial exchanges (Dalton 1967 [1965]:266). While the open plaza at Chunchucmil discussed by Dahlin et al. (2007) may have been a marketplace (which I do not believe they have definitively demonstrated), it is still unclear how important marketplace exchange was in
the economy of the center; it is unlikely that marketplace exchange was the dominant transactional mode.

“There is, then, abundant documentation of a long history of market-place economies. But market-place economies are not market economies. While undoubtedly contributing to the economic growth of Europe, market-place economies did not forge its transformation. As governor of the exchange relations in an economy, the market is something more than, and other than, the sum of market-places.” (Rothenberg 1992:7 emphasis in original)

I believe that Dahlin et al. (2007) have added to the confusion surrounding the extent of marketplace exchange in Classic Maya economies. It is important to investigate such phenomena within a theoretical framework that evaluates new evidence in light of existing theories. This is true of all currently en vogue theories or research topics, not just marketplace exchange – which happens to be quite popular with Mesoamericanists right now.

“Every generation of students seems to reinvent anthropology, rejecting the work of previous generations and forging a new set of goals…I began to realize that many of the problems I was having defining economic anthropology, trying to find the common threads and the deep controversies that give the field an identity, required reevaluating the roots of the enterprise. Weak foundations make for shaky houses. A lot of current confusion has its origin in old and unsettled problems; as the field changes, we need to constantly rethink our assumptions, most of which are passed down consciously or unconsciously from previous generations.” (Wilk 1996:xiv)

The next section of this chapter will review marketplace exchange in agrarian societies with an emphasis on peripheral markets. Peripheral markets are often periodic, only held at intervals with a periodic surge day when marketing is more prevalent and there is a larger influx of participants from further away. Markets in different areas of a region may be held on different days and form a market ring in which each marketplace has a designated day of maximum activity. Markets may remain periodic long after daily marketing activity could be sustained.
10.3 – Periodic Markets

The most important features of marketplaces in agrarian societies are their periodicity and location. Of course, in order to sell and buy (or barter and exchange) participants need to know two things: when and where will the market meet (Bromley et al. 1975:534-536; Hassig 1982; Symanski and Webber 1974; Webber and Symanski 1973; Wood 1975). These two basic requirements lead to a baffling number of arrangements that are difficult to predict through locational analysis or any other formal theory (see Bromley et al. 1975).

“The timing of markets affects the timing of human movements and commodity flows to and from the market-places, and hence, the market calendar must be related to the timing of production and consumption, and to the temporal organization of the whole socio-economic system.” (Bromley and Bromley 1975:86)

As this quote demonstrates, periodicity and location relate to and are derived from other aspects of the societal organization. In short, one cannot hope to understand periodic markets and their importance in society without knowledge of the broader social and ecological contexts in which they are embedded. Ross Hassig (1982) has suggested that periodicity will be tied to the calendar in Mesoamerica in his discussion of the Aztec pattern of periodic markets, showing that markets were held daily in the most urbanized centers (e.g., Tenochtitlan-Tlateloco) and at multiples of five days in less densely populated areas. The Classic Maya had extremely precise calendars, which purportedly regulated the timing of planting and harvesting, but would have facilitated periodic market rings.

Social and political organization, population density, degree of urbanism, agricultural production, organization of primary and secondary production, degree of specialization and division of labor, tax and tribute, age and sex structure, ethnic makeup of the society, degree of social stratification, degree of isolation from other groups and the transportation system, are all factors which influence the structure of the market
system in a given society. Indeed, marketing structure is connected to and derived from a host of other factors and marketing should never be analyzed without the benefit of information concerning all other aspects of life in the study community. This provides a daunting task for the archaeologist who may have spotty information for one category, none for another and an overabundance of opinions for other social and institutional arrangements. Moreover, preserved materials are only a subset of those involved in any sort of exchanges, and might even be those least involved in ancient trade and exchange. While pottery is a durable commodity ubiquitous in excavations, perishable foodstuffs were certainly exchanged more frequently.

“The whole problem, however, is not simply a matter of collecting more and more data. It is one of trying constantly to construct some general conceptual framework within which to consider such complex and little understood phenomena as market institutions.” (B. W. Hodder 1965:104)

Testing models with archaeological data requires the constant reformulation of theoretical frameworks and a holistic approach to the analysis of market development within the context of any particular society. Evaluation of marketing institutions requires a cross-cultural perspective. Only by comparison with the development and operation of marketing systems in other cultures can one hope to shed light on these in Classic Maya society.

On the Origin of Periodic Markets

How do periodic markets begin and continue to develop? B. W. Hodder (1965) discusses two theories on the origin of markets, the endogenous and exogenous theories of development. He defines these theories as follows:
**Endogenous Theory,**

“...starts from the individual’s propensity to barter, perhaps involving silent barter; deduces from this the necessity for local exchange, the division of labor and local markets; and infers, finally, the necessity for long-distance or at least external exchange or trade. In other words, the starting point is seen to be in local exchange and local markets, only few of which, commonly because of certain fortuitous locational advantages, become important markets centres associated with long-distance trading.” (B. W. Hodder 1965:97)

**Exogenous theory,**

“An alternate theory about market origins reverses entirely this sequence of events, claiming that trade with its associated phenomena can never arise within a community; for trade, it is contended, is an external affair involving different communities. Markets can never arise out of the demands of purely individual or local exchange.” (B. W. Hodder 1965:97)

Evidence for market origins in Yorubaland overwhelmingly supports the exogenous theory *for this area.* Ethnic trading caravans could be very large (involving 4000-5000 persons) and needed to stop for food and shelter along their routes. B. W. Hodder sees this as stimulating agricultural production and the development of resting places between settlements to accommodate trader caravans (1965:99). The arrival of trading caravans in Mesopotamia often led to an impromptu marketplace gathering (Renger 1984:79-80). B. W. Hodder suspects a general correlation between the development of indigenous markets and external trading, believing that marketless groups lacked sufficient impetus in the form of external trading connections while relying on more primitive forms of subsistence. The extensive literature on West African markets sometimes overshadows the fact that many other African groups did not have these institutions, including the Nuer, Nyoro, Toro, Amba, Konja, Nykore, Kiga, Haza, Zwina, Gisu and Ngoni (B. W. Hodder 1965:101).
For Africa south of the Sahara, Bromley et al. (1975) believe that periodic markets originate and persist because of social factors more so than purely economic rationality. They suggest that early markets were adapted to the primary production calendar of producers who were part-time traders practicing subsistence agriculture; they developed because of exogenous relationships, and never because of local exchange needs (endogenously).

“Most of the African evidence supports the exogenous theory of market origins, pointing to a close association between the growth of markets and the development of regular interregional communication. Markets require economically complementary societies, and agents whose social position frees them from obligatory participation in traditional prestation and personalized gift exchange…Markets did not originate as places for local subsistence producers to dispose of their “surplus” production; their growth signified an increasingly specialized division of labor and a growing exploitation of regional complementarity.” (Bromley et. al. 1975:533)

Others are adamant that local exchange, and not long-distance traders or an influx of tribute goods, leads to daily marketing activity (Hill 1966). Nonetheless, the endogenous development of markets is not assured. The Bulu of Camaroon never developed indigenous markets, probably because of their subsistence system, lack of external trade connections, and a lineage-based social system wherein reciprocity dominates. In other words, agricultural self-sufficiency and a lack of external trade partnerships acted to suppress the development of markets in Bulu society. Marketing in Sierra Leone seems not to have developed due to the lack of interregional exchange. Goods and crops were ubiquitously produced in this area, so aside from low level exchanges between fishermen and farmers or pastoralists and farmers, communities were highly self-sufficient (Riddell 1974:543).

“It seems unlikely that long distance trade in staples could have been very important, if it existed at all, before the growth of demand in Freetown, the diamond mining areas, and a few other centers. The relatively uniform distribution of population in Sierra Leone, and the wide areas over which most food crops could be grown, precluded it.” (Riddell 1974:543)
Perhaps periodic markets develop along both the exogenous and endogenous trajectories and quickly absorb the other realm once a location and schedule have developed. However periodic markets develop, they have a tendency to persist (Bromley et al. 1975).

**Economizing and Profit/Benefit Analysis**

W. G. Skinner sees market periodicity arising from the mobility of the firm. Here the firm is usually an itinerant peddler “toting his wares from one market to the next with the aid of a carrying pole.” Itinerant service agents are typically “wandering artisans and repairmen who carry their ‘workshop’ about with them, and other itinerants purveying services of all kinds from letter-writing to fortune-telling.” For consumers, periodic markets reduce the travel distance and time they must endure in order to provision their households; for sellers, periodic markets increase contact with more consumers (W. G. Skinner 1964:10).

“[B]y repositioning himself at periodic intervals, the entrepreneur can tap the demand of several marketing areas and thereby attain the survival threshold.” (W. G. Skinner 1964:10)

In Uganda, “more than 90 percent of the population are rural and exhibit a high degree of farm self-sufficiency coupled with maintenance of reciprocity through kinship and other social networks” (Good 1975:51). In the Buganda region of south central Uganda population densities average 155 persons per km². Optimal rationality in the economic sense is predicated on the (unrealistic) assumptions that,

“…traders would have complete information about the location and timing of all markets which are within the range of visitation. Second, their objective would always be to find the least-cost set of periodic markets in terms of distance traveled. Third, the routes traders follow between markets are always linear.” (Good 1975:59)
Through an analysis of optimal route selection, Good (1975) concluded that traveling traders in Uganda did not optimize their routes in terms of distance traveled. Profit may be greater for the rational trader who understands that social factors may be a more reliable indicator of potential profit than time/distance analysis. Traveling traders may chose to visit only certain markets because of the safety or familiarity of these, concentration of buyers for a certain product, or to return home often in order to re-supply (Good 1975:70). R. J. Bromley et al. (1975:532-533 see also Webber and Symanski 1973) have remarked that markets may remain periodic long after fixed full-time trading would be predicted by “economic reasoning” (i.e., formal economic modeling) due to traditional organization of time, inertia, and comparative advantage.

“Because demand is concentrated in weekly markets...most traders can make more profit by selling in a number of different markets.” (R. J. Bromley et al. 1975:532)

L. J. Wood analyzed market integration in one of the most densely settled areas of Kenya (304 persons per km²). Market diaries indicate that in the Kisii district of Kenya respondents made market visits approximately every second day and visited 3.35 different markets. Seventy-seven percent of these market visits were made on foot and were less than 10 km in distance (Wood 1975). Wood concluded from a shortest path matrix analysis that traders were not responsible for the integration of markets into a single district system. The fact that consumers visited multiple markets, not just a single node in a hierarchical system, provided the basis of links which constituted the Kisii district market system. In Wood’s mind, although they do not transfer goods between markets, marketers or marketgoers do transfer knowledge, gossip and information which can integrate the market system.

Brookfield (1973:49) claims that periodicity is congruent with the agrarian peasant’s conception of risk management; peasants engage in a program of “maximum participation consistent with minimum risk.” Craft producers in pre-Columbian central Mexico tended to multitask, engaging in multiple different craft production activities throughout the year. This tendency to multitask and not specialize in just one full-time
craft activity correlated with the development of market systems in central Mexico (see Chapter 7).

“Instead of seeking to maximize potential returns by specializing in a particular enterprise, individuals embrace the security of the known system based on generalized reciprocity. They commit themselves to partial participation in as many economic opportunities as possible in order to maintain some freedom of choice against the uncertainties present in the external world.” (Brookfield 1973:53)

We have evidence for this kind of pattern in pre-Columbian central Mexico, largely from ethnohistoric documents. Unfortunately, other parts of Mesoamerica were not documented to the same extent or even at all. Had the Spaniards never mentioned the large marketplaces they saw bustling with numerous participants in central Mexico, would we have detected their existence, scale, or/and organization through other means of investigation? Emphasizing the increasing commercialization of Mesoamerican societies over time (see Blanton et al. 1981), Blanton (1984) does not believe that a single outcome in terms of marketing structure will evolve from similar forces acting on different culture groups. This is basically Julian Steward’s (1955) multilinear evolution stance. In regard to evolving marketing practices influencing the development of the state, Blanton sees a well-developed market system leading to a more advanced state when the system can mobilize resources from beyond the patrimonial domain. At the same time, a well-integrated market system may provide revenues for the state through taxation. An integrated market system may also be viewed as contradicting a well-defined tribute or tax system in which goods and services are mobilized by the elites in a hierarchical fashion (Blanton 1984:58).

The Inka Empire provides a primary example of state intervention leading to rapid expansion of the state without a well developed market-system. The Inka state probably suppressed the development of such a system. In the Inka case, the increasing control of labor and redistribution of resources proceeded hand in hand with increased specialization which was not directed toward marketplace exchange or through the tenets of the market principle (D’Altroy 2002; Earle 1987, 2002; Murra 1980[1955]). Not to
downplay the important influence of military expansion, tribute, slave labor and long-distance trade, the West African kingdom of Dahomey developed through an institutionalized focus on redistribution, not market integration (Akinjogbin 1967; Polanyi 1966). Nonetheless, marketplace exchange did occur in both of these kingdoms, albeit subservient to the widespread pattern and formal state policy of redistribution.

**Rural Market Systems**

“Focus should be on the organization and structure of the particular marketing system in question. The ‘type’ of market organization, together with the nature of its external linkages, would seem to determine whether a peasant marketing system is an exploiter of peasant labor or a major arena for peasant economic development.” (C. Smith 1974:181)

Hierarchical marketing systems may integrate large areas (see G. W. Skinner 1964, 1976 for China, also C. Smith 1976b for highland Guatemala), while two-level or horizontally oriented systems may be more restricted in extent (i.e., dendritic marketing systems [E. A. J. Johnson 1970; K. B. Kelley 1976; Nash 1966, 1967; C. Smith 1976a:34-36; Wolf 1966], solar marketing systems [C. Smith 1976a:36-39]; or network marketing systems [P. and L. Bohannon 1968; B. W. Hodder and Ukwu 1969; C. Smith 1976a:39-44]). Peasant markets are very old institutions in China. Rozelle et al. (2003:99) had one respondent claim that the local marketplace had been founded during the Song dynasty (A.D. 907 – 1277), and this may even be a late estimation. Wood (1975) characterizes the hierarchical nature of rural markets in China as a single system.

“Marketing systems…are discrete only at the basic level, and each lower-level system is typically oriented to two or three systems at each ascending level. As a result, marketing structures…take the form of interlocking networks. It is the joint participation of standard markets in two or three intermediate marketing systems, of intermediate markets in two or three central marketing systems, and so on, which articulates and unites the little local economies centered on each market town into, first regional economic structures and eventually into a single society-wide economy.” (Wood 1975:109)
Polly Hill (1966) has determined that G. W. Skinner’s (1964) hierarchical scheme of standard, intermediate, and central markets in China does not accord well with evidence from West Africa. Skinner purposely left out ‘minor’ markets in China which specialize in horizontal exchanges of folk- or peasant-produced goods (Hill 1966:297). For most of the population of Yorubaland, agricultural and craft goods produced at the household level enter the market system through periodic or daily markets (B. W. Hodder 1965:158). Skinner used the term ‘standard’ to refer to markets which “met all the normal trade needs of the peasant household: what the household produced but did not consume was normally sold there, and what it consumed but did not produce was normally bought there” (1964:6). These ‘standard’ markets are in essence peripheral markets to meet local demand. There does seem to be an inherent flaw in Skinner’s hierarchical flow scheme in which ‘minor’ markets are independent of and never articulated with the integrated market system.

Wanmali (1980) finds that the integrative aspect of regulated markets in India has been overemphasized. Although state controlled markets for certain products were instituted in order to provide rural-urban integration, the persistence and development of indigenous periodic markets has continued alongside the state regulated system. The periodic market system has proven to be an important structure for moving rural products into urban areas (Wanmali 1980:485).

**Horizontal Exchange**

K. B. Kelley (1976:221) has pointed out a number of empirical cases of dendritic market systems in which a large number of low-level centers are oriented toward a single higher-order center; these do not fit the expectations of central place theory. Although Christaller’s K=7 “administrative pattern” is a version of a dendritic or solar pattern, G. W. Skinner (1964) also found that more than seven lower-order centers were oriented toward a single higher-order center in rural China. He described the pattern in China as a K=19 pattern. Looking to fit empirical evidence to a perfected Central Place Model, it is
important to recognize when reality diverges from the expected pattern and to investigate why this is so in each empirical case. It is also important to determine if goods move from peripheral markets into a central urban center, or if goods are primarily moving horizontally from lower-order markets to other lower-order markets without moving into and out of the higher-order center.

A fascinating study conducted by Peter Pringle (1989) provides evidence that horizontal exchanges may be important for the maintenance of market systems. His analysis was based at a single daily market at Okaldunga Bazaar, Eastern Nepal which services approximately 70,000 rural inhabitants. The market offers 68 varieties of foodstuffs, 50 different artisan produced items, 10 naturally produced products (e.g., tobacco, feathers) and several services (tailors, cobblers and blacksmiths). The market also acts as a bulking point for agricultural products moving through a hierarchical system to urban areas. Merchants receive produce from at least 16 other periodic markets which have sprung up at the fringes of what was once solely Okaldunga’s market area. This is an excellent example of a ‘solar system’ (Nash 1966, 1967) in which a central marketplace is surrounded by a number of smaller marketplaces which transfer produce into the central market and are supplied by goods from the central marketplace.

Aside from emphasizing the importance of marketplaces in the collection of grain from minor periodic markets for entry into the hierarchical system, this study elucidated how entrepreneurship worked during the 1972 famine. During this year when there was an extremely poor crop in Okaldunga, grain was imported from a distant market to meet purely local consumption demands, not to move grain farther on to more distant urban centers. The movement of grains during this year of local agricultural shortfall led self-employed porters to buy grain and carry it for resale into the area. Grain was purchased almost exclusively by self-employed peasants at the weekly market in Kotari, from where they carried it for four days to be resold in the Okaldhunga marketplace. The average porter load was reported by Pringle as about 100 pounds, although heavier loads have been reported by Malville (2001) for even longer distances in Nepal.
Self-employed porters had an intimate knowledge of both markets and were able to utilize this information in order to make a small profit weekly (Pringle 1989:758). While no organized group made a killing on the ecological conditions of the shortage, opportunistic porters were able to meet local demand. The profit was minimal, basically the same amount that a commissioned porter would be paid to carry the same amount; profit was just equal to transport cost. Shopkeepers with permanent shops did not enter into this trade even though they were better suited to do so because of their pre-existing connections and storage facilities, suggesting that profits from this famine trade were in fact minimal and not worth the effort of established merchants.

This example is instructive in that it contradicts and confirms two assumptions made by archaeologists. First, staple grain was moved a considerable distance into an isolated area, a situation which has been controversial in Mesoamerica (see Drennen 1984) and the southwest United States (see Sluyter 1993 and Malville 2001). Second, marginalized peasants (those without primary production lands) provided the labor as entrepreneurs for a minimal profit and no one made an excessive profit from high grain prices in the famine-stricken market because of the cost of human transport. Landless or marginalized peasants finding work as porters are also documented for rural China where it is considered an ‘honorable’ profession for those without land or skill. These porter work for merchants on contract and do not possess the income themselves to buy grain (Skinner 1964:20).

**Staggered Markets and Ring Market Systems**

Charles Good (1975) makes the excellent point that an optimal ring market cycle would be predetermined if the markets formed a perfectly articulated and integrated, non-conflicting schedule. Little or no decision making would be necessary on the part of traders, they would be predetermined by the schedule of location and periodicity (Good 1975:63). Just this type of well-integrated system was described by B. W. Hodder for rural day markets of the Akinyele market ring in Yorubaland. The Akinyele system
covers 300 square miles; 10,000 inhabitants (35% of the region’s population) attend a rural periodic market each day of the week (1965:153). Markets are evenly spaced about every seven miles, and no settlements (hamlets) are more than five miles from a market.

“These seven markets operate on successive days in such a way that each market takes place on a day on which it is the only one of the seven markets operating within the ring…it is a wholly indigenous phenomenon, expressing an intelligent mutual self-interest among neighbouring village chiefs, or bale.” (B. W. Hodder 1965:152)

Ridell concurs that even though trade and marketing was low in volume and somewhat sporadic or even disrupted at times in much of pre-Colonial West Africa, the system did act to integrate economies and communities of varying size and complexity (1974:541). Both B. W. Hodder (1965) and P. and L. Bohannan (1962) view market structures in West Africa as comprising overlapping rings which connect to other such rings “giving rise to local market systems that cover the countryside in loose chainmail fashion.” To which Wood (1975:109) has responded that the market system of any area is best viewed from the perspective of those participating, the “Eye of the Beholder model,” much like conubia in sub-arctic tribal communities.

Markets are typically not situated in towns in West Africa and the exogenous factors which have led to periodic and, perhaps eventually, daily markets in West Africa have also led to a system of multiple market authorities acting independently and simultaneously. Poly Hill sees the foundation of markets by ethnic traders mirrored in the fact that minority ethnic groups often have rights to collect tolls in markets which they founded, usually outside the walls of the major settlements (1966:299). There is a marked lack of correspondence between marketplaces and population centers in West Africa (B. W. Hodder 1965:151). There also appears to be a correlation between market development and stratified, powerful kingdoms. West African kingdoms such as the Ashanti, Dahomey, and Yoruba probably provided the security and regulation for trade to occur (B. W. Hodder 1965:103), although this was a dynamic situation, not a static state of peaceful exchange all the time. Bromley et al. note that markets are usually situated at
centers of communication or information (Central Places) or they can occur between settlements at crossroads (1975:535). Marketplaces are frequently located at nodal point in communication networks (Bromley and Symanski 1974:3). Furthermore, the transportation system largely influences the structure of a periodic marketing system and affects its level of integration (Skinner 1964:11; Prindle 1989:750). Where marketplace exchanges take place is probably a good indicator of why the market developed as well as whom (or what force) is regulating the market. Location also suggests the relative order of any given marketplace within a hierarchically integrated market system.

10.4 – Mesoamerican Market Exchange in the Protohistoric Period

Mixtec Markets at the Time of Conquest

Mixtecs, like many Mesoamerican peoples, were economically organized with households as the basic production/consumption unit of society, from small domestic family compounds up to the royal palace complex (Terraciano 2001:199-203). While stressing the self-sufficiency of Zapotec city-states, Oudijk (2002) views certain strategically located centers (i.e., Tehuantepec) as probable marketplace nodes as well as exchange points for the redistribution of tribute and long-distance trade items. Like the economy of the Aztecs or the Tarascans, tribute, long-distance trade, and marketplace exchange coexisted within the Mixtec economy. Dominant political centers in the Valley of Oaxaca probably required various tributary polities to provide specific goods; far-away subject towns providing luxury goods (i.e., jewelry, gold, and cloth) while nearer towns provided labor and agricultural products (Oudijk 2002:83). Marketplace exchange would have provided a convenient means of trading specific goods for others, but such exchanges were likely peripheral to the economy of the majority of predominantly self-sufficient households.
“As far as the economy of the Sierra Zapoteca is concerned, we are largely groping in the dark (Chance [1989]:111-21). Obviously, the area relied mainly on subsistence agriculture, which in times of surplus production may have generated some local trading, but this can be considered of minor importance. If we transpose some of the colonial information to the prehispanic period, the Sierra would have been a producer of cloth and mantles. These, probably together with other products, were carried to places of distribution inside and outside the region.” (Oudijk 2002:84)

The Mixtec economy was conditioned in part by their tributary status as vassals of the Aztec Triple Alliance. According to the *Codex Mendoza*, specific quantities of woven cloth, finely worked costumes, cochineal dye, quetzal feathers, and jade were paid to the Aztecs as tribute (Terraciano 2001:231). After the arrival of the Spanish, conquistadors relied on tribute as the principle mechanism of wealth appropriation. By the second half of the sixteenth century, tribute payments were standardized in Spanish coin (Terraciano 2001:231, 239).

“A basically localized and unspecialized economy of pre-Hispanic times was converted under Spanish auspices into an international economic system with connections to other regions of New Spain, to other colonial holdings in America, and to the Old World.” (Spores 1984:122)

The Spanish encountered a fairly densely settled agricultural people heavily invested in terraced and irrigated crop production in the Mixtec area. This made the Mixteca (like other Mesoamerican peoples) attractive to Europeans in terms of exploitation. While we are probably on the right track to view this contact situation in terms of rapid change and the transformation of Mesoamerican society into a new form of syncretic society, some authors have rightly noted the general continuity of Mesoamerican culture following contact and conquest.

“Spaniards competed with Mixtecs for resources from the moment of their arrival. The introduction of money and credit, new enterprises, and new markets expanded material opportunities for some people but increased demands for resources and labor. Despite colonial introductions and demographic decline, traditional forms of agriculture, household production, and local markets remained the basis of subsistence and surplus throughout the colonial period.” (Terraciano 2001:198)
The ethnohistoric documentation of Mixtec society from the Valley of Oaxaca at the time of contact does not immediately and unambiguously clarify the importance of market exchange in pre-Columbian times. The Mixtec economy rapidly changed following conquest by the Spanish. It is difficult to specify how the incorporation of new crops, animals, and goods from the Old World changed existing institutions. Community specialization in processing localized raw materials or craft specialists characterized the post-conquest Mixtec distribution system. After contact, the Valley of Oaxaca was in a demographic decline. Nonetheless, the Spanish required more intensive mining of ore and craft production for export. Cloth was the most influential native commodity, promoting heavy tribute demands. The Spanish continued to enforce (and expand?) cloth tribute demands from Mixteca territory, although they did not do so in Aztec territory. Cloth was an important export commodity for the Spanish, who ran a forced cottage industry in the Valley of Oaxaca, as they did in the Yucatan. Money and banking were also introduced to the native communities as well as pack animals which facilitated the movement of goods (Terraciano 2001).

Regional and interregional markets in both the highland and lowland Mixtec area “were operated by full-time resident or traveling merchants and by peasants who came to market on a regular or an occasional basis to sell surplus agricultural products; fish; meat; prepared food; small quantities of wood, cloth, stone, or metal products; and local natural or manufactured goods” (Spores 1984:134). Rapid changes in the indigenous economic system resulted from the Spanish introduction of ‘transportation improvements,’ in the form of pack animals. The changes in the tribute system instituted by the Spanish and the changes in the distribution system in general likely influenced the organization of production. While the Spanish conquistadors consciously reorganized tribute schedules and marketplace locations, it should not be forgotten that the introduction of pack-animals, money, and money-lending had somewhat uncontrollable repercussions.
“The new economic possibilities offered by the introduction of pack-animals like mules and horses were seized eagerly by the indigenous elite and commoners (Taylor [1972]:35-36), which must have caused considerable changes in the trading system and consequently its production system.” (Oudjik 2002:84)

Marketplace exchange is still common in the Valley of Oaxaca today (Cook and Diskins 1976), and has routinely been assumed for pre-Columbian times (i.e., Appel 1986; Feinman 1986; Feinman and Nicholas 2004, 2007). The “great markets” of Tlaxiaco, Nochixtlán, Pinotepa, Tututepec, and Oaxaca operating in the Valley of Oaxaca in the twentieth century suggest to some researchers that marketplace exchange was just as common in pre-Columbian times (Spores 1967:6). The degree to which pre-conquest trade and marketing resembled post-conquest versions is uncertain. As in other parts of Mesoamerica and the Andes, society was rapidly and fundamentally changed by Spanish intervention and subjugation.

The invading Spaniards were motivated primarily by economic concerns and the acquisition of wealth. Their colonial concern with instituting the most effective means of exploiting the New World’s resources and peoples prompted rapid change in production, distribution, and taxation/tribute. The Spanish were interested in maintaining effective distribution of goods for the provisioning of their newly established colonies. Evaluating pre-conquest economies from colonial documents is a dubious endeavor. The ethnohistoric documentation typically does not represent the first years of contact with indigenous peoples, but rather an economy already in the process of transformation. Unfortunately for anthropologists and historians, the documentation of indigenous institutions was not of primary concern to European invaders. The indigenous world was rapidly and fundamentally altered by contact, while documentation of these changes rarely entered into the minds of the players involved. We must be careful in our analyses of documentary evidence not to project conditions and institution from heavily altered societies back in time.
“Within the colonial system traditional forms of production, marketing, interregional trade, and the institution of tribute continued, but with innovations, modifications, and extensions. Production was increased, and a greater variety of goods was available than in pre-Conquest times. Traditional corn-bean-squash agriculture was supplemented by the introduction of European domesticated plants and animals. These then gave rise to new cropping techniques, animal herding, and the use of animal transport and power. Greater productivity, of course, meant more goods to be exploited by Spanish administrators, encomenderos, clergymen, and businessmen, but additional resources and growing demand abroad also meant that the Mixteca could be more fully integrated into the world economy.” (Spores 1984:122-123)

While some institutions were radically extended and/or reorganized, others were probably not. Concerning the scale and organization of marketplaces or market systems, we must ask how demographic decline, conquest warfare, and the introduction of foreign things and institutions transformed the existing system. Markets are particularly interesting in this regard, as all of the most influential factors which shape a market system were simultaneously distorted and changed at the time of Conquest. Terraciano (2001) cites several vague references to marketplace activity from 16th century ethnohistoric documents.

“In the 1540s, people from Yanhuitlan and vicinity attested to the dominant role played by the Suchitepec market, where one could purchase anything from slaves to prestige items. Exchanges also occurred along the borders of communities. Markets were held every five days in the preconquest period but were restructured to fit a seven-day week after the conquest. In 1575, Coixtlahuaca petitioned to return to a five-day market schedule, based on the native calendar, on the grounds that its new fixed day of Saturday competed with other nearby markets. Its protest suggests an indigenous precedent for the rotational, interregional organization of local market activities.” (Terraciano 2001:248-249)

The reference to a five day indigenous marketplace is intriguing. The scant references to marketplaces or merchants in the extant ethnohistoric documents do provide some clues as to the structure of economic activity in the Mixtec area. Taken all together, it appears likely that a mixture of long-distance merchants, barter exchange at ethnic frontiers, and marketplace exchange at political centers co-existed simultaneously. The petition to return to a five day periodic market schedule does seem to indicate a certain degree of marketplace exchange at Coixtlahuaca within a staggered or ring market
arrangement. Evidently, marketplaces were organized as periodic affairs and not (yet) daily markets; they were scheduled so as not to conflict with other periodic markets and were held within political centers. Of course, the possibility still exists that marketplaces were also situated at crucial nodes in the communication network of the valley or/and in peripheral communities. The degree of market integration, especially the hierarchical ordering of marketplaces in pre-Columbian Mesoamerica still cannot be determined with certainty.

Marketplaces in Highland Guatemala in the Early Sixteenth Century

Four alleged marketplaces are shown in The Lienzo de Quauhquechollan, an indigenous pictoral document which portrays the joint Spanish – Quauhquechollan (Pueblan) conquest of highland Guatemala in the 1520’s. Each marketplace is represented as a circle with one or two individuals inside, one holding a chest with feathers on top or sticking out (Asselbergs 2004:135). Feathers were a known trade item from Guatemala, but are also a marker of the numerical value 400 in the central Mexican pictoral representation system, much as shells represent 20’s in Classic Maya script.

“The marketplaces included in the Quauhquecholteca narrative must have been important marketplaces at the time, or perhaps they were specifically the marketplaces where the Quauhquecholteca traded with the peoples of Guatemala or where they sold and bought their merchandise.” (Asselbergs 2004:135)

Asselbergs also emphasizes the social and political functions associated with contact period marketplaces in Mesoamerica, noting that the Glasgow manuscript from Tlaxcala portrays two Spanish friars preaching in the marketplace (2004:136).

“Perhaps the marketplaces in the Lienzo de Quauhquechollan referred not only to trading activities of the Quauhquecholteca but also to the places where they received and brought news about the conquest (and where they spied), where new campaigns were announced and soldiers gathered, and where various other kinds of events and communication took place.” (Asselbergs 2004:136)
The *Lienzo de Quauhquechollan* does not show a battle scene at the contested Late Postclassic center of Chimaltenango, whose iconographic representation most likely depicts the resettlement of this site by Jorge de Alvarado and company. Chimaltenango’s toponym consists of a shield and a wall and has been placed at the intersection of four ‘roads;’ an I-shaped ballcourt, a temple, and a marketplace representation surround the toponym. Asselbergs confirms that a marketplace, named Tianguesillo is securely documented for Chimaltenango during the contact period (2004:166-167). Another toponym consisting of a bird surrounded by a circle of water denotes the site of Quilizinapa, a lagoon to the southwest of modern day Antigua, an association also supported by the depiction of the erupting volcano named Agua. This toponym is associated with a similar circular marketplace pictogram as at Chimaltenango, along with three houses; pochteca and perhaps a slave are also shown along the road leading there (Asselbergs 2004:185-186).

No marketplace is depicted for Quetzaltenango, which is a prominent scene in the document, referencing a battle. No K’iche’ are depicted, and this scene may represent a conflict between two Spanish groups and their respective indigenous allies (Asselbergs 2004:158).

**Marketplaces in Northern Yucatan in the Early Sixteenth Century**

Mathew Restall believes that marketplace exchange was uncommon or non-existent in the northern Yucatan in pre- and post-conquest times. He also ascribes the lack of marketplace exchange to the relative uniformity of the peninsula’s ecosystem (1997:185). Restall suggests that ethnically non-Maya itinerant traders were fully capable of provisioning the area without the substantial development of marketplaces in the Colonial period. That the ‘consumer’ demand of Maya populations outside of centers was, in this period, provisioned by itinerant peddlers, not through large exchange gatherings. Could this have also been true of Classic Maya population?
“Spanish sources indicate that itinerant traders, still in evidence today in parts of Yucatan, were in the colonial period a substitute for large indigenous markets, with these non-Maya but nevertheless marginal figures acting as middlemen between distant cahib. These merchants relied upon indigenous business and thus maintained close contacts with certain communities, even to the extent of marrying a Maya woman from a chibal of status in the cah.” (Restall 1997:185)

Nontheless, there is evidence that the Postclassic and contact period Mayas of the northern Yucatan engaged in “a certain amount of long-distance trade, though in the form of individual contacts and transactions rather than large, open markets” (Restall 1997:185). The oidor Tomás López was evidently unsuccessful in introducing a Central Mexican-type market [tiánguiz, bastardized from the Nahuatl tianquiztli] as late as 1552 (1997:185). However, there are ethnohistoric references to household heads who maintained agricultural estates traveling to trade in other Maya settlements, called cah.

“The cah is ubiquitous throughout the Maya notary record; it was the fundamental unit of Maya society and culture. Every cah had its place in the geopolitical framework of Yucatan, just as every individual Maya still tied to indigenous community society was a cahnal, ‘cah member,’ in the general sense, as surely as she or he lived on a cah house plot with relatives of the same, or an associated, patronym group.” (Restall 1997:13)

**Indigenous Trade in the Yucatan in the Early Sixteenth Century**

When the Spanish conquistadors first landed on the northeastern corner of the Yucatan peninsula they encountered the affluent trading center of Ecab (Belma) which greatly impressed them, and to which they applied the moniker “El Gran Cairo.” The Spanish also recorded that the inland towns of Cachi and Cahuacha also had large marketplaces (Chapman 1957:130). In 1527, Francisco de Montejo sailed into the Bay of Chetumal and, traveling inland, encountered the settlement of Chetumal which he described as a flourishing trading center. His description of this town states that there were 2000 houses, fertile land, well developed apiary culture, and that this was the only extensive cacao producing area of the entire Yucatan (Chapman 1957:130).
“The long-distance trader in Yucatan was a person of noble status and wealth. He trafficked mainly in slaves, cloth, and salt, to a lesser extent in honey and flint, i.e., mostly in raw materials. His principle ports of trade were about Xicalango in the Gulf of Mexico to the southwest, and on the Gulf of Honduras to the southeast. In the latter area he had storehouses and factors (agents). There apparently was a manner of distinction among traders, between what Roys calls the ‘professional merchant,’ the ppolom, and ‘those who traveled,’ the ah ppolom yoc.” (Chapman 1957:132)

Chapman reads the Late Postclassic Maya ethnographic literature to indicate that administered trade was conducted by professional merchants closely associated with political elites and rulers. Long distance trade in these societies was not a free enterprise, as we think of in modern Western thought, as much as a regulated state profession (Chapman 1957:120 for the Aztecs). Aztec professional merchants (pochteca) traded widely within the borders of the Aztec Empire (Berdan 1975, 1977, 1978, 1980; Isacc 1986a:334) as well as venturing long-distances to trade in foreign lands. Pochteca could also behave as government agents, acting as trader-spies in foreign marketplaces (Chapman 1957:124, 141) or conducting trade on behalf of the king of Tenochtitlan (Berdan 1983:174, 1986:286; Bittman and Sullivan 1978:214; Isaac 1986a:332-334; Santley 1986:241). Maya merchants did not enter Aztec territory; they traded at specified ports with pochteca, and all foreign trade was conducted by barter, not currency (Chapman 1957:128).

10.5 – Marketplaces in the Classic Period Maya Lowlands

Both Tikal and Calakmul, the two largest Peten centers of the Classic Maya lowlands, have architectural complexes located within their epicentral cores that are interpreted as physical marketplaces. Targeted studies of the distribution of artifact remnants or chemical residues (e.g., Dahlins at al. 2007 for Chunchucmil) have not been attempted at either of these facilities. Neither has an examination of hard artifacts recovered from the excavations of either complex, either macroscopically,

28 A collection of sherds from a trench purported to be marketplace refuse at Tikal has been macroscopically analyzed and included in the analyses of Fry (1979, 1980, 2003; Fry and Cox 1974); the material from this trenching operation
microscopically, or compositionally, been published. The exterior surfaces of tiered platforms of the Calakmul complex are adorned with painted images of men and women dispersing tobacco, salt, and beverages (Boucher and Quiñones 2007; Carrasco Vargas, López, and Martin 2009). Both complexes are dated to the Late Classic, perhaps coinciding with an eighth century “rivalry” between these two centers (Houston and Inomata 2009:252).

While it is generally accepted that the large open plazas ubiquitous at all Maya epicenters could easily have housed central marketplaces, they are perhaps prerequisites for but not evidence of marketplace exchange systems. From a configurational standpoint (Hirth 1998), Tikal certainly does have large centrally located plazas which could have served as market locations, though they are not large enough to have accommodate the entire projected population of all of Tikal at one time (D. Chase, A. Chase, and Haviland 1990:500), much less an even larger influx of people during a staggered regional market-day. Christopher Jones (1996) identifies the actual marketplace within the epicenter of Tikal as the structure 5E-32 patio quad (with structures 5E-33 through 5E-36 forming an interior open-cornered patio quad). Jones’ states,

“The theory of a marketplace function depends primarily on their unusual and consistent plan, which seems suited for such a use rather than for residence, administration, or staging of ceremonies.” (Jones 1996:55)

Yet he also mentions,

“A religious or educational cloister also comes to mind, but would be less likely to have both inward- and outward-facing doorways.” (Jones 1996:55)

Based in an analysis of stratigraphic superpositioning, Jones (1996, 2003) places the construction of the 5E-32 “marketplace” complex within the context of the complex has also been described as possible workshop debris (Jones 1996:12). However, production may occur within the marketplace (Clark 1989: 300; Hirth 2009).
architectural remodeling of Tikal’s epicenter in the Late Classic. Construction of a ball
court complex to the west of 5E-32, and the major causeways converging on this area
immediately predate initiation of the construction of the 5E-32 complex. Based on
architectural similarities with other dated constructions, Jones prefers a construction date
for the East Plaza ball court between A.D. 692 and 731.; specifically placing the
dedication of the ‘marketplace’ structures at A.D. 697 based on a reconstructed date from
a glyphic block from Structure 5D-42 or 5E-31, overlooking the ball court alley (Jones
2003:213-219). This date coincides with a major military victory over Calakmul and the
death of the Calakmul king Yukan Yuchaak K’ak’ (Carrasco Vargas et al. 1999;

“Other important constructions coincide with the building of the East Plaza Ball Court. Floor 1
extended onto the northern Maler Causeway and eastern Mendez Causeway, becoming the first of their two
pavements. These new causeways greatly transformed the appearance of Tikal at the time of the ball-court
project. Also, the first gallery of the East Plaza marketplace (Structure 5E-92-2nd) was erected at the far
eastern edge of the open space, blocking the only access stair up to the East Acropolis (C. Jones
1996)...Successive constructions of long multi-doorwayed galleries eventually completed a large complex
east of the ball court composed of an enclosing rectangle, protected inner galleries, gallery-lined streets,
possible guardrooms, and judges’ stands for what was probably a marketplace (C. Jones 1996: fig, 1, 2003:
fig. 7.5). The market was begun by Jasaw [Chan K’awiil I], but its final form was built with pavements
later than Temple 1 and must be credited to Jasaw’s son Ruler B or his grandson Ruler C.” (Jones

The reigns of these three Late Classic Tikal rulers are as follows (after Martin and
Grube 2000):

<table>
<thead>
<tr>
<th>Ruler</th>
<th>Reign</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jasaw Chan K’awiil [Ruler A]</td>
<td>A.D. 682 - 734</td>
</tr>
<tr>
<td>Yik’in Chan K’awiil [Ruler B]</td>
<td>A.D. 734 - 746&gt;</td>
</tr>
<tr>
<td>28th Ruler</td>
<td>A.D. &gt;766 - 768</td>
</tr>
<tr>
<td>Yax Nuun Ayiin [Ruler C]</td>
<td>A.D. 768 - 794&gt;</td>
</tr>
</tbody>
</table>

This scenario gives us a mid to late eighth century A.D. date for the construction of
the 5E-32 ‘marketplace’ complex, a date which accords well with the Imix date of the
majority of ceramics recovered from excavations nearby (Jones 1996:12). This does
correlate with the epigraphically derived era of competition between Tikal and Calakmul
mentioned by Houston and Inomata (2009:252). Tikal’s A.D. 695 star war over Calakmul is often interpreted as the final event in a string of military aggressions between the two centers, although Tikal Stela 21 [A.D. 736] depicts a prostrated Calakmul captive below the main figure, Yik’in Chan K’awiil [Ruler B]. Perhaps military aggression was largely replaced by peer-polity style competition in the form of monumental construction and centralized marketplace trade and/or exchange.

There are alternative interpretations to this architectural configuration, however, including elite display of tribute items or other storage facilities for non-marketed items (i.e., a centralized redistribution center). The formal architecture may also indicate a centralized “port of trade” complex instead of a marketplace in the sense of a bustling arena for the majority of Tikal’s inhabitants to congregate in order to barter goods and engage in social and religious activities. The identification of the function(s) for any specific building at any archaeological site, from architecture alone, have always been difficult to make (Andrews 1975), especially for the Maya (Straight 2007:195-198).

Jones (1996) discusses several architectural compounds at Classic Maya centers as probable marketplaces because they are similar to Tikal’s East Plaza in their spatial configurations. He notes that the north half of the central plaza of Group A at Seibal was suggested as a probable marketplace by Ledyard Smith (1982:106, 108, 232) and Gordon Willey (1990:202-203). This complex of long, low building platforms delimits a plaza with “at least three small low, square platforms within it,” dated to the Terminal Classic (Bayal), it is situated near a ballcourt and radial platform. A similar compound has been identified by Jones from the map of Yaxha, again a quadrangle of low mounds approximately 80 x 100 meters in dimension situated in the site center at the end of a causeway. Although the platforms were unexcavated when he visited Yaxha in 1995, Jones “confirmed that the mounds differ little from those in the East Plaza of Tikal” (1996:86).
Several other compounds, suggested to be marketplaces, are cited by Jones: the Court of the Thousand Columns at Chichen Itza (Ruppert 1924:269-270; 1952:72-74; Tozzer 1957:73-74, Fig. 57) the “Great Compound at the juncture of the axial causeways” at Teotihuacán (Millon (1973:57) and the marketplace at Tlatelolco. None of these compounds are from the Southern Maya lowlands. Chichen Itza is located in the Northern Maya lowlands, Teotihuacán and Tlatelolco are both in the Basin of Mexico, the latter known mainly from ethnographic accounts by Cortéz, Diaz, and Sahagun. The Chichen Itza and Teotihuacán marketplace suggestions were not based on archaeological recovery; they are suggested on configurational grounds, that is, centrally located big plazas or compounds.

“The eastern half of the East Plaza…is located at the juncture of entry roads, the Maler and Mendez Causeways, is near the principle ceremonial area (Gr. 5D-2) and a ballcourt (Str. 5D-42 and 5E), has arcades or roofed galleries (Str. 5E-29, 95, and 37), a design of streets and stalls around an open center (Str. 5E-32-36 and 99), and distinctive separate buildings at corners (Str. 5E-30, 40, and 97). Furthermore, the doorways that open onto the outer streets are identical to those within the enclosed quadrangle, arguing for identical interior and exterior functions, and making it less likely that the complex was cloistered or restricted. Workshop debris was not found in limited clearing of rooms, but may have been sampled in the trench off the N[orth] edge of the platform between Str. 5E-30 and 29 (see Plat. 5D-1st text), the most accessible dumping site to Str. 5E-32.” (Jones 1996:87)

The discussion of excavations around platform 5D-2 details a construction series from Manik to Imix times. The deep trenching through accumulated strata abutting a staircase of platform 5D-2-1st receives little attention in Tikal Report 16, which summarizes excavations in the East Plaza. An excerpt from a 1960 ceramic report penned by Vivian Broman explains that,

“[A] most satisfactory quantity of [Imix] sherds was recovered from this test [operation 22O]: much polychrome, most in fairly delicate condition and requiring special care in cleaning, as well as large sherds representing whole sections in many cases. The extended trench revealed that the bedrock surface had been quarried, later filled with construction fill to bring it up to a certain level, and subsequently loaded with dump debris.” (quoted in Jones 1996:12)
This 1960 ceramic report excerpt is followed by a single paragraph, which appears to have been written after scrutinizing lot forms from the excavation.

“Notes on individual lots mention large jar sherds, polychromes, cut and/or polished bone, including ‘fan handles’ and flutes, cut shell tinklers, pendants made from sherds, figurine heads, and censers. The bone, shell, and lithics were suggestive of workshop activity that presumably derived from occupation of the platform summit. Perhaps the material came from Str. 5E-2 and the E[ast] half of the platform, because the absence of Edznab sherds makes it clear that the deposit was not associated with the Edznab middens on and around the western structures.” (Jones 1996:12)

In the absence of specific qualitative and quantitative data from the artifacts of this deposit the designation of “workshop debris” is equivocal. The presence of cut and/or polished bone is suggestive of crafting as are the cut shell tinklers; production within the marketplace should not be discounted (Clark 1989:300; Hirth 2009).

Smaller architectural complexes which may be the physical remains of marketplaces have been mapped by Juan Pedro Laporte’s investigation team in the northeastern portion of Guatemala, towards the Belizian border, at the smaller centers of Pueblito, Ixtutz, and Xa’an; these complexes are situated at the conjunction of causeways entering palace and temple complexes (Houston and Inomata 2009:252; Laporte and Chocón 2008). A sparse collection of artifacts was recovered from extensive stripping excavation of the Pueblito ‘marketplace’ compound: 750 ceramic sherds dating to the Late and Terminal Classic period and some lithics which included 18 fragments of obsidian knives, a chert chisel, and a limestone malacate. When investigations at Pueblito were initially reported, Laporte (Laporte and Chocón 2008) discussed the configuration of the alleged marketplace compounds he was investigating in the Peten, comparing both large and small versions of this compound ‘type’ with similar configurations reported elsewhere. He concluded that the identification of this specific type of complex indicated a similar institutional arrangement at both small and large centers and was a strong indicator of both centralized marketplaces and peripheral marketplaces in Late Classic times in the Maya Lowlands.
Marshall J. Becker (2003a) has argued for the analysis of residential (or not) groups or plazuelas using “architectural grammar.” The method involves comparing different configurations of structures grouped around a common plaza in order to chart the distribution of similar types, which he has defined for Tikal (i.e., Type II = east shrine focus group). Very large complexes of range-structures (i.e., palaces) have also been discussed using a comparative method (Andrews 1980; Harrison 1986). The goal in these later studies was to chart the number and configuration of different types of rooms within a large architectural complex in order to group the rooms by similarity, and thus indirectly measure the probable number of activities housed within a single ‘palace.’

George Andrews’s (1980) analysis of the central palace at Palenque suggested that this compound had many types of rooms; multiple configurations which served different functions. While it can be quite difficult to assess function from architectural configuration alone, Andrews concluded that the palace at Palenque was indeed the physical setting for multiple activities. By comparison with European palace complexes, the example at Palenque was, in fact, a “palace,” in the conventional parlance of English – a royal architectural complex with a multitude of special-function rooms to accommodate a wide range of domestic and administrative functions for the royal family and their attendants. A similar study conducted by Peter Harrison (1986) concerning the North Acropolis of Tikal came to a similar conclusion – the acropolis was, in fact, a series of royal palaces.

Applying much the same logic to the alleged marketplace compounds, small and large, from Tikal, Yaxha, Ixtutz, Peublito, and Xa’an, Laporte confirms that a specific type of complex has been identified and deserves further investigation. Furthermore, the settings of these compounds are similar, centrally located at the convergence of causeways in close proximity to ceremonial and administrative buildings within the sites’ core areas. Therefore, the compounds fit the configurational expectations of marketplaces. Arguing that the configurations of these small compounds matched the
proposed marketplace at Tikal (Jones 1996), Laporte lamented the fact that a larger complex of this type had not been proposed for another large Maya center, although he did mention the tentatively identified marketplace at Yaxha, as well as similar compounds at Caracol and Chunchucmil.

The low stone foundations delimited at Pueblito form identical enclosures, once supporting perishable superstructures, measuring 5.4 x 3 meters. Similar low stone building foundations forming “stalls” have been described at the alleged marketplace at Chunchucmil, Yucatan in the northern lowlands (Dahlin et al. 2007). The alleged marketplace at Tikal, in the East Plaza, has more formal masonry architecture, as do the structures at Calakmul (Carrasco Vargas, López, and Martin 2009).

Noting that the existence and nature of marketplaces in the Classic Maya lowlands was a controversial subject, Laporte suggested that growing evidence pointed to marketplaces of different scales. He hypothesized that the Classic Maya economy was characterized by both local subsistence exchange (peripheral markets) and a system of local and regional markets.

Within the Chik Naab complex of Calakmul, a radial pyramid [Structure 1] measuring 11 meters a side and rising to a height of 4.7 meters has provided iconographic and epigraphic evidence suggestive of marketplace exchange. The three sloping tiers of Structure 1 Sub 1-4, tentatively dated to A.D. 620 – 700, were painted with scenes of people engaged in several activities. Men, women, and a child are depicted in various costumes which range from simple loincloths and cloth headbands to more elaborate head gear, jewelry, and intricately woven or painted cloth garments.

Several of the scenes follow a formulaic construction, whereby individuals seated behind ‘goods’ are identified with a glyphic caption. Much like the codex inscriptions originally deciphered by Yuri Knorosov (see M. Coe 1989), the Calakmul images display a pattern of coupling an image which portrays a variable component (the ‘good’) with a
variable element within the accompanying glyphic caption (the ‘name tag’). Unlike the
majority of glyphic captions carved into stone monuments at Maya centers which serve to
identify the images of rulers and courtly elites by proper names and titles, the majority of
these painted caption texts provide “generic descriptions” of the actors, not individual
names. The glyphic captions follow a pattern of prefixing the agentive *aj* (he/she/it of…)
to a variable glyph which correlates with the ‘good’ set before the individual. This
produces the combinations *aj ul* “maize-gruel person,” *aj waaj* “maize-bread person,” *aj
ixi’m* “maize grain person,” *aj atz’aam* “salt person,” *aj mahy* “tobacco person,” and *aj
jay* “clay vessel person.” The corresponding images correlate nicely with the caption
texts. For instance, the term *aj atz’aam* “salt person” captions a scene of a man with a
basket and spoon, the term *aj jaay* “clay vessel person” captions a scene of a woman with
a large basket filled with cylinders, and the term *aj ixi’m* “maize grain person” captions a
scene of several men with bowls and a tied sack.

Other images portray a bearer or porter with a large jar carried by tumpline and a
woman dressed in a translucent gown propping a large jar atop another woman’s head.
While the tumpline porter conveys the sense of bringing something to the marketplace,
the image of the tantalizingly dressed woman donning a second woman’s head with a
large pot is more consonant with a servant being loaded up to take something home from
the marketplace; a heavy jar would presumably be used to carry liquids or grain, unless
the jar itself is the good in this case.

The erotic dress of this particular female seems out of character with what one
might expect in a Classic Maya marketplace, although it has been suggested that she is, in
fact, a prostitute – prostitutes in the great Aztec marketplace of Tlateloco are mentioned
by Sahagun (Houston and Inomata 2009:252; Webster personal communication 2009).
While the Calakmul images have been called “murals,” a single marketplace scene with
multiple vendors is not portrayed. Separate images of different scenes portray individual
acts, and these are not explicitly detailed as “exchanges” – none of the published images
show one item exchanged for another (barter), nor do they show any money item, such as cacao beans or obsidian bladlets, proffered as payment for a good or service (exchange).

The Calakmul images are provocative, evoking a sense of marketplace activity and of “common people” engaged in mundane activities removed from the courtly acts of ritual and rulership – the kind of scenes usually portrayed in Classic period imagery and preserved in stone carvings or painted on pottery.

“Lacking the fine ceremonial garb of royal performance or any of the distinctive markers of supernatural identity, they offer insights into quotidian activities.” (Carrasco Vargas, López, and Martin 2009:19247).

However, the images do portray some enigmatic features which, perhaps perfectly at home in a marketplace, may indicate rank, administration, or even sponsorship. The female that places the jar atop another female’s head may be interpreted as a high ranking individual with a servant; her translucent garment sewn or painted with unidentified glyph-like markings. Alternately, she may be a well-dressed prostitute with an assistant, or a marketgoer simply helping a friend. An as yet untranslated series of three glyphs does repeatedly name a specific individual, in contrast to the generic titles of the majority of the portraits.

“The three large hieroglyphs repeated within several of the inset moldings may be rather different. These provide the name or title of a female, although her relevance to the painted program and to the structure as a whole is currently enigmatic.” (Carrasco Vargas, López, and Martin 2009:19248)

It should be mentioned that the short article by Carrasco Vargas, López, and Martin (2009) published in PNAS does not even contain the word “market” or “marketplace.” The article does begin by stating the obvious, that more is known about the elite sector of Maya society than the lower classes or humble everyday people.
“From public monuments to the more intimate scale of painted ceramics and personal jewelry, scholars have learned much about the practice and performance of courtly life. Missing from these sources are the lower echelons of society, the population that supported the opulent lifestyles of the elite. The role such people played in circulating goods and services, as well as the social systems through which this was accomplished, are virtually unknown.” (Carrasco Vargas, López, and Martin 2009:19245)

The mechanisms or institutions which developed to structure the circulation of goods and services are, indeed, difficult to investigate archaeologically. Paintings will never qualify, much less quantify, the circulation of goods at a very precise level. The archaeological investigation of the physical sites of exchange, the circulation of goods, and the range and scale of production and distribution will always be useful; however, the entrenched fascination with tombs and temples reigns supreme. Perhaps a renewed interest in central marketplaces will uncover more architectural complexes which served as physical locations for exchange, but not all marketplaces can be assumed to have been located centrally. Identification of a physical marketplace does little to answer questions concerning hierarchical market systems, integration of marketplaces with tribute systems, or the organization of production and distribution which did not flow through the marketplace.

“We have very little hard information about the social processes by which foodstuffs and goods circulated within Maya polities and the varying roles of festivals, gift-giving, communal feasting, and exchange, all of which are attested in ethnohistorical sources. These murals evidently portray an ancient social mechanism that has left no other evidence of its existence.” (Carrasco Vargas, López, and Martin 2009:19248)

The investigation of exchange, or the circulation of goods, through the examination of artifact distributions should complement any investigation of the physical loci of marketplaces. Only through the identification of production locals, exchange locals, and consumption locals can any market system be effectively described and understood.
10.6 – Concluding Remarks to Chapter 10

Chapter 10 began with a brief statement about marketplace exchange in the Aztec Empire, arguing for a contextual approach to the study of market systems within the context of the overall economic system of any given society, including the Aztecs. I stated that firsthand ethnohistoric documentation of the centrally located marketplaces within centers of the Aztec Triple Alliance core area has overshadowed the need for empirical research in this area and elsewhere, especially in the Classic Maya lowlands. After clarifying my theoretical position concerning the differences among marketplace exchange, market systems, and a market economy in this and previous chapters of this dissertation, I advocate investigation of marketplace exchange within the total economic system. In Mesoamerica in particular, I see multicentric economies that cannot be characterized as market economies. For the Aztecs, marketplace exchange was complex in its own right, and intertwined with a centralized imperial tribute system, professional long-distance traders, corvé labor, state redistribution, and gift exchange. Without the aid of ethnohistoric documentation of the same caliber for the Classic Maya lowlands, it is even more difficult to identify physical marketplaces, much less calculate how these formed any kind of market system within the multicentric economies of Classic Maya polities. For the Postclassic Maya of the Yucatan, Chapman (1957) has strongly stated that marketplace exchange and long-distance port of trade exchange each formed a distinct, and non-overlapping, system.

Taking the Inka Empire as the most often referenced example of a large state economically organized through the principle of redistribution, not integrated market exchange, I argued that marketplace exchange needs to be contextualized for the Inka case study, just as in the Aztec case. In particular, the ethnohistoric documentation concerning economic organization needs to be critically evaluated, whether referencing Inkas, Aztecs, or other complex societies. I reviewed some ethnohistoric documentation for marketplace exchange within the Inka state, singling out a specific example that has garnered some attention – the alleged marketplace gathering at Xuaxa in the Mantaro
Valley. After critical review, I suggest that marketplace exchange, war preparations, and centralized redistribution may have looked quite similar from the Spanish chroniclers’ perspective (as La Lone [1982] convincingly argued). Furthermore, these varied arrangements are not mutually exclusive. Ethnographic documentation of the use of bridges and toll stations by individuals conducting commerce on their own account, as opposed to the state’s, lend vague support to the notion of an entrepreneurial system coexisting within the overall state mandated and enforced redistributive bureaucracy. The existence, extent, and organization of such a system remain unknown and difficult to investigate further. In sum, I argue that it is more productive to investigate the structure of an economic system rather than label it and assume that the same institutional arrangements prevailed at all times in all places.

After leaving the Inka state, I discussed state administered trade in the West African kingdom of Dahomey in the seventeenth through nineteenth centuries A.D. Acknowledging the existence of marketplace exchange within this kingdom, I focused on the functions of marketplaces there, concluding that marketplace exchange in this place and time never constituted a market economy and that marketing remained subservient to the overriding redistributive organization of Dahomey. The Dahomean case study dovetailed into a discussion of exchange equivalencies and the use of currencies. The primary example here was the use of cowrie shells as a nearly all-purpose currency within the Kingdom of Dahomey. Following Karl Polanyi’s analysis of these objects, I conclude that it is not just the substance or objects themselves that meet the requirements of (almost) universal money, but the instituted usage of these shells. The section was followed by a brief review of the differences between all-purpose and special-purpose currencies, providing a few standard definitions of economic terms.

The chapter continued with a discussion of the similarities and differences among various economic transactional modes and the fact that these are not mutually exclusive. In particular, the calculated nature of gift exchanges, barter exchanges, and marketplace exchanges were brought to light. Throughout Mesoamerica, and beyond, complex
societies were characterized by multicentric economies, in which these (and other) economic modes coexisted to varying degrees of importance. I also alluded to a dangerous theoretic swing of the pendulum in economic anthropology as emphasis appears to be shifting toward analysis of ancient economies in terms of purely commercial activity and the market economy has been redefined for this purpose. I disagree with this situation and advocate investigation of economic systems, including market systems, within the overall economy of complex societies.

Continuing along this trajectory, more comprehensive and farther reaching ethnographic analogies are proffered as a means to explore the possible economic configurations that may have existed in the complex societies of the new world. Ethnographic studies suggest that social and economic systems often intersect in surprising ways. As a starting point for the investigation of market systems, I presented reviews of periodic market development and operation in rural Africa, China, and Nepal. Asking why and how periodic markets develop and persist, horizontally (or heterarchically) oriented market exchange systems were distinguished from hierarchically organized ones, with examples. Questioning the assumption that articulated markets are always hierarchically organized in a complex fashion, I pointed out that limited or two-level hierarchical market systems have been documented (i.e., dendritic or solar systems).

The next sub-chapter surveyed economic systems throughout Mesoamerica as they were documented in the sixteenth century following Spanish contact and the imposition of Colonial organization. Information for this period does come from firsthand ethnohistoric documentation. However, in the words of Chance (1989), we are “largely groping in the dark” when discussing the organization of Mixtec economic organization. Although the Mixtec economy was certainly a multicentric one, not a strictly market economy, it was also undergoing rapid change. The introduction of Spanish rule, ideas, and things quickly and irreversibly altered the pre-Columbian socio-economic system. It remains unknown just how integrated or how peripheral marketplaces were prior to conquest in this area. Nonetheless, ethnohistoric
documentation attests that local markets remained, as did some sort of regional and interregional market system – the organization of these is basically unknown.

Moving closer to the Maya lowlands, evidence for marketplace exchange or long-distance trade was also presented for sixteenth century highland Guatemala and the northern Yucatan peninsula (i.e., Postclassic Maya). Mathew Restall (1997) opines that marketplace exchange in northern Yucatan was uncommon (and unnecessary), contradicting the opinion of Bishop Diego de Landa. Ports of trade also existed in the Postclassic Maya lowlands at Ecab (Belma) on the northeastern corner of the Yucatan peninsula and at the inland towns of Cachi and Cahuacha. The larger Postclassic town of Chetumal (with some 2000 houses), just inland from Chetumal Bay, was described as a vibrant trading center in sixteenth century Spanish sources. Again, the more precise organization of trade and marketing at these places in these times remains obscure.

The last section of this tenth chapter brought us full-circle to a discussion of the evidence for marketplaces in Classic Maya society of the lowlands, in particular, at the largest Classic Maya centers of their core cultural area, the southern lowlands. At both Tikal and Calakmul physical marketplaces have been identified within the ‘downtown’ districts, or epicentral compounds of these centers. These designations are based in very different lines of evidence – mainly configurational at Tikal, iconographic at Calakmul. Christopher Jones places the construction of Tikal’s alleged marketplace structures [the 5E-32 Complex] at A.D. 697. Based on architectural superpositioning of construction episodes tied to long count dated monuments, this date appears to be quite secure; archaeological evidence in support of the identification of the complex as a marketplace remains equivocal. The iconographic imagery displayed on latest phase architecture at Calakmul’s Chik Naab Complex is stylistically congruent with the provisional date of use. Both ‘marketplace’ complexes are dated to the Late Classic period, perhaps coinciding with an eighth century “rivalry” between these two centers (Houston and Inomata 2009:252).
Moving from marketplaces to marketplace systems, Juan Pedro Laporte’s investigation team has reported recently mapped architectural complexes at the smaller Classic Maya centers of Pueblito, Ixtutz, and Xa’an located in the northeastern portion of Guatemala, towards the Belizean border. Laporte argues that these also fit the configurational requirements of marketplaces, further arguing that, although controversial and preliminary, these likely represent nodes in a market system that included both local exchange and regional trade. The chapter concludes with a review of the very recently excavated Calakmul ‘murals,’ and what they represent. I argue that the identification of a physical marketplace locale is only the first step towards investigating market systems of the Classic Maya lowlands.

The next chapter provides a critical review of economic organization within two great (competing) empires of northern Mesoamerica – the Tarascans and the Aztecs. After exploring the multicentric economies of these two powerful kingdoms, we will take a theoretical journey through even more distant lands, far from Mesoamerica. Continuing in the cross-cultural analogy vein, the economic organization of two other tropical civilizations are contemplated – the kingdom of Dahomey in West Africa and the Khmer polity of Southeast Asia.
Chapter 11– Marketplace Exchange within Economic Systems

11.1 – Economic Structure of Protohistoric States in Central Mexico

The Economy of the Tarascan State

“Pollard’s continuing interest in the connection between the political and economic systems of the Tarascan state led her to a close study of the economy of the Tarascan kingdom, in which she examined the roles of the market, the tribute system, and the government agencies. She analyzed in detail the geographical sources of goods, the mechanisms by which goods became available for consumption, and the question of who utilized the goods and services.” (Gorenstein 1993:xix)

For decades Helen Pollard has worked in the Pátzcuaro Basin of Michoacán, Mexico, home to the Postclassic/Protohistoric Tarascan state, centered on their political capital of Tzintzuntzan. Pollard has emphasized the structural differences between the earlier urban centers of Teotihuacán and Tula and those of the Protohistoric Tarascan and Aztec states (1980:693), questioning the assumed overlap of political and economic systems in the Pátzcuaro Basin under the Tarascan state. Between A.D. 1000 and 1200 the fall of powerful states to the west (Teuchitlán) and east (Toltec) triggered political instability and population movements in this area. In this vacuum, the Tarascan polity developed and transformed Michoacán from a peripheral area into a core one (Pollard 2000:80).

“The view that central places during these periods [Classic, i.e., Teotihuacan, and Early Postclassic, i.e., Tula] were primarily multifunctional and reflected congruent economic and administrative networks has largely been assumed rather than demonstrated in the literature; this may reflect an unquestioned use of Aztec and/or ethnographic analogies for these earlier periods.” (Pollard 1980:693-694)

The Tarascan polity flourished until the sixteenth century as a multi-ethnic tributary state to the west of the Basin of Mexico, home to the contemporary Aztec tributary state. Distinct cultural identities and languages reinforced the separation of the
Tarascan and Aztec states (Pollard 2000:72). Although messengers could travel between the Tarascan capital of Tzintzuntzan and the Aztec capital of Tenochtitlan, this was highly restricted (Gorenstein and Pollard 1991); communication remained “indirect and intermittent” (Pollard 2000:72).

Pollard has also stressed the non-urban nature of most centers in the Tarascan state (Pollard 1980; Gorenstein and Pollard 1983), with the sole exception of Tzintzuntzan (Pollard 1980:693; 2003:385), noting both the varied functions of these settlements and the centralized political character of Tzintzuntzan. Pollard’s work has focused on economics from an ecological point of view, investigating population densities, catchment areas, production, and exchange from a predominantly quantitative angle (see especially Gorenstein and Pollard 1983; Pollard 1980, 1982). The economy of the Tarascan state was certainly multicentric and the state directly controlled economics through long-distance merchants, the tribute system, corveé labor, and land/water grants (Pollard 2000:77). A large portion of the Tarascan economy was non-market oriented. Marketplaces also developed, mainly in the denser populated centers of the core of the polity in the Pátzcuaro Basin. Market development may have proceeded along different lines than the heavily state-directed branches of the economy. Pollard suggests that state regulation of marketplace exchange was not of primary concern to the central government, itself strictly controlled by the royal family.

“The noncongruence of market and administrative centers in the Tarascan core, and, I believe, in Protohistoric central Michoacán generally (Pollard 1980) suggests minimal politicization of the markets. The markets themselves appear to have been more heterarchical than hierarchical in the goods and services they offered and the populations they served. The exception to this appears to have been Tzintzuntzan, where manufactured and elite-utilized goods were associated with the large concentration of artisans and craftsmen in the capital.” (Pollard 1993:114-115)
The Protohistoric Tarascan Tribute System

Markets were most important and largest in the basin centers, but cannot be understood without reference to the larger tribute network. Local elites funneled off surplus goods, services, and labor from the immediate populace and local resource base, with minimal participation in market exchange, preferring outright ownership of production and trade (Gorenstein and Pollard 1983:108). Food, cloth, metals, tropical goods, and manufactured craft items flowed into the Tarascan capital of Tzintzuntzan as tribute. Likewise, a considerable amount of human labor was directly controlled by the royal dynasty in the form of military service, household servants, corveé labor for construction, and agricultural work on state lands (Pollard 2000:71).

The tributary system covered the entire empire, while the market system was restricted to central Michoacán and supplied goods and services to the ‘urban core’ area of highest population density (Pollard 1993:95). Tribute was hierarchically organized, with specialized bureaucrats in charge of the collection, storage, and transfer of goods (and services) from the local level to regional centers and then on to Tzintzuntzan or the military border (Gorenstein and Pollard 1983:101; Pollard 1993:116). A portion of this tribute was used to support local administrative and religious personnel. Maize and cotton cloth/clothing were the dominant goods to make it all the way to Tzintzuntzan. The following items appear on tribute lists from ethnohistoric documents: slaves, sacrificial victims, household services, metal objects, armaments, tropical fruit, cacao, raw cotton, gourds, animal skins, tropical bird feathers, ore (gold, silver, and copper), salt, beans, chili peppers, rabbits, turkeys, honey, maguey wine, and pottery (Pollard 1993:116-118, also Gorenstein and Pollard 1983:100). Completely controlled by the Tzintzuntzan-based royal family, the centralized and hierarchically organized tribute system was an all-important economic institution within the Tarascan state.
“This [tributary] network was fundamentally a political institution, the bulk of goods passing through various levels, from various regions of the state, ultimately finding their way to the capital, Tzintzuntzan, where they were placed in central storehouses. To the extent that they were consumed within the basin by the royal family, the political bureaucracy, the religious functionaries of state temples, as gifts to foreign emissaries, and as emergency stores for the local population, they represent a significant portion of the local economy. In addition, these items were used to maintain the army, which during periods of war would have supported large numbers of men from the basin.” (Pollard 1993:116)

Regions of the Tarascan empire supplied silver, gold, copper, and salt through conquest tribute (Pollard 1987, 2000). Other goods coming from the west (Jalisco/Nayarit) were also used by the Tarascan elites, including tin, hematite, cinnabar, pyrite, lead, specular iron, malachite, azurite, opal, quartz, marine shell, and gourds (Pollard 2000:77). In addition to tribute, the state owned much of the prime agricultural lands in the basin and the royal family maintained exclusive rights to certain forest stands (Pollard 1993:118). Lake resources were likely state owned as well.

Structure of the Import/Export System

Imports to the basin consisted of both exotic goods not available in the basin and bulky foodstuffs to supplement basin production which was insufficient to feed the large, dense populations (Pollard 1982; Pollard and Gorenstein 1980). Quantitatively, 90% of lithic artifacts recovered from Tzintzuntzan were made from imported obsidian; an estimated 44% of maize and 9% of beans needed to support basin residents were also imported from outside the basins (Gorenstein and Pollard 1983:108, see also Pollard 1982; Pollard and Gorenstein 1980). Maize was a major tribute item channeled into the basin, for use as religious offerings, state gifts, and maintenance of the army and the royal household (Pollard and Gorenstein 1980:277). As the population of the basin grew past the carrying capacity of the immediate area, the importation of foodstuffs became a necessity.
“It is clear that economic interchange within the state was not simply a matter of acquiring colored feathers for the elite and that the flow of goods in the expanding tribute system was not simply a political expression of obedience. The core of the Tarascan state in 1520 was not a viable economic unit. It existed, even thrived, only by the exchange of goods and services in regional and supraregional patterns.” (Pollard 1993:113)

The importation of maize, amaranth, beans, and chili peppers grown outside the basin was likely balanced by the exportation of dried fish and other lake products harvested from the basin lake by full-time fisherman. While the basin naturally lacks salt, obsidian, chert, and lime (goods used by all households in Protohistoric times), fish from the lake is the one good which certainly produced a surplus (Pollard 1993:113). The basin also lacks the natural resources to produce prestige goods necessary to maintain the elite political order (Gorenstein and Pollard 1983:90). Hence, markets did not facilitate the exportation of goods out of the basin, they primarily structured the importation of necessities (including prestige goods for elite circulation) to consumer populations. Like the lowland centers of the Classic Maya, Tarascan centers in the basin were primarily consumption centers; production within these centers was for local consumption, not an export market.

Many non-foodstuffs were not important market commodities due to their prestige value and restricted distribution, and were circulated through more controlled government agencies. Utilitarian goods (i.e., baskets, mats, and ceramics) were crafted from materials readily available in the basin. These were not state controlled and flowed out of the basin, balancing the heavy importation side of the economy (Gorenstein and Pollard 1983:108-110). Copper and bronze alloyed objects, including bells, needles, tweezers, and ax monies produced within the Tarascan borders, were exported throughout Mesoamerica (Hostler and Macfarlane 1996).

The state maintained a highly structured system of usufruct rights, including access to agricultural lands and also lands for hunting, fishing, cutting lumber, and
mining ore. These resources could only be exploited by grant from the king, who owned all land and probably every other productive resource within his kingdom. Long-distance merchants could only operate with permission of the king. The use of lands without royal authorization was punishable by death in some instances (Pollard 1993:125). The Relación de Michoacán [RM 1956:12] states that “neglecting the king’s fields” or “damaging the maguey” were also punishable by death (Gorenstein and Pollard 1983:102; Pollard 1993:118).

“Viewed functionally, it was an administered economy that was created and sustained by the administrative system and more subject to political manipulation than economic fluctuation.” (Gorenstein and Pollard 1983:111)

**Tarascan/Aztec Trade**

Tarascan elites used exotic high order goods originating in Aztec territory, such as jade, onyx, serpentine, pyrite, and copal (Pollard 2000:73, 80). Trade in goods flowing across the border separating the Tarascan and Aztec states was conducted at border settlements, especially the fortress center of Taximaroa (Gorenstein 1985). Such trade was conducted either directly through state-sponsored long-distant merchants or facilitated through Matlatzinca or Otomí traders (Pollard 2000:73). Pollard suggests that these state-sponsored long-distance merchants replaced non-Tarascan merchants as the state secured its borders and tributaries (Pollard 2000:80). Throughout all time periods (Classic through Late Postclassic) small quantities of green obsidian (Pachuca or Penajamo) from outside Michoacán must have been supplied by long-distance merchants (Pollard 2000:79; Pollard and Vogel 1994), especially during the Protohistoric period, given the closed-border situation.
Obsidian

For the area controlled by the Tarascan state, obsidian is one of the few materials that has been subjected to precise provenience analysis through compositional sourcing (Pollard et al. 1999; Pollard and Vogel 1994). Obsidian does not appear on any known Tarascan tribute list and is not mentioned as a tribute item in any ethnographic sources (Pollard 1993:115-116; 2000:77). Within the Aztec state, obsidian was likely a utilitarian item “considered a non-elite, ordinary material” (Isaac 1986b:322-323, 326). Although not particularly talked about as a commodity in the ethnohistoric literature from the contact period, obsidian must have been acquired through state tribute or marketplace exchange by the Aztecs.

Obsidian is suspiciously absent from the Aztec period tribute lists the Matricúla de Tributos and the Codex Mendoza. Noting the absence of utilitarian provisions for the maintenance of state offices and estates, Isaac (1986b) suspects that these are exclusively sumptuary tribute lists, not complete lists of all required tribute. Obsidian did flow as tribute in some cases (i.e., as manufactured weapons during wartime support calls), even if it is difficult to reconstruct obsidian tribute from the various vague references encountered in the existing ethnohistoric corpus. Bernal Díaz del Castillo (1928:300), The Anonymous Conqueror (1858:394), and Bernadino de Sáhagún (1959[Book 9]:69-97) all make brief reference to obsidian vendors in the market at Tlatelolco. These references attest to the presence of obsidian vendors splitting flakes or blades directly from cores in the marketplace, but do not directly address the number of vendors or the volume of obsidian moved through marketplace exchange (Isaac 1986a:319-321).

“I infer that the obsidian vendors were not an especially prominent feature of the Tlatelolco marketplace. We need not jump to the conclusion that low visibility meant low importance of the product or small volume of sales, however.” (Isaac 1986b:320)

As a utilitarian item used by all households in pre-Columbian central Mexico, obsidian likely flowed through different networks: tribute, long-distance trade, state-
sponsored agencies, and marketplace exchange. In the absence of concrete information from ethnohistoric documents concerning the procurement, reduction, and distribution of obsidian, compositional sourcing provides a means of evaluating obsidian distribution patterns. Nearly 400 obsidian artifacts from Tzintzuntzan were subjected to XRF sourcing in 1987 (Pollard and Vogel 1994). Ninety-four percent of the grey-black obsidians were sourced to the Zinapécuaro-Ucareo source zone. The remaining 6% is represented by red or clear obsidian from the Zinaparo source or green obsidian from the Pachuca or Penajamo sources outside the Tarascan borders. These specimens must have been acquired through state-sponsored merchants, given the lack of free commerce over the Tarascan-Aztec border (Pollard 2000:77).

In 1997, 198 obsidian artifacts from the Pátzcuaro Basin were sourced through INAA (Pollard et al. 1999). These were collected from various sites in the basin with occupations dating from the Classic to the Late Postclassic periods. For nearly all time periods 50-90% of the tested assemblages were sourced to Cerro Varal (Zinaparo). Generally, there is an increase in prismatic blades (and blade cores) in proportion to flakes blades in the obsidian assemblages following the emergence of the Tarascan state; the majority of prismatic blades source to Ucareo. Ucareo obsidian is dominant in the assemblages from Tzintzuntzan (and Urichu to a lesser degree) but not from the second largest basin center of Pareo or more peripheral Xarácuaro. Zinaparo obsidian is dominant in Late Postclassic occupation levels at Xarácuaro. The dominance of Ucareo obsidian in the collections recovered from the Tarascan capital of Tzintzuntzan is not replicated at other elite settlements, even during the Late Postclassic (Pollard 2000).

Pollard interprets this situation to indicate centralized control of the Ucareo source, or control of the circulation of the products from this source, by the royal family at Tzintzuntzan (Pollard 2000:79). The distribution pattern for obsidian from the Zinaparo source (including Cerro Varal and Cerro Zinaparo), dominant at Xarácuaro, implies market exchange while Tzinztuntzan’s obsidian supply was insured by direct state control over the Ucareo source (Pollard 2000:79). Again, Tzintzuntzan emerges as
primarily a consumption center more so than a production or redistribution center. Furthermore, the distribution of obsidian from different sources suggests that marketplace exchange was more of a local phenomenon, not an integrated polity-wide system.

“Thus, obsidian procurement under the Tarascan empire was a complex combination of market exchange, state control of provisioning elites and the capital, and state long-distance merchants’ exchange with foreign merchants at the borders of their territory.” (Pollard 2000:80)

**Marketplace Exchange and the Market System in the Tarascan State**

It is clear that the market system of the Tarascan state cannot be explained with reference to the modern market system. The Spaniards immediately began changing the market system, especially with regard to relocating the administrative capital from Tzintzuntzan to Pátzcuaro in 1541 (Gorenstein and Pollard 1983:39-41). As the capital and primate center of the region in pre-Columbian times, Tzintzuntzan serviced the largest portion of the Pátzcuaro basin population. Pollard has reconstructed the number of settlements and people serviced by the three major marketplaces in Protohistoric times (1980, 1993; Gorenstein and Pollard 1983) (Table 10.4.1).

Table 10.4.1 – Tarascan Protohistoric market structure (after Pollard 1993: Table 3.5).

<table>
<thead>
<tr>
<th>Market</th>
<th>Number of Settlements</th>
<th>Population Served</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tzintzuntzan</td>
<td>51</td>
<td>55,230</td>
</tr>
<tr>
<td>Pareo</td>
<td>49</td>
<td>32,820</td>
</tr>
<tr>
<td>Asajo</td>
<td>13</td>
<td>13,655</td>
</tr>
</tbody>
</table>

With the highest overall populations, concentrations of resident elites, and lake transport, Tzintzuntzan and Pareo grew into the two largest markets in the basin. Smaller Asajo, located in a more isolated mountain valley location, still had a major marketplace and all settlements in the valley would have had some access to lower level local
marketplaces (Pollard 1993:80-81; 2000:77). Other marketplaces situated within centers are mentioned in the Relación de Michoacán at Uruapan, Naranjal, and Asajo (RM 1956:114, 121, 92); Uruapan and Naranjal were less densely populated ‘peripheral’ centers (Gorenstein and Pollard 1983:40). There is no direct evidence for the location of the marketplace at Tzintzuntzan although Pollard believes that the logical location (based in her reading of maps) would have been adjacent to the lakeshore, accessible to canoe traffic (Pollard 1993:51). Although there is no information concerning the periodicity of these markets, Pollard suspects that the marketplace at Tzintzuntzan was probably daily (Pollard 1993:80). Twice in the RM (1956:246, 223) it is reported that the market at Tzinzuntzan was closed by royal decree; once for the death of a Tarascan king and once when the Spaniards arrived (Gorenstein and Pollard 1983:38, 100).

“The primary mechanism for the exchange of goods and services within the basin was by means of barter at the three marketplaces that serviced the Pátzcuaro Basin. Given the high degree of urbanization and the variability of local resources, markets provided many of the basic commodities used in Tarascan households.” (Pollard 1993:80)

Foodstuffs and utilitarian items available to commoner residents through marketplace exchange were provided to elites and the army through tribute and government agencies or by regulated production on government lands or through usufruct rights (Gorenstein and Pollard 1983:104, Table 12). There were also local and regional markets, although a lack of archaeology in the region and sparse attention to sourcing raw materials and artifact classes leave the mechanisms of distribution largely unknown (Pollard 2000:77). Without knowledge of the distribution patterns for specific artifact classes, it is difficult to evaluate the efficiency of the market system.

A marketplace is mentioned in the Relación de Michoacán at Uruapan (RM 1956:114) which also contains a painting of the Asajo marketplace (RM 1956:91, Fig 5.3) (Pollard 1993:113-114). At the Asajo market all sellers were women, mostly with baskets placed directly on the ground, without stalls or any permanent architecture, and spatially grouped by similar product. The RM gives some indication of what was
available at marketplaces in the Tarascan Empire. The eating of prepared food was common, as was begging for food in the marketplace. Maize grinding and even water porters are mentioned as available services. Specifically documented marketplace goods and services include maize, beans, chili peppers, amaranth, local fruit, ducks, local bird feathers, fish, cotton cloth and clothing, prepared food, medicinal plants, and household services (Pollard 1993:115-116). A multitude of other goods are presumed to have been distributed through the basin market system including various edible animals, pottery, and lithic tools. The marketplace was also the location for selling slaves, which were not acquired through war, but bartered for with blankets in the marketplace. This may be an indication of state involvement in the market and slaves may have been an important tributary item which fueled market activity (Gorenstein and Pollard 1983:98). The existence of marketplaces in the Protohistoric Tarascan state is undisputable. What is at issue is the quantitative importance of marketplace exchange within the overall economy and whether marketplaces were hierarchically ordered. It is also unknown to what degree tribute influx spurred marketplace activity and how marketplace exchange articulated with the tribute system, long-distance trade, and government agencies.

The Economy of the Aztec State

“In the Aztec economy three major distributive channels funneled luxuries from source to consumer: tribute, foreign trade, and marketplace exchange. The process was complex and sometimes enigmatic.” (Berdan 1983:177)

After defeating Azcapotzalco and other Tepanec cities within the basin, Tenochtitlan and Tetzcoco formed the Triple Alliance together with Tlacolpan, formerly a lesser Tepanec city. These three entities comprised the core of the Aztec state or empire, occupying the Basin of Mexico. There was a complex intermingling of territories from the very formation of the Triple Alliance with each of the three gaining control over communities in each of the other’s territory. Lands were given to relatives of the kings who held positions in the governing body or to distinguished warriors; their
heirs would be required to give military service. They may also have been given the rights to tribute from initially acquired lands. After the formation of the Triple Alliance each of the three members was free to undertake conquests on their own, although most conquests were undertaken as joint ventures of the united three. From the formation of the Triple Alliance the king of Tenochtitlan was designated the director of the imperial armies. Native rulers of subjugated areas were kept in place as a system of indirect rule and a tributary system was imposed over this structure. As a rule, distant incorporated provinces paid tribute to the empire as a unit and the tribute was shared by the three capitals, although it was first taken to Tenochtitlan before being divided among the three capital cities (Carrasco 1999:29-45). Once goods were delivered to the dominant capital of Tenochtitlan, they were divided among the three members of the Triple Alliance; Tenochtitlan and Texcoco each received 2/5th of the tribute while Tlacopan received 1/5th (Berdan 1982:36).

“In each of the three capital cities the king would govern his own domain directly and without interference, continuing an already existing political and dynastic organization. Each of the three kings kept under his rule a group of [lesser] kingdoms, each with its own dynastic and ethnic tradition. The king of Tenochtitlan ruled the Colhua-Mexica kingdoms, the king of Tetzcoco the Alcolhua-Chichimec kingdoms, and the king of Tlacopan the Tepenec kingdoms…Next this tripartite division was extended beyond the core area of the Basin. The three great kings decided that in all future conquests one of the three would be preeminent in one of three sectors of the Empire” (Carrasco 1999:29)

Tenochtitlan’s supremacy within the triple alliance gained strength under the reigns of its last two kings, Ahuitzotl and Moteuczoma II. During this period Tenochtitlan’s conquests in the southern sector of the basin expanded the primary capital’s control and increased tribute to Tenochtitlan. Under the reign of Nezahualcoyotl of Tetzcoco the rights to the chinampan tribute given by towns in the southern part of the basin was awarded to Tetzcoco. Tenochtitlan’s supremacy was cemented toward the end of the reign of Moctezuma II when Tetzcoco’s army, under the command of Nezahualpilli, was warring with Tlaxcala and was ambushed by forces under the command of Moteuczoma II, who subsequently used this incident to revoke the
chinampan tribute that Tetzcoco had been receiving since the formation of the Triple Alliance. When ambassadors for the Tetzcocan king protested to Moteuczoma II, he purportedly claimed that he was to rule as supreme ruler over the entire empire (Carrasco 1999:43). After Nezahualpilli’s death and the splitting of the Alcolhua kingdom ruled from Tetzcoco between the two brothers Cacama and Ixlitxochitl, the tripartite structure of the empire was failing (Carrasco 1999:45).

By 1519, the Triple Alliance was supported by tributary provinces providing sizable contributions from their own production of both luxury and subsistence goods; the bulk of this tribute burden fell on provincial commoners. These worked on state fields or calpulli lands cultivating the enormous quantities of foodstuffs required, delivered a portion of their craft goods if they were artisans, or expended a sizeable portion of their surplus purchasing needed tribute goods in local and regional marketplaces from professional traveling traders. Depending on the goods produced and the distance of the conquered province from the capital, tribute was collected annually, semi-annually, or quarterly (Berdan 1982:36-38).

“All in all, the annual revenue of the Aztec state through tribute must have been extraordinary. According to one annual tributary tally (the Matrícula de Tributos), the allied cities [Tenochtitlan, Texcoco, and Tlacolpan] received quantities such as the following: 214,400 cloaks, 647 warriors’ costumes, 100 bins of foodstuffs (maize and beans), 16,000 bales of cotton, 4800 wooden beams and an equal number of planks and pillars, 32,000 smoking canes, 28,800 gourd bowls, 3200 deerskins, 6400 bunches of quetzal feathers, and 240 gold discs.” (Berdan 1982:36)

Berdan demonstrates that among the Aztecs in central Mexico, tribute, foreign trade, and marketplace exchange coexisted within a multicentric economy (1977:91, 1982:15-44). The Aztec state was characterized by a complex tributary system which coexisted alongside long-distance exchange by professional merchants and a well-developed market system. All three of Polanyi's modes of exchange, reciprocity, redistribution, and marketplace exchange, coexisted and were differentially embedded in Aztec society (Earle and Ericson 1977; Polanyi 1957).
“A study of how empirical economies are instituted should start from the way in which the economy acquires unity and stability, that is the interdependence and recurrence of it parts. This is achieved through a combination of a very few patterns [reciprocity, redistribution, and market exchange], which may be called forms of integration. Since they occur side by side on different levels and in different sectors of the economy it may often be impossible to select one of them as dominant so that they could be employed for a classification of empirical economies as a whole.” (Polanyi 1968[1957]:148-149)

The continuing analysis of ethnohistoric documents has led to increasingly sophisticated models of the mature Aztec economy (e.g., Berdan 1975, 1982; Carrasco 1978; Hassig 1985; Hicks 1984; Santley 1986; M. Smith 1987). Nonetheless, questions persist concerning the degree of economic symbiosis among previously independent polities, the articulation of production with marketplace exchange, the overall structure and integration of the market system, and how tribute, long-distance trade, and marketplace exchange were integrated within the overall economy.

**Tribute**

“Warfare and military conquest were activities central to the Aztec way of life. With each successful conquest, the Aztecs gained territory, subjects, and economic resources. All of these were placed in the service of the conquerors through the institution of tribute…tribute refers specifically to revenue collected by a militarily dominant state from its conquered regions. The payment of tribute serves symbolically to express the dominance of one political entity over another, stimulates production of specific goods in conquered areas, provides revenues for the dominant state, and may also involve certain ‘contractual agreements’ such as the protection of the subjugated region from invasion by other groups.” (Berdan 1982:35)

Goods and services were extracted from previously independent polities within the immediate Basin of Mexico as well as incorporated provinces further away. Tribute was mandated in specific quantities of goods from different provinces although subject communities were often required to pay tribute in goods they did not produce themselves (Berdan 1982:36; Isaac 1986b:334). This was certainly facilitated by marketplace exchange, whether or not this practice was consciously devised to stimulate the market
system. For instance, Tlatelolco was charged with imperial tribute demands for war preparations, in food stuffs and in obsidian weaponry. The burden was largely placed on the market vendors who were taxed in order to fulfill these obligations (Isaac 1986b:341). Jade, copper, gold, and feathers, occurring naturally only at some distance from the Aztec core, came into the Valley of Mexico from provinces conquered in the later stages of the empire. The influx of exotic raw materials stimulated the production of luxury goods in the urban settings of the core of the state where a concentration of elites provided the demand to dispose of such luxury items (Berdan 1987:162). Some of these raw materials were also converted into manufactured goods in the form of strings of beads, labrets, ornaments, axes and bells, feather headdresses and entire costumes to meet specific tribute demands from the capital (Berdan 1987:163).

The state did impose sumptuary restrictions on the consumption of certain goods, interfering with the pure market principles of supply and demand. The Tenochean general Tlacaelel once appeared in the marketplace and decreed,

“Know now that the king, who is present, has willed that lip-plugs, golden garlands, many-colored feathers, ear-plugs, arm-bands, shields, weapons, insignia, mantles, and loin clothes are not to be bought in the market any longer by brave men. From now on the sovereign will deliver them as payment for memorable deeds, each one of you, when he goes to fight, must think he has journeyed to a market place where he will find precious stones. He who does not dare to go to war, even though he be the king’s son, from now on will be deprived of all things. He will have to wear the clothing of the common man. And in this way his cowardice, his weak heart, will be known by all. He will not wear cotton garments, he will not wear feathers, he will not receive flowers, like the great lords. He will not receive tobacco, he will not drink chocolate, he will not eat fine foods. He will be held in contempt as a man of low rank.” (Duran 1964:142, quoted in Blanton and Feinman 1984:676)

Although sumptuary law restricted the consumption of luxury items (Berdan 1982:26), Anawalt (1980) believes that sumptuary laws were not as strict as some have stated. Clearly the tribute and market systems were intertwined although the ethnographic documents suggest at what points they did not converge. Geographic
diversity in the highlands of central Mexico may have stimulated exchange between different ecological zones promoting interregional trade and marketing. This situation likely encouraged local commerce, in the marketplace, arising from long-distance trade among regions and contributing to the evolution of complex society (Parsons and Price 1977:166).

The tribute and long-distance trade systems were largely mutually exclusive; once tribute status was accepted by an incorporated province trade ceased (Chapman 1959:24; 1978:213). Tribute demands also do not account for the total volume of the luxury-goods trade within the state (Berdan 1987:178). Equally important as the amount of tribute collected through state institutions are the imported goods that were not covered by tribute demands. Although silver was present in the Tlatelolco marketplace the ethnographic documents do not indicate any tribute in silver, suggesting that this precious metal must have moved through non-tribute mechanisms (Berdan 1987:167, 177). The documented tribute demands for feathers likewise do not cover the quantity imported into the Aztec core, indicating that feathers must have moved through both tribute and non-tribute mechanisms (Berdan 1987:175). Professional long-distance merchants, the pochteca, are known to have traded widely within the borders of the Aztec Empire (Berdan 1975, 1977, 1978, 1980; Isacc 1986b:334).

**Pochtca**

“Known most commonly as pochteca or oztomeca, these full-time entrepreneurs and political agents were concentrated in the Valley of Mexico cities ringing Lake Texcoco. They operated at a high governmental and economic level and exhibited combined qualities of group independence and state dependence.” (Berdan 1986:283)

Pochtca did go to the edges of the empire to acquire raw materials and goods and also functioned as spies, so there was a political dimension to their occupation. Becoming a pochteca was not an option for most people and permission from the king
was required (Bittman and Sullivan 1978:213). Although the references are vague, the pochteca have also been implicated in the conquest of the southernmost Soconusco province (see Isaac 1986b:334-337). Even the highly commercially-oriented pochteca were evidently maximizing status over gains in wealth; they sponsored frequent banquets to dispose of their accumulated spoils of trade in a socially acceptable manner. Politically-enforced social rule limited the accumulation of wealth and, hence, accumulation for capital investment (Berdan 1986:293). Wealth acquired from long-distance trading was annually redistributed through festivities at the guild or ward level (Isaac 1986b:333). Banquets were also a means to redistribute the spoils of trade to warriors and nobles for good favor (Bittman and Sullivan 1978:214). Pochteca departed on long-distance trading ventures as ‘caravans’ of human porters carrying their goods, the goods of others from their ward, and perhaps the goods of others not prepared to make the trek. For protection they traveled in numbers and, in at least one instance, carried goods on behalf of the king (Berdan 1986:287; Sahagún 1950-1982, [Book 9]:14).

The 1600 Mantles

During the reign of Ahuitzotl (r. A.D. 1486 – 1502), not his successor Xocoytzin (r. A.D. 1502 – 1520), 1600 mantles were entrusted to a group of pochteca to be bartered on a major trading expedition (Isaac 1986b:332-334). The 1,600 *quachtli* (mantles or large white cotton cloaks) were distributed to a group of Tenochtitlan pochteca who split the goods with Tlatelolcan pochteca. These agents converted the mantles into higher priced goods in the marketplace, mostly decorated articles of clothing. In general, pochteca dealt in ‘high-order goods,’ those that were high in value and low in bulk. The journey was rough and long in proportion to the profits obtainable (Berdan 1987:180), hence, pochteca were much like professional long-distance traders from the Old World that operated on an even larger scale with the benefits of more advanced transportation, accounting, credit and banking institutions (see J. Bentley 1993; Bernstein 2008; Casson 1984).
Once the mantles were converted into valuable articles in the great central marketplace they were destined for exchange at the gulf coast port of trade at Xicalango (see Chapman 1957). The caravan of pochteca also traded with their own stock of merchandise and they departed with an armed escort provided by the king (Berdan 1983:174, 1986:286; Sahagún 1950-1982 [Book 9]). Although this is the only occasion mentioned in the ethnohistoric literature where the pochteca traded in the king’s goods, this practice may have been common.

“Political absorption generally followed the establishment of economic ties, and there was at least one instance when the emperor himself (and probably other nobles as well) converted tribute into trade goods for exchange by the pochteca abroad. I suspect that such behavior was fairly common, as does Frances Berdan (1982), but the ethnohistoric sources are not particularly helpful in this regard.” (Santley 1986:241).

Barry Isaac (1986b:334) wonders if this singular act is representative of procedure throughout Aztec times. Bittman and Sullivan (1978:211) believe that marketplace exchange developed in the Aztec core, followed by increasing caravan trade to distant regions, a view congruent with Pollard’s assessment of marketplace development within the Tarascan state. Viewing trade as a prelude to tribute, Bittman and Sullivan (1978) see an uneasy power struggle between the central government and the professional merchants. They generally posit increasing state control of foreign trade, suspecting that Moctezuma II would have instated total centralized control over trade if not interrupted by the Spanish conquest. They propose that Moctezoma II was interested in a state monopoly over long-distance trade paralleling the institutional arrangement that Inca Yupanqui made for the Inkas (Bittman and Sullivan 1978:214).

After the Spanish conquest of the Aztecs, pochteca continued to trade without centralized support, acting as itinerant peddlers writ large (Berdan 1986:297). Although they may have continued for a short time after conquest under license from the Spanish (Gibson 1964:359), they were soon replaced by Spanish trading firms. I imagine that
these Spanish trading firms made use of pochteca with the knowledge of trade routes, languages, customs etc.

Regional Merchants and Markets

“The central Mexican marketplace, or tianquiztli, was probably the liveliest spot of any community. There people from all walks of life congregated daily, or at least every fifth day, to enjoy the company of friends, the haggling over the prices of maize or cloaks, and the latest news and rumors of the region. The marketplace, whether large or small, was an outdoor affair. In the larger communities and cities it may have been surrounded by arcades and shadowed by an imposing temple; in the rural villages it may have been a centrally located plaza – relatively quiet and peaceful for four days, wakening as a noisy, bustling, colorful scene on the fifth.” (Berdan 1982:41)

High-order goods, not known from any tribute list but the kind usually trafficked by pochteca, were to be found in the periodic market at Tepeacac. The presence of luxury-goods here may be attributable to a “borderland markets” phenomenon (Berdan 1985; 1986:287). Tepeacac was situated near the border between Tlaxcala and Huexotzinco, two habitually warring polities – against one another, the Triple Alliance, and Cholula (Berdan 1983:177). While the pochteca generally trafficked in long-distance high-order goods and raw materials, regional merchants dealt in more mundane goods (see Hassig 1985). At the Tlatelolco market, regional merchants exchanged cacao, maize, amaranth, chilis, tortillas, wheat29, sandals, cotton, palm fiber cloaks, painted gourd bowls, cane baskets, turkeys, and salt (Sahagún 1950-1982 [Book 10]:65-94). Cacao, maize, chili, cotton, and gourd bowls were regional specialized products indicating a degree of middle-trader activity (Berdan 1986:289). Other vendors exchanged household surplus on a part-time basis.

“It was the small surpluses from individual household production that added so much to the color and variety of the Aztec-period marketplace…On an uncommon basis they may have dealt in an occasional luxury item…Their attention, however, was most often focused on subsistence products, which could be

29 Wheat is the only item on the list representing a Spanish-introduced good.
more readily bought and sold in the marketplace than if procured otherwise. Trade by these vendors served to supply the innumerable households with essential goods on a daily (or 5-daily) basis.” (Berdan 1986:289)

After the Spanish assumed control, the small vendor was still prominent in the marketplace, even if the goods exchanged were influenced by changes instituted by the Spanish. After the Spanish conquest traditional indigenous wealth items were no longer used prominently in displays of rank. With a change in the social system came a shift in the focus of trade and marketing; the small-scale producer-seller was least affected by the Spanish conquest (Berdan 1986:294-298). Cacao was used as an exchange medium through the Colonial period (Thompson 1956), although tribute demands in Spanish coin led to increased marketplace exchange for currency. Cotton cloaks ceased being used as exchange media in the core of the empire, but were still viable exchange goods for longer in peripheral areas (Berdan 1986:297). Nonetheless, much exchange was always conducted by direct barter (Hicks 1994:101).

Craft Production

“Craft production may be divided into elite and utilitarian industries (Brumfiel, 1986). The former, which included featherworking, lapidary art, and metalworking, were carried out by full-time specialists attached to noble residences (Berdan, 1982: 26-29). Utilitarian crafts, including pottery, stoneworking, and basketry, are rarely mentioned in the ethnohistoric literature, although Sahagun's data (1950-60, Book 10) suggest that these were produced at the household level. Textile production, both cotton and maguey, stands apart from other crafts in both economic importance and the amount of ethnohistoric documentation. Spinning and weaving were required of all women, noble and commoner, and woven textiles served as exchange media as well as clothing; they were the most important type of non-food tribute at all levels of the tribute hierarchy (Berdan, 1982).” (M. Smith 1987:240)

The domestic mode of production (Sahlins 1972) makes effective use of time from all household members (Netting 1990:39-41). No special workshops were needed for cotton cloth production; a household cottage industry in which the raw materials were supplied by the state and the final products collected to supply the state with large
quantities of cotton clothing (Hicks 1994:95). Nonetheless, larger estates may have had more attached female weavers, and the king’s estate may have had Inka-style textile workshops (Diaz 1968:276); other temple or cult institutions may also have had larger numbers of attached weavers (Motolinia 1941:61). Large landholdings were gifted bases on noble status of the lineage in accord with their functioning within the political system (P. Carrasco 1978:25, 1983:71) and largely removed from the market economy (Hicks 1994:102). Weaving was not a common activity outside the household, and appears to have been considered a domestic chore, whatever the size of the household (Hicks 1994:94-96).

“That cloth was both one of the main commodities that functioned as a medium of marketplace exchange and a common item of tribute implies that the nobles, who received so much cloth, were among the major patrons of the markets. This should not be surprising; the rich ought to be able to buy more than the poor. But it reminds us that the markets of ancient Mexico may have had more in common with upscale department stores than with the peasant markets of Middle America today.” (Hicks 1994:104)

Hicks (1994) equates the high volume of cloth consumption with part-time household production, not with full-time specialized production. Because of the time involved in the production of cloth under a non-mechanized mode of production, all households participated as part-time specialists. Larger elite households would have produced more of their own cloth and have had greater purchasing power in the marketplace.

**Differential Production and Community Specialization**

There are two competing models of the development of community specialization in subject communities after incorporation into the Aztec political sphere: previously autonomous city-states either maintained their existing internal production and distribution systems or they shifted away from craft production toward agricultural intensification (Charlton et al. 2007:239). Brumfiel has argued that the Basin of Mexico subject communities of Huexotla (1980) and Xico (1986) followed the second path,
intensifying agricultural production at the expense of craft production. Charlton et al. (2007) have demonstrated that the incorporated community of Otumba had the most and greatest variety of craft workshops of any Aztec city-state investigated to date. Late Aztec period Otumba saw an increase in both craft production and agricultural intensification [floodwater irrigation] (Charlton et al. 2007:264). Evidently various city-states responded differently to Aztec political domination. Charlton et al. (2007) suggest a general model of city-state self-sufficiency for Otumba under Aztec rule with increasing importation through a developing market system; by the Late Aztec period Otumba was a bustling commercial center.

Ceramics were just one portion of the household-level craftwork industry at Aztec period Otumba. Although no kilns or firing areas have been recovered, evidence suggests that households were sparsely dispersed and highly self-sufficient through household production during the Early Aztec period. At one household, pottery production appears to have been of low intensity and infrequent, possibly for household consumption exclusively (Charlton et al. 2007:244-245). The majority of archaeological evidence suggests household-level production of obsidian [core/blade or biface production], lapidary work, and fired clay vessels and objects [such as figurines, spindle whorls, musical instruments, pipes, stamps, and ear spools]. Only fired clay and fiber processing appear to have been organized beyond simple household-level production at Otumba during Late Aztec times (Charlton et al. 2007:243).

The “clay workers’ barrio” was first identified by William Mather (1968) from heavy surface concentrations of figurines and mold fragments. Subsequent excavations produced ceramic items and molds as well as ceramic vessel concentrations, wasters, and molds. Evidently ceramic vessels, figurines, and other molded items were all produced by the same production unit that was not highly specialized in terms of the manufacture of a narrow range of products. There was an increase over time in the variety of clay objects produced (i.e., a higher diversity). Ceramic production was conglomerated in a barrio, possibly indicative of calpulli organization (Charlton et al. 2007:243, 246, 259).
A second ceramic production loci was found segregated within the southwestern portion of the center, where the producers of long-handled incense burners congregated in a sort of barrio “attached in some manner to the elite households in the southwestern site core” (Charlton et al. 2007:246). A compositional provenience analysis utilizing INAA has helped to sort out the distribution patterns of ceramics manufactured at Otumba. Late Aztec long-handled incense burners (*sahumadores*) appear to radiate out from Otumba into the Teotihuacán Valley, although these have been recovered alongside specimens not produced at Otumba (Charlton et al. 2007:260-261). The relative percentages and distribution patterns of these artifacts suggest that separate manufacturing and distribution systems were centered on the city-states of Otumba, Tepeapulco, Tulancingo, and possibly Tenochtitlan. Figurines produced at Otumba have been found to the northeast at Tepeapulco, but generally speaking, Early and Late Aztec ceramic production at Otumba was directed toward fulfilling the consumption needs of the immediate Teotihuacán Valley.

Early Aztec Red ware and Black-on-Orange ware were primarily produced and distributed locally throughout the Otumba city-state although some specimens recovered were made from clay sources outside the Teotihuacán Valley (Charlton et al. 2007:259). During Late Aztec period local production and exchange of Late Aztec Red Ware was still predominant, complemented by small amounts of non-local product from a variety of different compositional reference groups from other city-states of the basin.

“This pattern suggests the lack of complete integration of the Teotihuacan Valley into a Basin-wide marketing system distributing Red Wares.” (Charlton et al. 2007:260)

These findings mirrors the results of Hodge et al’s (1993) INAA provenience study of Aztec ceramics which indicated that Black-on-Orange ware was produced in a number of different centers and not produced or circulated primarily from Tenochtitlan. Hodge et al. (1993) also found some overlap in exchange networks, but were surprised that more interregional trade was not in evidence.
Late Aztec Black-on-Orange consumption/distribution patterns in the Teotihuacán Valley evidence a greater mixture of compositional reference groups. Black-on-Orange ware in a variety of paste classes in the Teotihuacan Valley suggests that a lack of production was augmented by some importation to meet consumer demand (Charlton et al. 2007:262).

“We have suggested that these wares were distributed through integrated Basin wide market systems and that production may have been by full-time specialists in a workshop setting rather than by part-time potters within a household context.” (Charlton et al. 2007:260)

With the expansion of the Aztec state the Basin-wide market system partially enveloped the local solar market system centered on Otumba allowing for the movement of some goods between the two partially-integrated systems (Charlton et al. 2007:265). Charlton et al.’s suggestion that Black-on-Orange ceramics were produced by full-time specialists working in workshops is difficult to evaluate. No archaeological evidence of non-domestic workshops has been found, and the ceramics themselves have not been evaluated in terms of standardization measures reflecting a very high-degree of standardization indicative of full-time production.

Formal Modeling of the Aztec Market System

Michael E. Smith (1979b) evaluated the Aztec economy in terms of Central Place Theory, concluding that the spatial distribution of centers in the Basin of Mexico reflected the development of complex marketing institutions. Confident that ethnohistoric documentation of commercial structures in the Basin of Mexico during Aztec times permitted the evaluation of the regional settlement pattern in terms of complex regional peasant marketing systems (e.g., G. W. Skinner 1964; C. Smith 1974, 1976), he concluded that “the Valley of Mexico under the Aztecs exhibited not only peasant marketplaces but an integrated regional marketing system” (M. Smith 1979b:112). Marketplace exchange within individual centers of the Aztec empire is
documented in various ethnohistoric sources. The degree to which previously autonomous centers became more economically interconnected through a basin-wide system of hierarchically ordered marketplaces has not been firmly established. M. Smith noted two major problems with the application of CPT to prehistoric data, the first being the presence of a market economy. I assert that he never made an argument for the presence of a market economy in the region in Aztec or any other times; the presence of a market economy seems to rest on the presence of large marketplaces at major administrative centers.

“The second basic difficulty in applying CPT to prehistoric societies is that a fundamental aspect of central place methodology is the construction of a hierarchy of market centers, based on the number and types of goods and services offered (Marshall 1969:50ff; Crissman 1972, 1973, 1976; Johnson 1977:465); this is almost impossible to do using archaeological data alone.” (M. Smith 1979b:113)

Turning to the highly abstract Central Place model in order to confirm the hierarchically arranged market system, M. Smith relied on the theoretical grounds that regularly spaced market centers reflected the dominance of unspecified economic forces. Susan T. Evans objected to M. Smith’s use of CPT in support of an integrated marketing system, preferring to view this settlement hierarchy as a function of political integration with state administered economic organization based in the political control of land and labor, implying that redistribution was more important than profit maximization (1980:869). In short, Evans sees political control as the dominant factor influencing the observed distribution of centers (as Pollock does for the Tarascan centers), while M. Smith interprets this pattern as a reflection of economic integration. Ian Hodder (1972) expressed his reservations with the application of location theory to archaeological contexts for precisely this reason. He was concerned that settlement patterns appropriating the expectations of Central Place Theory would be taken as proof of unspecified economic forces and would discourage the exploration of competing explanatory factors. Discussing the distribution of lowland British walled towns in the third and fourth centuries A.D., Ian Hodder pointed out that excavation had revealed the presence of ‘market places’ or rows of street shops in some of these town, but
administrative functions were also supported by the presence of basilica and other governmental buildings.

M. Smith (1979b:117, 122) chose to compare the spacing of centers in the Basin of Mexico to the K=3 ‘market principle’ over the K=4 ‘transport principle’ based on urban food needs at the capital of Tenochtitlan. However, Evans (1980:871) feels that the transport principle may be more important given the Tenochtitlan’s central position within a system of long-distance trade and tribute, as well as waterborne access to chinampa agricultural production. Evans also considered the K=7 ‘administrative principle.’

“Smith does not consider this variant [K=7] of the central place model in his analysis. However, the assumptions underlying the pattern are met by the generally accepted reconstructions of the segmentary sociopolitical organization in the Basin of Mexico during the Late Horizon. Tenochtitlan’s relations with Texcoco are better understood from the perspective of politics, as allied capitals of systems of tribute-paying city-states, than from that of their hypothesized economic interactions as sites of marketplaces.” (Evans 1980:873)

In general, this discussion was based in two different reconstructions of Aztec society, and did not actually rely on CPT modeling to distinguish different forms of economic integration. Basic assumptions regarding the Aztec economy were placed before any CPT analysis; the debate rested more on the interpretation of archaeology and ethnohistory, not in the formulation of CPT diagrams. Indeed, invoking the CPT diagram in order to ‘prove’ the integrating power of economic interaction did not strengthen M. Smith’s argument. As he pointed out himself, different authors interpret the evidence differently.

“I will simply point out that two noted authorities, considering the same data base (and published in the same book) reach very different conclusions on the role of the state in controlling the Aztec economy. Carrasco (1978:23) states that ‘the most important characteristic of the economy of ancient Mexico was the fact that it was an economy directed and regulated by the political organization,’ while Calnek (1978:112) concludes that ‘the evidence of direct state intervention in the primary processes of
production and distribution is, in large part, negative’ {author’s (Smith’s) translation}. Clearly more research is needed in this area before conclusions can be drawn.” (M. Smith 1980:878)

M. Smith lists several criteria supporting the supposition that markets were integrated into a single system. These are itinerant merchants traveling from market to market (open to interpretations – as he noted himself [1979b:111-112]), staggered or ‘ring’ markets, community specialization, a decline in warfare during unification before the Spanish conquest, and ease of water transport. He also notes that economic factors were not the sole variable influencing the settlement pattern, just the dominant motivation and the CPT model fits the data and provides a baseline to evaluate other influences (1979b:120). Of course, political alliance can be taken as the base line and economic factors judged against that.

Santley’s (1986) network analysis of the Aztec road system convinced him that the core of the mature Aztec empire was organized as a dendritic system, and not a complex interlocking market system, as M. Smith (1979b) had hypothesized.

“This characterization of regional politico-economic structure agrees quite closely with the results of recent ethnohistoric research, which suggests that the Aztec economy was highly administered and not governed by commercial factors.” (Santley 1986:242)

Discussing the applicability of Central Place modeling using archaeological and ethnohistoric data, Isaac (1986a:3-9) makes several valid points. First and foremost, the theory, as formulated by Christaller (1966[1933]) was never meant to accommodate the analysis of non-commercial societies, although Christaller did mention that certain market system configurations (i.e., K=7, K=n) would arise from differing economic organizations; “to deal with this question is, however, not the task of this work” (Christaller 1966[1933]:135 quoted in Isaac 1986a:5). The major theme of Christaller’s (and Lösch’s) work was the analysis of highly commercialized societies, not pre-Columbian centers of the New World. Thus the analysis of Aztec economic organization
is dependent upon one’s personal view of the relative importance of long-distance trade, market exchange, tribute, and redistribution.

“I mention the presumably ‘tributary mode of production’ [after Wolf 1982:79-88] because I want to stress a feature of classic CP theory that seems to be underappreciated in anthropology, namely, its wholesale incorporation of turn-of-the-century, free-enterprise economics. Said differently, classic CP theory presents an idealized schema of settlement arrangement under conditions of laissez faire capitalism – or, in Christaller’s (1966:134) words, ‘freedom of supply, freedom of consumption, and free mobility.’” (Isaac 1986a:4)

I do not believe that the (perhaps rigid) assumptions of classic CPT are met by the Aztec Empire case study, or any other pre-Columbian society. It may be argued that CPT spatial arrangements did arise in the networks of pre-Columbian settlements for similar or different reasons than those predicted by CPT; however, this has not been vigorously argued. The spatial patterning of pre-Columbian centers has been argued to conform to classic CPT models because of economic conditions similar to those of the Old World Western societies for which the theory was developed to analyze. In this respect, it does seem that the settlement patterns of pre-Columbian apples are being compared to the expected settlement patterns for Western oranges predicted by CPT.

11.2 – Marketplace Exchange within Dominantly Redistributive Economies

The Case of Dahomey

Dahomey was a sub-Saharan African inland kingdom of some 300,000 persons founded ca. A.D. 1625 and conquered by the French in 1892 (R. Arnold 1957a:155). The first king of Dahomey, Tacoodonou established his royal residence at the usurped capital of Abomey. During the reign of his grandson, Agaja (aka Guadja Trudo), who took the throne in 1708, the maritime states of Whydah and Allada (aka Ardra) were incorporated into the Dahomey kingdom in order to control trade passing from the
interior of the continent to these coastal trade ports (Dalzel 1967[1793]:2; M’Leod 1971 [1820]:13). The kingdom of Dahomey was a crucial player in the transatlantic slave trade, although the country “was a passive trader, maintaining, herself, no organization for active trade over long-distances” (R. Arnold 1957a:157 see also Akinjogbin 1967).

“Slaves were elite goods, moreover, and their movements were restricted on this account as well. In principle, all slaves belonged to the king, as was the case with all property in Dahomey, and the king’s subjects held slaves only by his leave. To own slaves was a privilege limited to persons of rank, and to trade in slaves was a prerogative of status, ‘license to trade’ being in effect contingent upon receiving an endowment in slaves from the hands of the king. As elite goods, slaves carried high political significance. Dahomey paid tribute in slaves to the king of Oyo, and slaves were frequently presented by the king of Dahomey to visiting foreign emissaries as a matter of diplomatic etiquette, as well as to the nobles of his own court.” (R. Arnold 1957a:171-172)

Trade at Whydah 30 was under supervision of the king of Dahomey and was mainly restricted to trade in elite items. Sumptuary law forbade trade and ownership of powder and guns as well as symbols of authority, such as foreign cloth, umbrellas, shoes, chairs, and other things that circulated only in elite spheres, largely as gifts from the king of Dahomey as markers of political authority (R. Arnold 1957a:173). Slaves were a valuable elite commodity used in tribute payment, international trade, as political gifts, and as labor on landed estates. While caboceers (local chiefs) did retain some of the slaves directly captured during annual war raids, these were monitored and taxed by the king of Dahomey personally (R. Arnold 1957a:172).

“As the reader may have noted in [A Port of Trade: Whydah on the Guinea Coast (Arnold 1957a)], we had no need to refer to markets in order to explain the conduct of trade. From start to finish, the trading operation is an affair of state, administered from the palace, and conducted by the dignitaries of the land under terms of treaty. The presence or absence of market[place]s makes no difference to the trading operations described there. That a market[place] exists in the port of trade itself is, then, striking confirmation of the independence of trade from market[place].” (R. Arnold 1957b:177)

30 To avoid confusion, I use the term Whydah here in reference to the actual port controlled by the polity of Whydah. Whydah is the name used in much of the literature to refer to the polity of Whydah, the capital center of the polity, and the coastal trade port controlled by this polity.
The Dahomean economy, in fact, all of Dahomean society, ran on known equivalencies. There were the customary equivalencies of bride-price, religious or ritual specialists’ fees, and, “the precisely calculated gift exchanges between kin groups at funerals” (Polanyi 1968[1966]:225). There were also set equivalencies decreed by the Dahomean king for both imported goods and exchanges in the marketplace. Royal proclamation set the maximum price that a trader should pay for slaves and even the king himself bought at this rate (Dalzel 1967[1793]:34-35, 213). In the days of the Aladaxonu dynasty (ca. A.D. 1625 – 1892) the economy ran on a yearly cycle and two principle events provided the major economic stimulus: the annual war raid and the Annual Customs ceremonies. The King was the central agent in both of these affairs. The annual war raid brought in slaves for labor and for sale (to the king); the annual customs was a time for the collection and redistribution of wealth in which the king publicly acknowledged his most prominent supporters and, in fact, all of Dahomean society.

After the harvest season, war preparations were made through the collection and distribution of war materials and some foodstuffs. A large militia, including slaves, was organized into groups of 10 to 100 individuals and led by Ahwangan, or war chiefs. These militia patrols followed the standing army of professional female warriors into battle beyond the borders of the Dahomey polity. The Annual Customs was held each year following the return of the Dahomean army from these military ventures. A great variety of goods were collected at the Annual Customs, from lavish gifts to manufactured goods to slaves. The majority of collections and distributions of goods into and out of the king’s hands were made publicly at this national event. Foreign traders and businessmen contributed a considerable amount of goods to the king, as did native administrators. The entire event was staged for optimal presentation value and individuals of prominent standing were expected to present themselves to the king in person on this all-important occasion.
“The Annual Customs was the major event of the economic cycle. In terms of gross national product and foreign import, as well as popular participation, it was an economic institution of unique proportions. The king himself was the central actor in an assembly of all the personages, administrators, and office holders of the land, in which literally every family was represented at least by one member for part of the time. In a day-long performance the king received gifts, payments, and tributes, subsequently distributing a part of this wealth as gifts to the crowd…During the festivities, which continued for weeks at Abomey, the king himself made disbursements to the population. As many as thirty or forty thousand people might be present. On the platform erected for the king and members of his court, cowries, rum, cloths, and other fine goods were heaped up to be scattered among the crowds by the king or the dignitaries of the court day after day as the ceremonies continued.” (Polanyi 1968 [1966]:207-208, 210)

The scheduling of the Annual Customs, following the annual war season, ensured a controlled redistribution of slave labor, a key element in the social and economic systems of the Dahomey Kingdom. Every important official, including the king, kept a plantation and the state was extremely careful to monitor the primary production system throughout the history of the kingdom. While different regions produced different crops, all were expressly required to be under cultivation by local inhabitants, augmented by slave populations. Human sacrifice was practiced on a vast scale, and considered of utmost importance in maintaining cosmic harmony. As Captain Sir Richard F. Burton (1864) reported,

“Human sacrifice in Dahomey is founded on a purely religious basis. It is a touching instance of the king’s final piety, deplorably mistaken, but perfectly sincere. The Dahomean sovereign must…enter deadland with royal state, accompanied by a ghostly court…This is the object of what we have called the ‘Grand Customs.’” (quoted in Polanyi 1968[1966]:209)

Hence, the Annual Customs, as an all-important event of community solidarity and reaffirmation, involved the sacrifice of large numbers of captives in the name of the ancestral spirits and of those lost in war. In this respect, the king was again the central figure, acting as supreme mediator between the living and the dead. Accordingly, slaves were annually captured and distributed in a fashion which insured adequate agricultural labor, a continued supply of war militia for the perpetuation of this economic system, and a sacrificial pool for the ritual maintenance of society and the cosmos.
“A meticulous disposition was made of captives taken in battle. After setting aside a sufficient contingent for sacrifices to the ancestors, a number of captives were set apart, corresponding exactly to the Dahomeans lost on the field of battle. These were eventually distributed to the royal plantations to replace the losses. The balance of the captives were divided into three parts: one part going to the king for his household; a second to be sold by the king as slaves; and the third to be distributed among the warriors and chiefs as a reward for valor.” (Polanyi 1968 [1966]:212)

Administered Economy

Administration of the agrarian economy in Dahomey was strict, and officials carefully monitored the balanced production of various crops. The chief export crop, palm oil, was state regulated as were subsistence crops and even pig stocks. State bans on the sale of crops, or even pigs were common as an institutional measure for adequate supplies to the homeland. Salt workers at the coastal port of Whydah were directly monitored by specific court appointed ‘salt-officials,’ even though it was lightly taxed and royal decree stated that salt had to be sold to anyone who needed it. Private production of honey or ginger was prohibited. Growing pepper or groundnuts was limited to personal use, except in certain districts producing for the market under state supervision and taxed in cowrie shells. The cultivation of cash crops such as coffee, sugar cane, rice, and tobacco was banned in Whydah (Polanyi 1968[1966]:214-215), where the accumulation of such goods in bulk might lead to profiteering and an acquisition of wealth in the conquered trade port.

Production of staples was a major concern of the state and entrepreneurial market exchange was discouraged in favor of redistribution through state institutions. An elaborate census apparatus was in place, and royal palace officials occupied themselves for most of the year keeping economic records in preparation for the Annual Customs. Records were kept of populations, including numbers of workers within different occupational categories: cultivators, weavers, potters, hunters, salt-workers, porters, blacksmiths, and also slaves (Polanyi 1968[1966]:216). External trade with Europeans
was conducted as administered trade by the central government (R. Arnold 1957a, 1957b; Polanyi 1966).

“For Dahomey, then, war and trade were not commercial activities but conditions for survival. It is only in these terms that the economy and the society becomes intelligible. To misread war and trade as commercial activities is to distort beyond recognition the organs and techniques which Dahomey developed to cope with the conditions of existence imposed by its environment.” (R. Arnold:1957a:162)

Agricultural products were taxed on a village by village basis, with help of the census records. Assistants to the ‘minister of agriculture,’ the Tokpo, annually counted granaries throughout the kingdom by product: maize, millet, peanuts, beans, and yams. After reconciling the count of granaries with registered citizens for each village, the king fixed the taxation rate for the year (Polanyi 1968[1966]:224-225). The administrative apparatus of the Dahomey kingdom was highly concerned with the monitoring of taxation. The royal palace at the inland capital of Abomey was itself a large self-sufficient household, excepting some specialty items such as salt and iron implements. The taxes, levies, and contributions needed for the Annual Customs necessitated a series of structured institutions in order to keep track of all occupational specialties, and tax them accordingly. Hunting, a more important source of meat in the kingdom than animal husbandry, was taxed in the following manner:

“There were two hunting chiefs at court, one for hunters and one for fisherman, and a chief of the hunt (dega) in each village. A count of the hunters was taken annually in the course of ceremonial observances at the shrine of the deity of the hunt near Abomey. On the basis of this count, the dega were divided into thirteen groups, four dega for each Dahomean month, and each of the thirteen groups was required to furnish meat for the palace during one month.” (Polanyi 1968[1966]:220-221)

Animal husbandry was also taxed; all those who raised pigs were taxed one animal per year; cattle, sheep, and goats were taxed every three years as a proportion of the herd (i.e., 1 of 8 goats). Salt workers, residing solely in the coastal port-town of Whydah, were taxed ten sacks of salt per worker each year and a cleverly devised system of counting and double checking this production was devised.
“These sacks [of salt] were deposited with the Viceroy of Whydah, who set aside a pebble for each sack received, sending these ‘salt-pebbles’ to Abomey at stated times. At Abomey the pebbles were counted, in sets of ten, to determine the number of salt-workers represented. A separate check on the honesty of the Viceroy was made by sending another official from the court to the salt-workers’ quarters at Whydah to count the number of salt-pans set out. This count had to tally with that submitted by the Viceroy, and any discrepancy was a grave offence for which the Viceroy might be punished by being deprived of his revenues of office for the period of a year.” (Polanyi 1968 [1966]:221-222)

A somewhat parallel accounting procedure was employed in the monitoring of iron production.

“The forge was the unit for accounting, taxation, and other administrative measures relating to iron. Twelve forges throughout the country were designated to make hoes, and production of hoes was limited to these forges, each of which was under the watchful eye of an official...Since no hoes could be sold directly from the forge, all sales had to take place in the market [place] under the supervision of market officials. The market head or his deputy had to witness every sale of hoes, recording the sale by placing a pebble in a box, which was marked with the [unique] device of the forge at which the hoe was made...it was stamped on the product of the forge, and copies of all devices were registered with the palace and distributed to all market officials. There were twelve boxes in the keeping of each market head, one for each forge, and so as each box was filled, it was sent to Abomey and replaced from the capital.” (Polanyi 1968[1966]:222)

After a supplementary count of hoe production, accomplished by summoning the smiths directly to the palace, the king himself assessed the required iron tax to be delivered by each forge to the capital. As these two accounts demonstrate, the effective monitoring of salt and iron production was accomplished using very simple methods of “bean-counting.” As a concomitant of the rather simple counting technology and extremely centralized fashion under which it was instituted, a large retinue of officials was necessary in order to monitor all forms of production within the kingdom.

At the coastal port of Whydah porters were hired out by their lords, whom they had been supplied to through political gift-giving and remained subservient to; they were
not free agents. These hired-out porters were paid by their ‘patrons’ in kind and cowrie. The cowrie money was specifically designated for use in the marketplace in order to supply the porters with provisions. The whole system appears to have worked as a non-profit venture whereby the porters that were attached to the estates of great lords were lent to merchants for menial labor tasks under the condition that they were supplied with provisions (R. Arnold 1957b:182-183).

Porters carrying goods throughout the kingdom were also taxed. They were required to declare themselves as such agents and to carry a specific token (a small chain or piece of raffia cloth) which matched an identical token left with toll-house attendants. Toll-houses were stationed at the entrance to every town with attendants there to check each porters’ token and a pebble was set aside with the matching token of each individual porter at each passage. Taxes were assessed based on the number of trips made through each toll-gate (Polanyi 1968[1966]:223). A similar system was reported by eyewitnesses in the Inka Empire of the early sixteenth century A.D. (see Murra 1980[1955]:145-150). A state system of custom-houses insured safe passage and the collection of taxes on all products moving within the country of Dahomey. The English traveler John Duncan’s travel party was regularly supplied with rations at such custom-houses, and frequently lodged at these locations overnight.

“In this kroom [town] is a custom-house for collecting the duties upon all goods carried through it, from whatever part they come. The heaviest duties are imposed upon tobacco and rum, which are brought from the coast in great quantities; these goods are chiefly of Brazilian and American manufacture…A small duty is also imposed upon all regular traders, even on articles of native growth or manufacture. This is imposed upon the trader instead of license, and is considered more fair to the trader; for should he not sell his goods he has not the duty to pay; but, on the other hand, if he has a good trade, he can afford to pay the low rates of duty. These custom-house establishments are invariably the property of some one of the King of Dahomey’s ministers, as well as all the duties collected at such establishments. They are established in all the most convenient parts of certain districts, by the same rule as our turnpike-gates in England, so that every person must pass through them.” (Duncan 1967[1847]:282-283)
F. E. Forbes visited several Dahomey town markets in 1850, remarking that provisions for the poor were cheap in the marketplaces, with one exception—water. Ten cowries would purchase “a sizeable piece of meat and pepper sauce,” and “for a few cowries, a halfpenny, a very substantial breakfast can be procured” (F. E. Forbes 1966[1851]:79-80). Forbes also described the redistribution system as it worked on a daily basis. Return gifts of rum were expected by many ‘service personnel,’ including dancers and even the groups of porters delivering gifts of food from the king; hired porters required ‘subsistence’ pay, even while sitting idle, an inconvenience as much for the payments as for the procurement of shell money to make them.

“The subsistence, as it is termed, for carriers and hammockmen, when, like ours, lying idle, is three strings of cowries, or 3d., for men, and two for women, per day. Every week it costs us upwards of ten heads of cowries merely to subsist our people, and about fourteen gallons of rum, which articles (besides cost) will require four men to bring them from Whydah.” (F. E. Forbes 1966[1851]:81)

Merchants and Traders

The European travel accounts sometimes mention wealthy merchants with extensive estates worked by slaves or ethnic traders, from the east, at court in Dahomey. Greed and the profit motive were certainly not absent in Dahomean society. The state did actively suppress free-trade and wealth accumulation resulted from association with the government, not private enterprise.

“…Nar-whey, as rich a merchant as exists in Dahomey, and as great a slave-dealer. This man’s father was a servant in the British fort at Whydah, and his son by birthright has his place. He speaks English, but Portuguese better; is ‘hand and foot’ to the viceroy of Whydah, and spy to any that will pay him most. He has got an extensive domain at Whydah; secondly, a large farm at Torree; thirdly, Whybagon; fourthly, Ah-grimeh; fifthly, Troo-boo-doo; sixthly, Carnnah; and, again, a domain at Abomey. He is the owner of upwards of 1000 slaves, and as deep a villain as ever breathed.” (F. E. Forbes 1966[1851]:175-176)
Arabs traders or merchants (Mahomean missionaries, or *Mollah*, the Arabic term for priest) travelled through Damomey on their way to the gulf of Benin. Europeans occasionally saw these agents on their journeys, although M’Leod questioned their purely commercial motives.

“Although these people had some few articles in the way of traffic, yet they were evidently not to that amount from which a profit could be derived at the proportionate to the risk and difficulties of such a journey.” (M’Leod 1971 [1820]:94)

**Corvéé Labor**

As in any well regulated pre-industrial state, land and labor were the foundations of wealth in Dahomey. Dahomey received tribute from subject communities and was itself a tributary state of the inland kingdom of Oyo. Redistribution of wealth was a complex matter and existed at multiple levels: local work groups, state public works groups, tribute to the state from dominated communities, and tribute to more powerful overlord neighbors. Labor service to the state was required and organized by the king through subordinate local chiefs. Although mandatory, labor for state projects was paid for from state reserves.

“When any public work is to be done, such as the erection or repairs of royal buildings, the King summons his caboceers, and portions out the labour among them, paying their people for their trouble. Thus the work is performed with great dispatch. Besides such necessary disbursements, the King pays a considerable yearly tribute, in cowries and merchandise, to his formidable neighbor the King of Eyeo [Oyo]: part of which is defrayed from the contributions levied upon those states which are tributary to Dahomy. The residue of the royal treasure is, upon various occasions, distributed with a liberal hand among the Dahoman grandees, and even among the inferior subjects, so that the receipts and expenditure are nearly equal; and the money which flows to the royal coffers, from the King’s subjects and vassals, thus circulates again among the people.” (Dalzel 1967[1793]:xii-xiii)
Political Duality

The Dahomean political system, with its tendencies toward duality and cross-checking measures, employed vast numbers of officials and co-official ‘wives,’ or ‘mothers.’ Administrative offices, the army, and institutions for the monitoring of any production within the kingdom all worked on the duality principle of male/female counterparts. Even though provinces newly incorporated into the Dahomey kingdom were permitted to retain their own administration so as not to overtax the central administration, a system of monitoring the affairs of the new provinces was maintained whereby both male and female officials from the king’s court moved into the newly acquired territory’s local administrative system as overseers. While the practice of keeping local lords in power lessened the strain of central administration, the state institution of dual monitoring ensured a large royal court and fairly extensive state bureaucracy.

“There is of course, a paradox in talking about a reduction of bureaucracy in view of the type of duality that doubled and quadrupled the numbers of officialdom. Yet the fact cannot be gainsaid, that all responsible observers, friendly or otherwise, are agreed in acknowledging the Dahomeans’ outstanding efficiency in civilian and military affairs.” (Polanyi 1968[1966]:233)

The royal palace and the central administration of Dahomey were intrinsically intertwined; one cannot make a clear separation between the king’s extremely large household and the state bureaucracy. The king’s wives, perhaps 2000 of them, were important functionaries in the state sphere and the standing army of perhaps 5000 Amazon women were also housed within the royal palace compound. Even state officials in Abomey were supplied by redistributed foodstuffs from the king’s ‘private’ estate, even though they did not physically reside within the royal court compound and maintained private residences. The king took audience with officials and dispensed judgments from reception areas within his palaces. His private plantation was a source of large revenues utilized in the broader state redistributive system and large storage facilities housed within the royal palace complex held supplies of maize and other
products. Attached specialists produced textiles and pottery here as well. In all, the royal palace compound was an enormous and complex household which involved thousands and thousands of men and women in the management of the king’s estate as well as with the greater workings of the entire kingdom’s economic and social well-being (Polanyi 1968[1966]:229-230).

**Marketplaces**

While local market officials were in charge of precise equivalencies at their specific marketplaces, the king determined the general ‘price’ levels for each good exchanged; these equivalencies changed infrequently and took on a customary acceptable rate during the reign of any given king. Equivalencies in the marketplace could, of course, change in accord with the needs of the state, but did not fluctuate rapidly as a function of supply and demand as they do in a market economy. Nonetheless, equivalencies in the marketplace did shift abruptly, precisely because of the state’s need to balance the economy. Sir Richard Burton reported one such case during the reign of King Gelele (aka Glélé, r. A.D. 1858 – 1889) in which marketplace equivalencies were drastically altered through official decree.

“[I]t is said that Gelele has resolved to grind the faces of his subjects for ten years of which six are now elapsed. After that time they will be supplied to honest labor, and a man shall live on a cowrie a day, so cheap will provisions become…Prices have quadrupled during the last six years…The Cankey-ball (Dahomey’s quarter loaf) fetched, under the old king, three cowries – is now worth twelve.” (Burton 1846:249 quoted in Polanyi 1968[1966]:226)

Given the lack of a well-integrated system of price-setting markets ruled by the market principle, the Dahomean king purposely acted to bring the economy of the kingdom back into equilibrium. Without the prognostications of modern economists utilizing complex mathematical formulas to assuredly predict the economic forecast of the next decade, King Gelele sought to balance the kingdom’s economy with ten years of
immediate hardship by raising the prices for goods exchanged in the marketplaces. The king evidently did understand the principle of ‘paying now or paying later,’ choosing to implement a harsher economic reality on his people for a short time, rather than allowing a longer period of economic depression to set in for the long run.

The local marketplace did loom heavily in the lives of the agrarian people within the Dahomey state. Several published accounts by European visitors recall marketplaces and the character of activity conducted within these. M’Leod (1971[1820]:93) noted that “their markets for the sale of the usual necessities of life, are as well regulated as in any part of Europe.” Duncan (1967[1847]:3-4) also visited several marketplaces, noting that towns with only 300 to 600 inhabitants had weekly markets. At the marketplace at Quampanissa, Duncan’s travel party created quite a sensation, with the local inhabitants in attendance at the marketplace surrounding them in curiosity; market officials dispersed the crowd when the local ruler advanced.

“In a short time the crowd dispersed with as much precipitation as they had collected, several people advancing with immense thongs of bullock’s hides fastened to a handle, like a hunting-whip, and laying about them right and left indiscriminately upon all who came in their way. These, it appeared, were market-constables, who are employed by the [local] king, or gadadoo, to preserve order, and protect property in the market. These people are paid by a tax upon a portion of every article of provision exposed. Upon other articles a duty is charged in cowrie. These men were clearing a path for their master to advance.” (Duncan 1967[1847]:115)

A merchant informed Duncan that the marketplace at Timbuctoo was not nearly as large as the one at Adofoodia. He described the marketplace at Timbuctoo as a convenient exchange locale and a great salt market, although the community had no manufacturing industry of its own to speak of (Duncan 1967[1847]:187-188).

“Adofoodia is as large as Abomey, and its trade nearly equal in native merchandise…The market at Adofoodia is well supplied with nearly every article already mentioned, except tobacco, which I did not observe. Slaves are here sold in great numbers. During my stroll round the town I was followed by dense crowds of people wherever I went.” (Duncan 1967[1847]:188)
Within the marketplace at the costal trade-port at Whydah, buying and selling were regulated, and there was a discreet segregation of goods by type and kind. Some local representatives spoke on behalf of certain groups of sellers within a single category of good, yet the overall order of the marketplace was regulated by a state-appointed overseer with the help of his minor officials. The sale of goods was restricted to the marketplace; private shops and direct procurement were forbidden by the state; orderly conduct in the marketplace was necessary for state collection of taxes and the maintenance of peace (R. Arnold 1957b:184). Rosemary Arnold’s description of the marketplace at Whydah (the Zobeme) is particularly complete. According to her bibliography, her description is pieced together from numerous first-hand accounts, including those of Barbot, Burton, Dalzel, Duncan, Forbes, McLeod, Norris, Sketchly, and Snelgrave.

“Southwest of the Boa temple is the Zobeme, or market place. It covers an area of about fourteen acres [approx. 5 and a half hectares], and is divided into several principle sections by cross streets. Each section is exclusively appointed for the sale of one class of articles, such as pottery, hardware, fetish charms, oil, and so forth. The meat, fish, corn, flour, vegetable, fruit, and foreign goods all have separate markets…The market shops are low booths, about ten feet by six, raised upon banks of clay, beaten hard, and are thatched with palm leaves, and the floor is usually smeared with cow dung. Each shop stands upon its own ‘islet,’ as they may be called, for in the rain the footpaths are not infrequently six inches deep in water. The vendor squats at the side of her booth, a black clay pipe stuck between her lips, sometimes a babe at her breast. The medium of exchange is the cowrie, although large purchases may be paid for in coin…The market is held daily. It is well supplied with every article of native consumption and many articles of European manufacture. Primarily it is a food market for the sale of cooked victuals. Half the shops [actually stalls] contain either raw or cooked provisions, Burton says, ‘and many a “working man” breakfasts and dines in the alley, or quenches his thirst at the “gin palace” where liquor is dispensed’…Marketing is in full swing about 4 P.M., when a scene that baffles description is to be witnessed. Swarms of people, especially women, meet to buy and sell. Here an old beldame, with shrieveled breasts hanging down to her waist, will be haggling with a child four years old for a farthing’s-worth of fetish. It is a curious contrast, the placidity and impassiveness with which the seller, hardly taking the trouble to remove her pipe, drawls out the price of her two-cowrie lots, and the noisy excitement of the buyers, who know that they must purchase and pay the demand…Foreign goods are in evidence, though not in such plenty as those the natives produce. Duncan lists the articles exposed for sale, and among them we can identify those which appear to be foreign goods, cotton cloth, native and English, he says, thread,
beads, gun flints, flints and steel. This is a scanty array and the articles are all of a utilitarian character, sold in small quantities.” (R. Arnold 1957b:177-179)

The description is fairly typical of West African marketplaces to this day. Marketplace exchange in the heyday of the kingdom of Dahomey (ca. A.D. 1625 – 1892) was “peripheral” in the sense that land and labor were not transacted there. Marketplace exchange played an important role in the provisioning of local peoples with utilitarian goods, but was only one part of a complex economy based primarily on regulation and taxation within an integrated state economy dominantly based on the principle of redistribution. Agricultural self-sufficiency at the household level was supplemented by regulated marketplace-exchange and this was important in the daily lives of local inhabitants. State revenues did not depend on taxation of marketplace exchanges to the degree that state-administered trade did.

Dahomey in the Twentieth Century

When Melville Herskovits (1967) lived in Abomey in 1931, the timing of work and marketing were still structured by the indigenous four day week in spite of the introduction of the seven day week by the colonizing French. Most Dahomeans, even specialist craftspersons, engaged in agricultural labor as their primary means of subsistence. Following the precedent set centuries earlier when a great deal of slave labor was employed, three days of hard work were followed by a fourth day of rest.

“The mafouka, or head of the customs or chief trader…explained that every fourth day was a holiday, not kept holy, but devoted to the will of the working classes; in short, a sort of remuneration to the slave for the three days labour.” (F. E. Forbes 1966[1851]:180-181)

Communal work parties facilitated the building of houses and the preparation of agricultural plots (see Herskovits 1967:Chapter IV). Marketplace exchange was important for household provisioning, but still “peripheral” in the sense that land and
labor were not transacted through the market (e.g., Bohannon and Dalton 1962; Dalton 1967). The most esteemed professions for male Dahomeans in 1931 were ironworking and weaving (Herskovits 1967:45). This had not changed in the 240 years since Dalzel had visited the country. Toward the end of the eighteenth century, Dalzel reported that forges produced agricultural implements, carpenter’s tools, cutlasses, spears, and other weapons; bracelets, rings, cutlass handles, and other jewelry or trinkets were also produced from brass or silver (Dalzel 1967 [1793]:xxv).

“The specimens of art produced by the Dahomans discover a degree of perfection little to be expected from the rude simplicity of their tools. Their looms are the most awkward machines imaginable, yet they manufacture very pretty and durable cloths of cotton, which are held in great estimation among themselves, and are often purchased by the Europeans for counterpanes, at a high price. Their dies [dyes] stand washing very well, especially their blues, which are inferior to none.” (Dalzel 1967[1793]:xxiv)

In 1931, these craft-workers were organized as guilds. Ironworkers did not smelt iron but used scrap iron to forge agricultural implements and other items; much of their work consisted of repairing broken implements. Cloth spinning was practiced by old people of both sexes; part-time specialists produced cotton, raffia, or combined cotton and raffia cloth on narrow looms. Each weaver kept a loom housed in a separate structure apart from his or her domicile. Forges were also housed in separate structures in close proximity to houses (Herskovits 1967:44-45). Potting constituted a third important profession. Pottery was produced by women without the aid of rotational devices and was one of the few commodities purchased by middle-traders for resale in marketplaces instead of being sold there directly by the producers (Herskovits 1967:54, 56).

“The market is the principle medium for the distribution of economic goods, affording a channel through which the products of farmers, artisans and craftsmen flow to the ultimate consumer, and through which compensation is returned to the producer. Yet more than an economic significance attaches to this institution, for the market-place is also a center for social activities and a place where religious rites are held.” (Herskovits 1967:51)
The four days of the indigenous week were named after the first market held on that day – Mioxì, Adókwì, Zōgodú, and Ådjàxì. This is a clear indication of the primacy of initial marketplaces within a staggered market-ring system. The principle market Mioxì was held at Kana, one of the most important religious centers of the kingdom since the time of the Aladaxonu dynasty. Other marketplaces were added through time as the market system grew. The establishment of a marketplace during the rule of the Aladaxonu dynasty (ca. A.D. 1620 – 1892) required a human sacrifice.

In the twentieth century, the establishment of a new marketplace required the construction of a dedicatory mound called an ax’izâ, a marketplace shrine. Aizâ are located at critical junctures within the kingdom, before compounds, at the gates to cities, at principle cross-roads and entrances to districts for the “protection of all groups of human beings.” The ax’izâ, the form of aizâ specific to marketplaces, required the interment of a cache of specimens of all goods to be sold in the marketplace within the sacred mound, “being given as an offering, in accordance with the principle of sympathetic magic.” Herskovits tells of individual vendors leaving small offerings at this ax’izâ for good luck in the marketplace. Additionally, important social circumstances, such as the completion of taboos associated with birth, are announced to the ax’izâ. Twins are also presented to the ax’izâ as soon as they can walk as are cult institution members completing training, before walking the marketplace begging alms and demanding gifts from vendors (Herskovits 1967:52-54).

“These rituals indicate to what extent the non-economic aspects of the market bulks large in Dahomean thought, and show its correspondingly important role in the daily life of the people. Yet, at the same time, it must be made clear that this association of the market with religious rites goes along with, but in no wise affects its place as affording the primary channel for the distribution of economic goods.” (Herskovits 1967:54)

Other activities intersected with, but were not driven by marketplace exchange. A “chief-priest” ‘blessed’ each hunter who was required to visit this official in order to obtain or renew the spiritual power necessary for a successful hunt. This was a means of
keeping tabs on the number of hunters operating in the community. Close count was taken and each successful hunter gave a hind-quarter from any animal killed during the hunt to this individual. This meat was then sold in the marketplace and provided the principle revenue for the official (Herskowits 1967:41).

Marketplaces were kept swept clean on off-days. These were open spaces, free of grass with only two or three iron roofed buildings provided by the French. Vendors sat on small stools or directly on the ground, grouped by product with their wares spread out about them. Temporary shelters were sometimes erected by vendors during the hottest part of the day and consisted of a few poles stuck in the ground with mats laid over them. By 8 am vendors began arriving to set up for the day. By 2 pm the marketplace at Abomey saw its greatest activity and by 5 o’clock the majority of traffic was heading home from the marketplace (Herskovits 1967:57-58).

“To detail the wares sold in the market-place would be to catalogue those elements in the material culture of Dahomey that are transportable.” (Herskovits 1967:58)

Raw and cooked foods, agricultural products, live food animals, and manufactured goods were all available in the marketplace at Abomey. Corn, millet, yams, sweet potatoes, cassava, various beans and peppers (both dry and fresh) were sold. Raw foods were available in processed form as corn meal or cassava flour. Yams were freshly fried on order for customers and boiled ears of corn could be purchased for immediate consumption. Oranges, bananas, coconuts, papaya, and pineapple were for sale, although not in large quantities. Locally made palm wine as well as European bottled drinks could also be purchased, as could gourd bowls and indigenous medicinal plants and remedies. Butchers sold pork, veal, mutton, and occasionally beef; field meat was also sold in the marketplace (Herskovits 1967:58-59).

The only permanent shops were for European introduced goods. Bicycle repairmen and tailors with European sewing machines making clothing kept shops near the marketplace at Abomey and were always available, even on non-market days.
European goods, such as sugar, salt, kerosene, thread, soap, and matches were also sold at small shops kept by natives although these goods were also available from vendors on market days. There are also smaller informal ‘markets’ for food staples – cooked food, salt, and sugar – located at the intersection of bush paths or held as night markets in periodic marketplaces. Herskovits explains that these are not referred to as “markets” by the indigenous people (1967:60).

The only wholesale market was for agricultural products and associated with *gletanu*, the large farms that typically practiced monocropping. In the days of the Aladaxonu dynasty these were stateowned. Marketplaces were not hierarchically ordered and products from *gletanu* were disposed of in relatively quiet wholesale markets situated close to the farms, not in denser urban areas. From the wholesale markets agricultural goods were further distributed only to local markets in the vicinity by women traders carrying the product on their heads. The system was highly limited by the constraints of primitive transportation; most goods being carried on the heads of women (Herskovits 1967:55-56).

Prices for goods in the marketplaces were set by *sodudo*, concrete organizations of vendors dealing in the same product. If a member of a *Sodudo* was not at the marketplace then a child was sent to their home to inquire why. If she was ill, all members of her *sodudo* visited her on the next non-market day to bring gifts and household provisions. If a member of a *sodudo* died then all other members would cease to trade at the marketplace for a prescribed period of time. At Abomey, foodstuffs were priced by the first seller to arrive and this information was quickly communicated to all other women selling the same product. Pottery was priced daily by agreement of all pottery sellers arriving at the marketplace that morning. Undercutting prices was practically unheard of and a lack of open competition characterized marketplace vending. Vendors typically left the marketplace at the close of the day with the remainder of their unsold products; they did not attempt to ‘clear the marketplace.’ Individuals not
associated with *sodudo* who attempted to sell in the marketplace would be viciously beaten by the group’s members (Herskovits 1967:61).

11.3 – The Economic Organization of the Khmer Empire of Cambodia

Fifty years ago, Michael Coe asserted that the classification of a population center as “urban” should be based on the concentration of non-food producers, which requires a highly productive agricultural system, regionally differentiated zones of productive capacity, and an effective transportation system for moving this diverse agriculture into urban areas to be exchanged for the products or services of non-food producers (M. Coe 1961:67). While Coe stressed differentiated agricultural areas as the primary stimulus for urban conglomeration, I believe that the actual exchanging of *any* subsistence foodstuffs for goods and services produced by non-food producers may lead to the development of urban centers and their continuing success. As discussed in Chapter 10.3, there are two competing theories on the development of periodic marketplace exchange in agrarian societies: the exogenous and endogenous theories. The endogenous theory posits that exchanges within a community will lead to the development of marketing, while the exogenous theory holds that an external influence is a necessary prerequisite and that marketplace exchange will only develop when long-distance trading provided the impetus for exchange. Revisiting the Classic Khmer society in a 2008 article, Coe emphasizes the suspected low population density and dispersed settlement pattern extending outward from Angkor, the administrative center of this state and empire. He directly equated this settlement pattern with that of Lowland Classic Maya centers, although none of the Maya examples have epicentral cores or dispersed sustaining areas as large as the Khmer example.

The royal court complex of the Khmer Empire was very large and complex with many officials, retainers, servants, and concubines, numbering in the thousands. Similarly large royal compounds have been reported for the Dahomey Kingdom of the eighteenth – nineteenth century (Polanyi 1966) and the fourteenth – sixteenth century
Inka Empire of the Andes (D’Altroy 2002; Moseley 2001; Murra 1980[1955]). Nonetheless, population density was probably quite low in the administrative capital of Angkor, where the central royal compound was surrounded by a sea of villages and agricultural fields (M. Coe 1961:72). The ninety provincial capitals of the Khmer Empire were supported by the masses of agricultural villages in their respective surrounding territories. Without a well-developed monetary system, some very large Angkorian state institutions were initiated through royal charter. Entire regions were attached to these cult institutions and responsible for providing foodstuffs and corvée labor.

“The temple of the Ta Prohm group at Angkor was granted by its charter 3,140 villages for its support; the total number in its service was 79,365 persons. Prah Khan, another group at Angkor, was inaugurated in 1191 A.D. and had 5,324 villages and a total of 97,840 persons available as food producers and corvée labor. By 1191, there were 306,372 persons living in 13,500 villages devoted to the support of the Khmer temples and their cults. This figure surely must have represented a large part of the adult Khmer population at that time.” (M. Coe 1961:73)

Inscriptions written in Sanskrit and Old Khmer list 18 priests, 2740 officials, 2202 assistants, and 615 dancers – none of them ‘producers’ themselves – supported just at the Ta Prohm cult complex itself (Coe 2008:715). This is a fairly large retinue of non-food producers, certainly larger than even the largest Classic Maya court or cult establishment by an order of 10 or 100. Even if the absolute populations are of a different scale, population densities may have been roughly equivalent and the social and economic organization of the Khmer Empire does provide a convenient example of the possible structure of institutional arrangements which could have existed at the largest Classic Maya centers. These numbers also reveal the extent of control exerted by non-urban capitals; non-urban is not synonymous with small or weak.

Although Coe’s article (1961) takes a cultural evolution standpoint, it is perhaps better to focus on the organizational principles which permitted the Khmer Empire to flourish, and how these arose from the environmental conditions present. The main point of this article was to compare the Khmer civilization with the Classic Maya civilization;
Coe suggested that Maya centers were non-urban cult-centers, possible organized in a similar fashion as the Khmer centers. Additionally, he emphasized the similar ecological conditions which led to the formation of these two civilizations, stressing the lack of urban production for internal exchange or external trade. In fact, Coe was acutely aware of, and continually emphasized, the difference in size between Maya and Khmer centers.

“(I)n talking of Angkor, one has to keep in mind its vast scale: one could readily accommodate within its apparent limits at least ten Tikals or Calakmuls…Most of Tikal would fit comfortably within the walls of just one of Angkor’s monumental complexes, Angkor Thom.” (M. Coe 2008:715)

Viewing the Classic Khmer civilization as a well organized and far reaching empire system, Coe stresses the extreme power wielded by the imperial suzerain; reminiscent of the absolute power of the Tarascan Conzoni, Tarícurí, or the Sapa Inka Pachacuti.

“A king like Jayavarman VII was at the apex of a vast bureaucracy, and at the head of an army that could and did stamp out rebellions and invasions. His power was as absolute as that of a Roman emperor, his person inviolate.” (M. Coe 2008:725)

The Angkor-Tikal analogy, that Coe evoked, stresses the similar ecological conditions and organizational principles of these flourishing kingdoms. Citing John Miksic (2000) and Robert Redfield and Milton Singer’s (1954) distinction between orthogenetic cities, organized on principles of stability and ritual, and heterogenetic cities, emphasizing change and entrepreneurship, Coe relates the political organization of Angkor to that of the largest Classic Maya centers (i.e., Tikal or Calakmul).

“With its impressive monuments; a moneyless economy; a weak development of markets and trade…; an enormous civil, military, and ritual bureaucracy entirely supported by heavy taxation on the production of rice and other important staples; and a dispersed settlement pattern, Classic Angkor was the orthogenetic city par excellence. Substitute maize for rice, and you would have a pretty good description of a Classic Maya city.” (M. Coe 2008:723, italics in original)
Coe emphasizes the interrelated factors of environment, settlement, production, trade and exchange when discussing urban cities or less-than-urban centers (i.e.; regal ritual centers [Fox 1977]). In his analysis, Teotihuacán and Tenochtitlan are urban centers with high population densities of non-food producers residing in the cores of these centers and exchanging their products and services for agricultural products produced outside the core settlement; trade and marketplace exchange are dominant in maintaining organic solidarity. In Coe’s argument, Tikal and Angkor have less dense populations of non-food producers in their cores, supported by tax and tribute in staples; trade and marketplace exchange are unimportant and a ritual state apparatus maintains mechanical solidarity within society. Following this latter model, labor services and craft production are primarily associated with state institutions and redistribution is the dominant mode of economic integration.

**Pre-Angkor Institutions**

Conventional Angkor history begins with Jayavarman II in A.D. 802 when he is credited with the founding of the Angkor state (Vickery 1998:84, 33, Footnote #1). With the breakdown of the Funan maritime trade routes, population shifted to the interior of Cambodia and the control of land and labor under the Chenla and Angkor states (Vickery 1998:257, 405). The Angkor state developed under a form of the Asiatic Mode of Production, or something very similar to this idealized production mode. Vickery suggests that the Angkor state did not necessarily develop out of centrally controlled hydraulic works as the Asiatic Mode of Production implies, but stresses that *some kind of* centralized public works can provide sufficient impetus for the development of the state. In Angkorian times these seem to have been temple institutions with large retinues of support personnel, though not necessarily slaves. The core attribute of the Asiatic Mode of Production are state domination of agrarian production, a lack of private property, and a middle level of society consisting of state functionaries rather than private landlords or commercial entities such as guilds (Vickery 1998:7-17).
Under Jayavarman II the Angkor state saw greater political centralization based in the control of land and labor. This was accomplished through the forced resettling of peoples, including whole communities (Vickery 1998:405) (cf. The Inkas). Pre-Angkor inscriptions associated with royal cult institutions set up by elites are dominantly economic in nature, expressing rights over land and labor. These epigraphic monuments list the ‘property’ of cult institution, including people (sometime whole families) with their herds and fields (i.e., productive assets). In addition to field hands, high-status ritual performers, musicians and dancers, and craft specialists are also listed (Vickery 1998:175, 274-277). Vickery interprets these inscriptions to indicate organized production centered on large estates, not privately held but instituted by political elites with traditional rights over land and the people residing there. Some early pre-Angkor cult institution lists imply just enough production to be self-sufficient but with the addition of orchards for surplus production. Vickery suspects that private ownership of estates or “specialized centers of food or craft production” pre-dates the establishment of cult institutions by royal decree (1998:268-281).

Pre-Angkor Cult institutions were established in the name of a god by a benefactor or patron through an initial ‘gift’ of productive resources – land and its associated labor pool. Not all donations were strictly gifts, some have a structure more reminiscent of commercial economic exchange. Initial donations are sometimes in exchange for cloth or rice (e.g., inscription K. 79) or even silver (e.g., inscriptions K. 41, K. 288) presumably produced by the temple cults. Persons attached to the land were not slaves in the strict sense but persons of low status attached to institutions or elite persons (Vickery 1998:281-284). Inscription K. 41 details the exchange of rice fields from ten different sources; eight “district chiefs” exchanged fields for cloth, two others for silver. This appears to have been a completely economic transaction, not a sacred or ritual one. This is the only known case of such a transaction worded as an “exchange,” not a “donation,” and the extent of such purely economic transactions remains uncertain. Inscription K. 726 from western Kompong Chan involved ‘donations’ or exchanges
involving at least 35 donors, few of them holding elite titles, and may also represent a more strictly economic transaction (Vickery 1998:289-290).

“The examples discussed…demonstrate that pre-Angkor temples were not merely religious centers, but also served as centers of economic integration, and as units of agricultural and craft production, producing surpluses beyond what was needed by the establishment itself, and engaging in exchange of produce, land, and people with members of the elite from surrounding areas.” (Vickery 1998:292)

The latest pre-Angkor inscriptions (seventh – eighth centuries A.D.) document the central rulers’ interests in cult or temple institutions as the control of land and labor became more centralized within the emerging Angkor state (Vickery 1998:245). The phrasing of these latter inscriptions shifted toward one-sided donations with clauses precluding the donors’ families from rights to future production from the temple estates (Vickery 1998:294). In general, the system moved toward more slavery-like conditions and the centralized consolidation of power over time. A system of ‘temple’ estates ‘owned’ by local autonomous chiefs developed into a more centralized system of control over production. The breakdown of the autonomous village led to state control over rights to people and their productive assets (Vickery 1998:309-312).

Economic Organization of the Mature Khmer Empire

In a recent dissertation, Eileen Lustig (2009) explores the political economy of the Khmer Empire. Her work is based upon systematic ‘readings’ of the epigraphic corpus of Khmer texts. The Khmer texts are roughly analogous to Classic Maya inscriptions; they are exclusively elite-focused, associated with temples and pavilions, and evidence a clear preoccupation with rank and title. Many of the inscribed stone Khmer monuments were recovered from their original proveniences; others were moved to secondary contexts. The major difference between the Khmer and Maya monuments is the inclusion of economic information within the Khmer inscriptions documenting support
populations for cult institutions and exchanges involving land and goods (Lustig 2009:108-110, 122).

Lustig (2009) strictly dichotomizes market economies and redistributive economies, suggesting that the Angkor state was an example of the former and not the latter. She equates the existence of marketplaces with a market economy and monetization with “markets.” For instance, she cites the use of cowrie shells as an exchange medium from inscriptions at Sukothai from the late 13th century A.D. without discussion of how cowries functioned within this system. As an example, cowrie shells functioned as a medium of exchange in the Dahomey Empire without a hierarchical marketplace system and outside the market economy factors of price-setting markets (Polanyi 1966; Chapters 10.2, 11.2). Given the degree of centralized control of the Angkor economy, marketplace exchange rates were just as likely controlled through the political hierarchy, even by the imperial ruler directly.

The Khmer inscriptions do document the practice of redistribution of grain by cult institutions. The crux of Lustig’s argument that the Khmer Empire was not characterized by a redistributive mode of integration rests on her assertion that most people were self-sufficient in terms of agriculture. Given this self-sufficiency in primary production concurrent with centralized taxation and corvée labor within a non-monetized economy, the proposition that the Khmer economy of the Angkor period was a market economy and not primarily based in the principle of redistribution is incongruent with her own evidence. As Lustig states clearly,

“The inscriptions may record details of the exchange prices for land, servants or services, but never payments for goods and services outside the elite world of the rulers, religious foundations and titled officials. Indeed, the Khmer epigraphy is never explicit about issues of money and markets.” (Lustig 2009:160)

Quantifying the amount of rice provided to temple institutions from the inscriptions, Lustig concludes that these offerings “were symbolic but also pragmatic”
She also points out the difficulty in separating the elite families that administered cult foundations from the centralized taxation and government system of the Empire. In general, a system of local officials was embedded in a higher order centralized bureaucracy (Lustig 2009:226-227) (cf. Dahomey). Descriptions of the Khmer Empire seem, at least partially, analogous to those of the Aztec Empire of central Mexico, whereby a light hegemonic control (see Hassig 1985) over a vast area was centrally administered from a capital center. Agricultural production around the capital was intensive and productive, maintaining the self-sufficiency of the center of the polity core. This was facilitated by bulk transport of staple grain through water transport around the capital; higher order goods were imported from farther away. Agriculture was the ultimate basis of wealth and power and the state was expanding to incorporate new territories; local officials collected tribute to be funneled toward the capital; landed estates and temple or cult institutions were supported by attached supporters and these were awarded based on merit, not purchased on the land market.

Given the similarities between the political integration strategies of the Angkor and Aztec Empires, might the two regions have had analogous marketplace systems? During discussions of the Angkor economy at a Penn State forum in 2010, Roland Fletcher suggested that the institutions of the Angkor polity may have maintained marketplaces for their exchange utility. He suggested that temple institutions may have redistributed some of their appropriated goods to individuals to be converted into other commodities in marketplaces. This is often cited as a reason for the hyper-marketization of the Aztec polity core. On the other hand, the centralized redistribution of cowrie shell money in the Kingdom of Dahomey permitted easy conversion within peripheral marketplaces without a subsequent monetized, commercial development – precisely because Dahomey was a power economy, not a market economy.

While large scale facilities for the central collection of grain or goods have not been documented within the Angkor capital, Dr. Fletcher opined that movements of goods were probably constant, that the collection of staple grain, other products, goods,
and even services might have been rotational with temple institutions being supplied regularly on demand, not annually (cf. the Indian Jajmani system). This is an important point to remember when comparing the Khmer with the Classic Maya. The apparent lack of central storage facilities does not preclude appropriation and/or redistribution on a substantial scale, it just argues for a certain institutional structure to such a system. If we look to the Aztec Empire case, we should also be aware that appropriation of product may transpire through multiple different sub-systems within the overall economy of the state. Grain and other perishable agricultural products along with lake resources (fish, birds, insects, snails, and amphibians) were mobilized rapidly and constantly near the capital, aided by effective water transport. Concurrently, long-distance high-order goods or raw materials were brought into the capital annually as tribute or intermittently by merchants. Alongside these two prongs of the extraction system, marketplaces were highly developed and well organized within the core of the polity and facilitated conversions among many of the different goods entering the Aztec heartland.

**Centralized Administration**

To what extent was the Angkorian economy centrally administered? Lustig cites several instances of collection agents and large commodity acquisitions by the state, but concludes that,

“All these instances may be referring to state enterprises or, on the other hand, to levying of these important commodities. Even if they were examples of state-organised production, it does not follow that the whole economy was centrally administered.” (Lustig 2009:173)

Nonetheless, the collection of certain ‘special products’ (see Webster 1985) including wax and honey by the Khmer, suggests some level of state involvement in specific industries. The iron industry also appears to have been strategically controlled or monitored by the Angkor state, as it was in the West African Kingdom of Dahomey (Polanyi 1966) or the tribal kingdom of the Lozi in Western Zambia, where elites strictly
controlling the production of this important product while they did not interfere with the system of household based pottery production at the village-level or exact ceramics as tribute (I. Hodder 1981).

“This royal interest in wax, an export, and honey suggests the state either monopolized the production of certain resources or taxed their extraction and distribution. The evidence of iron ore mining of the rich deposits of Phnom Dek, of iron smelting at the nearby temple of Prah Khan of Kompang Svay, and the construction of an almost direct road between that temple and Angkor suggest that the state had a strong interest in the iron industry. It is reasonable to expect that the state was involved with other strategically important industries as well, though it is not evident from the inscriptions that it was responsible for the production itself.” (Lustig 2009:229-230)

Several inscriptions documenting the mandatory support for large temple-foundations have been cited as proof of the scale and power that could be exerted by these institutions and as evidence of the scale of redistribution present in the Khmer economy at large. This does not indicate that marketplace exchange was unimportant in the overall Khmer economy, just that state institutions certainly were essential to the development of this complex economy. The most often referenced account of large-scale appropriation comes from Jayavarman VII’s Prah Khan temple at Angkor; it reads as follows:

(CLXXVII) Within these foundations, may the men and the women including the Cāmpa and the Yavana with the Pukām and the Rvañ, numbering 306,372, may the villages numbering 13,500, may everything made of stone and wood which contributes to the divine service, may all this be preserved absolutely intact.

(CLXXVIII) For these people attached to these foundations, may there be without exception each year 400,126 khāri of rice, considered as oblation to the gods; the lands, sources of revenue, attributed to these foundations, must not be used [for anything else]; and those who declare a greater revenue than is correct, frustrate the divine service.

K. 908 (A.D. 1186)
“The above stanzas from the inscription of Jayavarman VII’s Prah Khan temple at Angkor, requisitioning what has been interpreted as an annual supply of roughly 40 million kg of rice, demonstrate this ruler’s capacity to mobilise substantial resources and to assert authority over a sizeable population, exemplifying the power of the Khmer Empire at the end of the 12th century CE. To have reached this point, the empire had to use existing processes and develop strategies to expand, extract wealth and administer its territories.” (Lustig 2009:220)

From the “expressions used to describe different kinds of transactions and the transactions themselves,” Lustig concludes that, “the complex barter exchanges [of the elites] were unlikely to represent the broader Angkorian economy” (2009:160). While it may be true that exchanges outside the elite world of king and court transpired along different lines than the majority of common exchanges by the peasant population, this does not indicate in any way that the broader Angkorian economy was market oriented. In fact, Lustig makes a multitude of statements concerning the workings of the broader Angkorian economy for which epigraphic evidence is absent, while insisting that it is unlikely that the elite transactions which she analyzed are representative of this broader Angkorian economy.

“Although barter was the mode of exchange, the use of many barter items for the one transaction is unlikely to have been practical for purchasing everyday commodities, and hence to have been representative of the wider economy. Rather, this is a feature of the particular genre of the texts, indicating elite societal priorities, where status appears to have defined much of elite social and political life.” (Lustig 2009:231)

Of course, exchange by barter does not preclude commercialization or commoditization. Both capitalist-based commercial exchange with standardized money and barter exchange have a “commonality of spirit” involving the impersonal exchange of one thing for another without the social rank of either party coming into consideration or any previous or future exchange being considered (Appadurai 1986:10). The elite “barter” transactions recorded in the Angkorian inscriptions and discussed by Lustig are not the kind of transaction most anthropologists think of when they use the term barter. I envision marketplace exchange or silent ‘dumb barter’ when I hear this term, not the kind
of large scale transactions recorded in the Angkorian inscriptions. In regard to the Khmer land-transfer documents, individuals within a collective or corporate group received differential compensation based on respective rank. This is a clear indication of the non-commercial aspect of these transactions. Lustig suspects that specialist weavers, temple builders, and sculptures were likewise remunerated according to rank, although she believes that this could not have been a widespread practice (Lustig 2009:185-187).

“While hierarchy or merit patently influenced the terms of these transactions, such a system is unlikely to have functioned in the rest of the economy, since all prices would then vary according to the relative status of buyer and vendor, and this would be unworkable without an elaborate code, for which there is no evidence. In transactions unrelated to temple deities, market considerations were likely to have had greater priority.” (Lustig 2009:187)

This quote and others from Lustig’s dissertation demonstrate her unwavering adherence to a market economy model which is unsupported by any strong contextual evidence. Furthermore, the use of the term “price” unnecessarily introduces a modern economic paradigm which is inappropriate when speaking of this particular preindustrial empire. Services do not necessarily have to be paid for directly (as in the Indian Jujmani system), and the ‘elaborate code’ which Lustig feels is essential to the workings of a complex non-market oriented economy can be reasonably assumed given the documentary evidence from Angkor. Rank was certainly recognized and there is no reason to assume that this was restricted to the elite and not a consistent society-wide practice.

“…elaborate titles representing real and symbolic functions, insignia and sumptuary laws were used to distinguish position in society.” (Lustig 2009:68)

The original clan structure of Khmer society was apparently reorganized by the time of Jayavarman II, into a complex system of temple communities and varna and varga divisions. Varna seem to be elite social classes or castes; varga appear to be analogous commoner social classes or castes (Lustig 2009:70-71). Given the existence of
such a complex system of reckoning social rank, it does not seem farfetched that the Khmer Empire could have existed, prospered, and extended based on the integrating economic mode of redistribution to a greater extent than that of market exchange. In 17th century India, it was the central political authority that was responsible for maintaining productivity and the distribution of goods. While the king’s court was certainly an institution unto itself, this institution was responsible for the society-wide integration of production and distribution; one segment of society could not have existed without the other.

“[T]he major institution that mediated between commoditization and singularization was the office of the king, whether this be construed as the dominant caste brotherhood within the village or the emperor of all India. The duty of the king was to consume the wares of his subjects and to make his court the great engine of redistribution. In this way, the needs of the particularistic local community producing a good could be balanced with the needs of the polity as a whole. The propagation of diversity in patterns of consumption – of cloths, fruits, spices, grains – was the physical manifestation of the king’s classic role as arbiter between the castes.” (Bayly 1986:298)

Lustig seems to waiver on the concept of the separation of the elite segments of Angkorian society, for which there is epigraphic evidence, and the broader populous, for which there is a lack of documentary information.

“The Angkorian temple economy should not be seen as separate from nor wholly representative of the greater economy, because the temple sector, run by and for the elite, impacted on, and was in turn influenced by the greater economy, while a secular economy of barter and a unit of account [allegedly] existed for local markets and probably for other transactions outside the temple setting. However, from the viewpoint of the writers of the inscriptions detailing the purchases of goods and services, status, hierarchy, merit and public display of wealth appear to override market concerns.” (Lustig 2009:190)

To look to the heart of the economy in Khmer society from the vantage point of the inscriptions, it is difficult to reconcile the market economy interpretation. It is also difficult to conceive of a market economy existing solely at the commoner level while landed temple-estates, tribute, and corvée labor characterized the elite segment of society.
Commoners appear to have been rather self-sufficient and marketplace exchange was likely peripheral to household production. The extent to which labor and land became commodities is intriguing. The inscriptions indicate that the transfer of land became more centralized as the Angkor state developed. Land was sometimes ‘purchased’ with grain, precious metal, or sortings of varied goods by collective corporate groups, but was also gifted along with entire attached communities; all land was owned by the suzerain who had absolute authority to redistribute it as he saw fit (Lustig 2009:58, 81, 166). The inscriptions referencing land acquisitions (especially in the 10th -11th centuries A.D.) evidence a preoccupation with titles and land-claims, most likely a self-serving focus within an economy where landed estates were the basis of wealth and power (Lustig 2009:82, 108, 163).

A Daily Marketplace in Thirteenth Century A.D. Angkor

Evaluating a few inscriptions concerned with various quantities of goods exchanged for quantities of land, paddy, or persons, Lustig states that these documents, “do not indicate any price setting, as would be required for a monopolistic market in a ‘dendritic central-place’ system [ala Carol Smith]” (2009:168). A marketplace is mentioned, but not described, in the Ta Prohm inscription, and The Chinese traveler Zhou Daguan wrote a brief description of an Angkorian marketplace from the year A.D. 1297. While Zhou Daguan’s travelogue makes mention of numerous practices and customs which he directly observed at Angkor, information concerning the political and economic systems of the Khmer at this time are notably absent from his account.

“The emphasis on clothes, parasols, and the like is not surprising – Zhou himself came from a culture in which there was an intense interest in the various forms of clothing, parasols, and so on, that were worn by officials of different ranks and reflected a person’s status. Zhou also tells us about the monthly games and rituals that took place, evidently under elite patronage. But he does not give us a sense of the economic and administrative arrangements on which the power and authority of the elite were based. He makes no mention, for example, of institutions and practices that the inscriptions at Angkor describe,
including temple foundations and the acquisition of wealth through land. Nor does he explain how the ‘great houses’ and ‘homes of the wealthy’ came to be what they were.” (Harris 2007:20)

In spite of the lack of information regarding economic institutions, Zhou Daguan does give a brief description of a daily marketplace and how exchanges were transacted. He mentions many products that were offered in marketplaces, including medicines (Daguan 2007[1297]:66), and that marketing was female dominated. As a Chinese envoy to a foreign kingdom, Daguan was preoccupied with the products of the country, describing the catching of kingfisher birds, collection of ivory tusks from elephants, beeswax collection, and the cutting of trees for sap, he also noted the presence of Chinese goods and their functioning in marketplace exchanges (Daguan 2007[1297]:69-71).

“There is a market every day from around six in the morning until midday. There are no stalls, only a kind of tumbleweed mat laid out on the ground, each mat in its usual place. I gather there is also a rental fee to be paid to officials. Small market transactions are paid for with rice or other grain and Chinese goods. The ones next up in size are paid for with cloth. Large transactions are done with gold and silver.” (Daguan 2007[1297]:70)

Unfortunately, it is not quite clear whether transaction involving cloth, gold, or silver actually transpired within the marketplace or elsewhere, and what relative percentage of marketplace exchanges were devoted to utilitarian household items as opposed to large transactions for resale. Zhou Daguan does give us a vital piece of information concerning the structure of trading in the Angkor Empire in the thirteenth century A.D. – trading was dominated by females. His description sounds quite like those of Tarascan markets.

“The local people who know how to trade are all women. So when a Chinese goes to this country, the first thing he must do is take in a woman, partly with a view to profiting from her trading abilities.” (Daguan 2007[1297]:70)

Trading and marketing dominated by the female population of a society is not an uncommon phenomenon. Given the Angkorian preoccupation with symbols of authority, landed estates, slave labor, elite-sponsored festivities, gift-giving and marriage alliance
formation, I tend to see a clear parallel between Angkor and the roughly contemporary West African societies of the Yoruba and Dahomey, where trading and marketing were in the hands of women as well. Daguan’s description of the Angkorian king’s appearances with retinues of officials and symbols of rank (Daguan 2007[1297]:82-84) sounds much like an eighteenth or nineteenth century British account of visiting Abomey, the capital of the Dahomey Empire.

"Yet we cannot imagine that all precious goods came into the possession of the officials as gifts from the rulers or through transactions. As wealth increased, the flow-on effects amongst, for example, artisans and people attracted to centres of economic activity must have contributed to the expansion of markets to serve the growing numbers of people wanting to purchase prestige goods for themselves and the foundations. The texts are not informative on whether rulers controlled the import and distribution of some strategic goods as was often the case in China and South India.” (Lustig 2009:231)

To return the the Dahomey Empire as an analogy, it is clear that some societies have, at some times and some places, expanded and thrived through a greater reliance on governmental control of resources and trade, redistribution, gift-giving practices and landed cult-institutions without a reliance on commercialism and purchases. The same can be said of the Inka Empire of the Andes and, perhaps, the Tarascan state of West central Mexico. In the end, the Khmer inscriptions do not contribute greatly to our understanding of the place of market exchanges, transacted within a marketplace or not, within the economy as a whole.

“…there is no indication that the markets and prices were centrally controlled. Images on the Bayon walls show local markets functioning like those of today for the exchange of household products, including foods, plant products, textiles and ceramics. If the Khmer Empire was indeed a decentralised state, it would follow that regional markets were organized by intraregional groups, including merchants, perhaps in conjunction with local elites.” (Lustig 2009:232)

Arguing against the notion that the Khmer Empire had an archaic economy functioning largely through the integrative modes of reciprocity and redistribution (ala Polanyi), Lustig continually argues that there is no proof of the lack of a market
economy. She infers “some form of marketised economy” from the existence of private wealth and land transfers. Documentation supports the supposition that barter exchange was the common mode of transaction for both commoners and elites and that no all-purpose money was employed. Temple institutions did collect and redistribute grain; commoners were attached to these institutions, not voluntarily associated. In general, the economy appears to have been multicentric and the place of market exchange within this multicentric economy is less than certain.

“Little support has been found from the analysis of the inscriptions for those premises of Polanyi’s (1957) substantive economics, whereby ‘archaic’ economies lacked price-setting markets and money and functioned through reciprocity and redistribution. The wealth seen in the hands of individuals, used for purchasing land and endowing temples, was arguably acquired through some form of marketised economy, with markets likely located in long-established regional centres and necessarily supplied by merchants. Even these are rarely mentioned in the texts.” (Lustig 2009:251, italics in original)

Given the current state of information concerning the Angkorian economy, it seems premature to argue for the existence of institutions not in evidence while ignoring documented institutional arrangements.

11.4 – Concluding Remarks to Chapter 11

This penultimate chapter of my dissertation surveyed economic systems as they are known from ethnohistoric and archaeological research, in several pre-industrial states. The Postclassic/Protohistoric Tarascan state of the Pátzcuaro Basin of Michoacán, Mexico, was a multi-ethnic state controlled by the Tarascan royal family. This polity was certainly characterized by a multicentric economy, with a well-defined hierarchical tribute system operating within this ecologically varied region. Importation of obsidian and corn became increasingly necessary as the population outgrew the carrying capacity of the core area. Marketplace exchange was also well-developed in the core area around their capital at Tzintzuntzan. Crucial to the understanding of the workings of this polity
was Hellen Pollard’s ecological and quantitative approach to sorting out the structural differences between the earlier urban centers of Teotihuacán and Tula and those of the Protohistoric Tarascan and Aztec states (1980:693). Pollard has challenged the assumption that the Tarascan state was characterized by completely overlapping economic and political systems as well as the uncritical use of Aztec and/or other ethnographic analogies from the contact period in evaluating the Tarascan economy and imperial strategies of control and state formation (Pollard 1980:693-694).

Pollard has suggested that the central political authority of the Tarascan state was not primarily concerned with the regulation of marketplace exchange. A market system was most highly developed within the denser populated centers of the core of the Tarascan polity within the Pátzcuaro Basin, although still more heterarchically organized than the strictly hierarchically-organized imperial tribute system. This tributary system covered the entire empire, while the market system was restricted to central Michoacán, supplying goods and services to the densely-populated ‘urban core.’ In general, markets appear to have developed in the core area in response to local food consumption needs as well as elite consumption of high-order craft items as well as the concurrent needs of specialist artisans to dispose of their products. The Tarascan state was also heavily militarized with state warehouses centrally located at Tzintzuntzan to support the imperial army (Pollard 1993:116).

The state, run by the royal family, claimed rights over just about every productive resource within the basin, including land and water; maintaining a well-monitored system of usufruct rights. Likewise, long-distance merchants could only operate with permission from the king. Markets did not develop for the exportation of goods out of the basin, instead facilitating importation of both low- and high-order goods destined for a dense consumer population. Tarascan centers in the basin were primarily consumption centers and marketplace exchange was “more subject to political manipulation than economic fluctuation” (Gorenstein and Pollard 1983:111). Marketplace transactions were completed through barter, not universal money. Some state involvement in the market
may be indicated by the sale of slaves at marketplaces; slaves may have been an important tributary item which fueled market activity (Gorenstein and Pollard 1983:98). The Tarascan economy can also be considered a command economy; the state likely ‘owned’ or controlled the Ucareo obsidian source, as well as maintaining outright ownership of other prized natural resources. The review of the Tarascan economy situated the role of marketplace exchange within a complex and expanding empire of the New World, one comparable, yet different, than the Aztec Empire.

Beginning with the formation of the Triple Alliance of the Aztec Empire, a complex imperial tribute-system was set in motion. Goods from subjected communities flowed into the dominant capital of Tenochtitlan before being proportioned out to the Triple Alliance partners; Tenochtitlan and Texcoco each received two-fifths of the tribute while Tlacopan received one-fifth (Berdan 1982:36). Within the multicentric economy of the Aztec alliance, tribute, foreign trade, and marketplace exchange each played an important role, although it is difficult to evaluate the relative importance of each mode. I was interested in evaluating just how these economic modes intersected and how to evaluate this with ethnographic or archaeological data. After reviewing the relative importance of the varied economic sub-systems of the Aztec Empire, this section concluded with a short review of attempts to utilize Central Place Theory in order to qualify the structure of the market system. The take-home point from CPT studies is that different researchers come to different, often competing, conclusions. I do not hold great hope for the productivity of this line of inquiry.

The next section of Chapter 11 departed from Mesoamerica to examine the overall economies of other tropical civilizations. First, the economy of the West African kingdom of Dahomey was evaluated. This began with a discussion of the trans-Atlantic slave trade as a form of state-administered trade. The bulk of my discussion of the Dahomean state revolved around the redistributive ethos of this complex society, largely based in the practice of manipulating known equivalencies. The mature Dahomean state was found to be similar to the Tarascan or Aztec states of Mesoamerica in many ways.
All three societies enforced sumptuary laws, were governed from a royal palace household, relied on forms of administered trade and outright state ownership of productive resources, rapidly expanded through war and conquest, implemented complex tax and tribute systems, and performed state-ordained human sacrifice on a vast scale – to the horror of European chroniclers. They also differed in important ways; with varying degrees of entrepreneurial merchant trade, the degree that valuable status-items were circulated through marketplace exchange, and the absence or presence of slave exportation for state profit. I will also add that the kingdom of Dahomey was characterized by lower population densities than the Mesoamerican systems discussed in this chapter.

The discussion of Dahomey focused on the degree of state involvement in the economy and the overlap of political and economic systems. Populations were enumerated through an elaborate census apparatus and the economy was meticulously monitored, from agriculture and hunting/fishing to primary and secondary production – mainly for taxation. Various ‘bean-counting’ devices were reviewed; these were devised to avoid slippage within the state-controlled economic system. Likewise, an economic infrastructure of roads and custom-houses was also state controlled, similar to the situation reported for the mature Inka Empire (see Murra 1980[1956]). The operation of custom-houses (and right to collect duties) was awarded to local elites, as rewards for state service, similar to landed-estate grants in the Aztec Empire. All economic agents were strictly monitored. The state relied heavily on both slave labor and corveé labor, although the latter was paid for from state coffers.

From the very formation of the Dahomean state, ca. A.D. 1625, warfare, for conquest and slave raiding, characterized this expanding polity. The Dahomean state political strategy permitted newly incorporated provinces to retain their own local administration by instituting indirect control through state overseers, forming a ‘light hegemonic empire.’ This expression of the ‘principle of duality,’ instituted as a formal system of overseer agents, increased both state economic efficiency as well as the number
of individuals sponsored by and attached to the state; an enormous state bureaucracy thus developed.

Equivalencies in the marketplace could and did sometimes fluctuate as a function of state intervention, not due to market forces of supply and demand. Marketplace exchange was important for household provisioning, but still “peripheral” in the sense that land and labor were not transacted through the market (e.g., Bohannon and Dalton 1962; Dalton 1967). This was still the case in Dahomey in the first half of the twentieth century (Herskovits 1967). Operating within an indigenous four day week, in 1931 marketplaces were named after the first market held on each consecutive day – Mioxì, Adókwi, Zögodú, and Ådjáxi; a clear indication of the primacy of initial markets within a staggered periodic market-ring system. Market exchange remained peripheral, and yet all-important in the lives of the common people. The marketplace was also an active social arena.

In 1931, the market at the capital of Abomey was mainly a food, craft, and household utilitarian goods market; the circulation of indigenous products still dominated. The marketplace was basically an open-air market, largely devoid of permanent facilities; the only permanent shops were for European introduced goods and services. Only one wholesale market existed for the disposal of agricultural product from large (privately-owned) farms. The market system was not hierarchically organized to any great degree and characterized by a lack of transportation improvements. Female human porters dominated in this simple system; it did not form a well-integrated market system. Prices for goods in the marketplaces were set by sodudo, concrete organizations of vendors dealing in the same product.

The last section of Chapter 11 provided a review of the Khmer state of Southeast Asia. In the early ninth century, this polity began a process of consolidation of political power in the area through something akin to the Asiatic Mode of Production. The core attributes of the Asiatic Mode of Production are state domination of agrarian production,
a lack of private property, and a middle level of society consisting of state functionaries rather than private landlords or commercial entities such as guilds (Vickery 1998:7-17). The Khmer texts are roughly analogous to Classic Maya inscriptions; they are almost exclusively elite-focused, associated with temples and pavilions, and evidence a clear preoccupation with rank and title. Unlike the corpus for the Classic Maya, the Khmer inscriptions are clearly associated with cult institutions and relay economic information—including rights to land and labor. In general, the system moved toward more slavery-like conditions and the centralized consolidation of power over time. A system of ‘temple’ estates ‘owned’ by local autonomous chiefs developed into a more centralized system of control over production.

Eileen Lustig (2009) conducted an analysis of the economic content of the known Khmer inscriptions, strictly dichotomizing market economies and redistributive economies, suggesting that the Khmer state was an example of the former and not the latter. I find this preposition incongruent with current empirical and theoretical evidence, including Lustig’s own research. She (incorrectly) equates the existence of marketplaces with a market economy and monetization with “markets.” Elite exchanges documented in the corpus of inscriptions—of which her entire argument is hedged upon—were based in rank; these do not represent impersonal exchanges as one would expect under a market-economy situation. Lustig opines that (undocumented) commoner exchanges were unlikely to have been conducted by barter. This preposition directly contradicts numerous empirical examples and analogies, and, in fact, Lustig’s own work. In her own words, “[A] secular economy of barter and a unit of account [allegedly] existed for local markets and probably for other transactions outside the temple setting” (Lustig 2009:190).

Based in a lack of evidence more so than any logical argument derived from data, Lustig’s fundamental argument that marketplace exchange was so overwhelmingly dominant in the overall economy of the Khmer polity that it should be considered a monetized market-economy is untenable. Unsatisfied with Lustig’s evidence and line of
reasoning, I instead asked the question “to what extent was the Khmer economy centrally administered?” The inscriptions, dealing almost exclusively with elite behavior and state-instituted cult organizations, give a clear impression of heavy state administration— in public works, taxation, and landed-estates. Evidence does suggest that this economy was multicentric, with multiple transactional modes coexisting (contra Lustig 2009). Unfortunately, the current state of research leaves more unanswered questions than definitive conclusions.

In conclusion, Chapter 11 has expanded the discussion of the place of marketplace exchange within the overall economy of pre-industrial complex societies. In the final chapter of my dissertation, I will relate the compositional analysis of ceramic vessels from the Classic Maya center of Tikal to the issue of marketplace exchange. I hope that these last two chapters have primed the reader to contemplate the place of marketplace exchange within the total economy of the Classic Maya.
Chapter 12 – Conclusions

Population Estimates

I spent considerable time reviewing the procedures for calculating population estimates at Maya centers and the specific calculation method and estimates proffered for Tikal. The ‘industry standard’ formula for converting mapped settlement into density figures has been widely accepted by those working in the Maya lowlands. The overall population figures for Tikal estimated from settlement maps produced during the 13 year-long field project run by the University of Pennsylvania, 1956-1969, have had a lasting impact on all subsequent discussions of the Classic Maya. In particular, the high population density and overall population estimated for Tikal strongly suggested that the center must have had a stronger centralized government than previously assumed. These reconstructed figures also suggested that the economic system was likewise more complex than previously hypothesized. The idea evolved that the Classic Maya of Tikal had developed high culture hand-in-hand with greater political complexity and economic interdependence. Marketplace exchange and market systems (even a market economy) began looking like societal institutions that reasonably accounted for the distribution of goods recovered archaeologically as well as a means of maintaining societal cohesion within a large polity. Such systems have also been viewed as a catalyst for increased socio-political complexity.

Generally considered the obvious first step in the investigation of a Maya center, construction of a population estimate from settlement maps constitutes the first piece of ‘hard evidence’ in argument for the political and economic position of a center both internally and in respect to a hierarchically arranged political system or economic network. While meaningful for comparative purposes if calculated with the same or similar formula, population estimates (density and total population) for Maya centers have yet to be justified against agricultural production. High population
estimates suggest many concomitants, including intensive agriculture, complex political structure and economic interdependence.

The conventional wisdom of pioneering studies of swidden agriculture in the Peten (i.e., U. Cowgill 1962) suggested that extensive maize production in this area could not support even 100 persons per km², much less the higher densities proposed by Puleston (1973) for Classic period Tikal. Maize agricultural yields under swidden cultivation could have supported the Late Preclassic population at San Bartolo (Griffin 2012), but could not have sustained 500-700 persons/km². Researchers have proposed that Classic period inhabitants of the Peten might have relied on crops other than maize (and beans and squash), such as ramón tree nuts (Puleston 1971) or manioc roots (Bronson 1968). Neither of these hypothesized subsistence crops has been completely convincing argued to have been used widely by the Classic Maya and bone isotope studies confirm a substantial reliance on maize. If substituting higher yielding, higher coloric crops for maize did not reconcile agricultural production with population density estimates then perhaps more intensive primary production was practiced.

Terracing has been documented in certain regions of the Maya lowlands, as well as drained-field agriculture, but not at Tikal. Intensive irrigation systems have not been documented at Tikal or other major lowland Maya centers. The lack of evidence for intensive agriculture capable of supporting the alleged high populations of Tikal has called these estimates into question and spurred a number of hypothetical arguments meant to address just how the abundant Tikal inhabitants fed themselves. At Tikal, it has even been suggested that the northern earthwork once functioned as a hydraulic device meant to funnel water to low ground for irrigation (Silverstein et al. 2009). This hypothesis is not entirely convincing as a means of ameliorating crop loss during canicular episodes, much less as a theoretical solution to the basic conundrum of high population densities many times greater than extensive agriculture in the area could ever support. Originally discarded as a serious possibility (Cowgill
and Hutchinson 1963) it has recently been suggested more emphatically that bajo agriculture might have been highly productive in some ‘breadbasket’ areas of Tikal, such as the Bajo de Santa Fe to the east of the epicenter, just north of Ramonal/Chalpate (Kunen et al. 2000; see also Dunning et al. 2002). While bajo agriculture might have formed part of the agricultural production system of Classic period Tikal, it has yet to be determined which bajo areas were under cultivation and just how productive these would have been. This scenario also implies a redistribution system for agricultural product, likely involving pooling and redistribution, collection as taxation, and market exchange.

If the solution to this riddle of high populations being supported by some form of agriculture rests on the ability to redistribute production from more productive areas to less productive areas, then perhaps it is worth considering importation of staple production from extensive agriculture as well. The problem with this line of inquiry is immediately apparent though, mapping has consistently documented high population densities for all areas of Tikal. If peripheral and intersite population densities are at the upper end (or greater than) the carrying capacity of the land under extensive agricultural production, then a very large sustaining area would be necessary. The problem with very large sustaining areas is apparent as well: other centers would then fall within the limits of Tikal’s sustaining area and would in turn require their own very large sustaining areas.

After considerable review of population estimates at Tikal, and the methods of constructing these estimates, it should by now be apparent that I favor somewhat more conservative estimates for Tikal and most other Maya centers. I reject the 500-700 persons/km² estimates based on settlement density as two or three times to high. While it is likely that population densities were higher than swidden agriculture alone could sustain (without importation of foodstuffs from outlying areas also under swidden cultivation), I doubt that population densities outside of epicenters grew beyond 200 persons/km². That is, I do not envision Classic Maya Lowland centers
having populations over 200 persons/km² for more than 1-4 km² of central habitation. As a very speculative and broad-stroked analysis of the settlement pattern of Tikal, for say a 12 km radius from the epicenter (452 km²), I hypothesize a mixed system of agricultural production. I can imagine highly productive house gardens with important crops, including tree crops, grown in greater proximity to homesteads and requiring greater labor inputs for their maintenance. Along the northern earthwork corridor, household groups were encountered a rate of about 13/km², often only 200-300 m apart, sometimes less. I am actually troubled by the close spacing of households (groups) in peripheral Tikal and have difficulty reconciling milpa production adjacent to households. Likewise, the consistent relatively close spacing of households into the hinterlands and inter-site areas confounds interpretation as an infield-outfield system of agricultural production in which residents walked some distance to cultivate fields. Again, alleged population densities in the hinterlands of Tikal are at the upper limit of the assumed carrying capacity of the immediate lands under an extensive agricultural production system. In short, the settlement pattern does not leave enough land around peripheral and hinterland households for extensive production capable of sustaining themselves and outfield lands for residents living closer to the epicenter. This brief speculative review has been rather static, the actual system was likely quite dynamic and surely evolved over time.

I do not believe that a single miscalculated variable (such as productive crop grown, agricultural technique, or even persons per household) will correct for the discrepancy between population count and agricultural yield. Rather, I believe that a multitude of corrections or augmentations will eventually lead to a compromise between high populations, intensity of agricultural production, and system of redistribution or exchange for agricultural product. In the end\textsuperscript{31}, the analysis of

\textsuperscript{31} “The End” is a rather apocalyptic phrase to use here, but a more eloquent substitute does not come to mind. Of course, the analysis will continue on with refinements of diminishing scale in mathematical curve fashion approaching completion, although never attaining it, theoretically. Either accept “the end” as a literary trope, as it is employed upon completion of a cartoon episode or novel, or as an absolute, as in the end of the world, as I am constantly reminded will occur in a few months, on December 23\textsuperscript{rd} or so, 2012, according to interpretation of the Maya calendar, at which point further argument will be rendered obsolete.
Classic Maya settlement patterns will more accurately reconcile estimated population densities with agricultural production. For now, I cannot provide a single ‘magic bullet’ answer to the dilemma. I can only say that I imagine a mixed system of agricultural production, some sub-systems being more intensive and others more extensive, combined with less people living within households than currently hypothesized, and fewer households occupied simultaneously.

Estate Production and Consumption

One aspect of the settlement pattern of Tikal that I spent some time discussing was the apparent development of larger households that I referred to as “estates.” Some of the larger groups we surveyed at Tikal needed greater labor inputs for their construction, and I hypothesize that the labor of the residents of these groups was organized around a household head. Were larger groups organized as residences for multiple nuclear families of basically equal social status or do these large groups represent more complex and hierarchically ordered extended households? I was also curious what the consumption patterns from larger groups reflected in terms of exchange patterns. I use the term “estate” to simply indicate a large household internally organized to deal with production and consumption. This phenomenon speaks to several theoretical arguments initially proposed in the period from 1940 – 1960. How does one classify and model populations around a center the size of Tikal? Are these inhabitants best viewed as highly self-sufficient rural smallholders to be contrasted against urban city-dwellers? Is this numerically dominant segment of society comprised of ‘folk’ people, largely disconnected socially and economically from central elites or are they more profitably viewed as a peasantry class, subjected to centralized administration and dependent upon broader economic forms of societal cohesion? Moses Finley’s definition of a ‘peasant’ in the ancient world included being linked to market systems and taxation systems; hence he did not view Old World agrarian populations as entirely rural “folk” people (Saller 2002:253). In the absence of written records for the Classic Maya, it is difficult to assess social
structure and, hence, it is difficult to reconstruct the institutional arrangements that structured the daily lives of the people. To what extent was life outside the monumental epicenter of Tikal conditioned by kinship structure, political bureaucracy, specialization and economic interdependence?

The settlement pattern of Tikal does reveal one striking feature of their Classic society – the household (as in residence) is fairly unambiguously visible on the landscape. The PST Project investigation program had good success identifying and sampling at the household level of analysis. In fact, I stated at the outset of this dissertation that the household, not the individual, family, or lineage, was the primary analytical unit of investigation. However, the household was a variable and likely flexible arrangement throughout the Classic period occupation of Tikal and individual households evidence a range in houselot and structure size; volume, elaboration and quality of construction, and diversity of recovered artifact assemblages. Diverse lithic inventories from the intensively excavated small structure Groups 4F-1 and 4F-2 (i.e., households) indicate that a multitude of household tasks were practiced at these locations. The greater numbers of chert bifaces and production evidence for obsidian blades and even shell artifacts suggest household-level production, not large manufactories dedicated to intensive production for widespread exchange. Lithic debitage counts from any household outside the Tikal epicenter do not compare with those from known workshop contexts at Colha, Belize or Tula, central Mexico. Only the central lithic debitage deposits from the North Acropolis excavations of the University of Pennsylvania project, 1956-1969, suggest intensive and centralized production. These are secondary deposits and remain enigmatic, although they certainly indicate a level of lithic production close to the epicenter not encountered elsewhere at the site.

The investigation of Classic Maya social order led me to contemplate the development of large households and what these represent in terms of socio-economic function. Holding firmly to the basic tenet that land holdings constitute the
most likely indication of wealth and status, I have attempted to address, at least theoretically, the existence of larger lineage-segments or corporate groups as a distinct part of Classic Maya society. Reviews of the north Indian *jajmani* and the ancient Greek *oikos* systems were presented as possible cognates for Classic Maya household organization. In these two cases, wealth and power were certainly restricted to the land-owning class or caste (Kolenda 1967[1963]; Finley 1973). However, the ceramic distribution patterns discussed in Chapter 9.5 argue against the interpretation that larger estates investigated in the peripheries of Tikal (i.e., Group 1, Group 45, or even Ramonal/Chalpate) were highly self-sufficient in terms of ceramics, or reliant on highly localized ceramic production through a single or limited number of clients.

Regardless of the specific social arrangement of estate production, along lineage lines, feudal oaths, caste affiliations, or organized as corporate groups or ‘houses,’ estates or manors are most likely households by definition, not manufactories or craft guild workshops and production and consumption can be analyzed at this analytical level. “Manoralism” refers to estate production that usually, but not always, followed associations among the aristocracy (Herlihy 1970:xvii). For feudal Japan, Blanton (1994) interprets the insular and self-sufficient nature of large rural estates as a response to their peripheral locations within the settlement pattern and subsequent lack of access to marketplaces. For the Classic Maya of Tikal, the settlement pattern evidencing large households situated at some distances from one another in the peripheries without connecting roadways or waterways likely reflects a lack of access to a hierarchically organized market system, suggesting that these were likely organized internally as largely self-sufficient estates. Why then did they consume pottery from a number of different production units?

In Chapter 3.3 I reviewed the archaeological investigation of one ‘minor center’ at Tikal, Group 7F-1. More centrally located within the 16 km² Tikal map, 1.25 km southeast of the Great Plaza, this larger group proved to be the residence of
high-status elites, probably related to a royal dynasty (see Haviland 1981; Martin and Grube 2000:38-39). The recovery of the broken, effaced, and reset Stela 23 here originally suggested that this group formed part of the political hierarchy of the Tikal governing body. Subsequent excavations revealed a distinctly residential function for Group 7F-1 while grave goods confirmed the elite status of some of the individuals buried at the group and the ability of residents here to acquire exotic goods. Haviland (1981) rejected the designation of Group 7F-1 as a “minor center,” suggesting that its primary purpose was to serve as a residence for a group of people of elite social status. Evidence for ceremonial activity was most prevalent during the period of time (ca. 9.8.0.0.0 to 9.12.10.0.0, ca. A.D. 593 – 682) when the residents were not actively part of Tikal’s governing body and minimal at those times when the residents were involved in central dynastic affairs at Tikal. This does not discount the possibility that this large group was involved in a polity-wide or interregional market system, however. Temple economies and cult institutions of ancient civilizations have increasingly been interpreted as economic entities fully participating within broader economies, not as insular, self-sufficient entities apart from them (i.e., Killen 1999; Lustig 2009; Von Reden 2007). Estate production in the Old World has likewise been interpreted as forming a part of wider economic systems and a catalyst for the development of record keeping, exchange, and capital investment.

“In the Zenon archive…we have an extremely rich source of information on the composition and management of a dorea gift-estate – that of Apollonius, the dioiketes [treasurer] of Ptolemy II Philadelphus – which has yet to be set and interpreted in its historical context. Taken in isolation this archive has provided the documentary basis for construction of the historical thesis of the ‘royal economy’, the great dirigiste economic development which allegedly took place under Ptolemy II.” (Rathbone 2002[1989]:160)

“Rostovtzeff overestimated the relationship in his model of an integrated market economy in the Hellenistic period. As a number of studies have now shown, the dynamics came from large estates. Varying in size and organisation, large estates in Athens, Italy, and the Roman provinces, especially when linked to cities by a viable road system, systematically produced for sale, and their activities
were fully monetised. The question posed to ancient economic historians henceforth is how to assess the impact of large estates on regional and interregional economies as a whole.” (Von Reden 2007:2)

These cited examples are certainly of a different scale than the elite estates at Tikal, yet instructive in theory. Haviland (1992) did suggest that the paucity of shell ornaments within interments at Tikal Groups 4F-1 and 4F-2 combined with evidence of shell (and obsidian) production there indicated specialized production for exchange. None of the burials from Groups 4F-1 or 4F-2 contained eccentric flints or obsidians, jade or hematite, carved bone, or stingray spines, while these were all interred with Burial 160 from Group 7F-1 (Haviland 1992:939). Haviland (1985:39) described Burial 160 as “comparable in its size and grave goods only to the royal tombs of Tikal’s epicenter.” We can conclude that the residents of smaller households did not retain all of their production and that the senior household head of Group 7F-1 was in a position to acquire exotics in life, or was of sufficient status to warrant these upon death; nonetheless, it is unknown if these exchanges were mediated through market exchange, redistribution, client patronage, gift-giving, prestation, or other transactional modes. If the goods interred with burials at Group 7F-1 were not produced within this group, then we have another indication that this estate was not entirely self-sufficient in terms of production. This would indicate the members of Group 7F-1 either procured these items through some form of exchange or that these craft items were produced by members of the extended household not in physical residence there. Similar to the finding that estates consumed pottery from a number of different production units, we are again faced with explaining the consumption of goods produced elsewhere at these large households.

**Lithic Tool Production and Distribution at Tikal**

As a subprogram of the University of Pennsylvania’s investigation program, the Tikal Sustaining Area Project was designed to sample the peripheries of the center in an attempt to counterbalance epicentral investigations and garner information on

Several non-epicentral deposits of lithic debitage or ‘lithic dumps’ were encountered, including “hundreds of pounds” of chert debitage that had been discarded into a chultun interspersed with refuse containing Cauac ceramic complex sherds (A.D. 1 – 150) in the periphery of Tikal (Fry 1969:144). Other peripheral ‘lithic dumps’ recovered from chultuns included deposits of obsidian blade production debitage dated to the use of Cimi complex ceramics (A.D. 150 – 250). After Cimi times, deposition of “less than 1000 pieces” of lithic debitage appear in construction fill or monument cache contexts, but are no longer recovered from peripheral chultuns (Moholy-nagy 2003a:91). Moholy-Nagy (2003a:89) notes that debitage has been recovered from peripheral contexts in which this production debris was intermingled with typical household refuse, an indication that “specialist knappers worked in or near their residences.” She has concluded that household-level lithic production was the dominant form of production at Tikal from the Late Preclassic period until abandonment.

Taking all recovered obsidian evidence from Tikal into account, lithic reduction of this substance was dominantly geared toward the production of prismatic blades. Approximately 56,000 pieces (98%) of obsidian recovered from excavations
conducted by the University of Pennsylvania between 1956 and 1969 were identified as manufactured prismatic blades, prismatic core reduction debitage, or reworked forms made from spent cores or core forming macroflakes. Clearly, the obsidian industry of Tikal was mainly oriented toward the production of prismatic blades.

Investigations of areas of the Peten near Tikal also support the dominant use of obsidian in prismatic blade form. Radial transects through the Peten lakes region of Guatemala to the south of Tikal conducted by The Central Peten Historical Ecology Project, or CPHEP (D. Rice and P. Rice 1979, 1980) mapped abundant settlement. Test-pit excavations in this area were mostly focused on humble, non-elite contexts; Yaxha is the only major center within the survey zone. The CPHEP did not recover evidence of lithic dumps similar to those recovered from comparable excavations from peripheral Tikal. Summary statistics compiled by Rice et al. (1985:592-593)) on a sample of 296 pieces of obsidian (destined for sourcing analysis32), out of a total of 826 recovered from 355 test-pits, document that the prismatic blade was the dominant form used here as well. Within the sample analyzed, 223 pieces (75.3%) were fragments of prismatic blades and another 24 pieces (8.1%) were prismatic core fragments. Aldenderfer (1991:132) reported that 96% of prismatic blade segments recovered by the CPHEP had definitive use-wear and a good majority had been used to exhaustion and discarded. The 24 core fragments were mostly recovered from excavations at the center of Yaxha, leading Aldenderfer (1991:127) to the conclusion that manufactured prismatic blades, and not cores, circulated to basin residents. Two other observations made by Aldenderfer (1991:133) are that obsidian density decreased as a function of distance from the center of Yaxha, and that access to obsidian was positively correlated with wealth, as perceived through architecture size.

32 This sample of obsidian artifacts was hand-picked for sourcing analysis and was certainly segregated in order to sample a range of different forms; as such, blades are most likely under-represented.
Anabel Ford’s (1981, 1986) 23 test-pit excavations throughout the Tikal-Yaxha transect recovered 72 obsidian artifacts. Of these, 67 (93.05%) were prismatic blade fragments. Ford reports an average obsidian density of 2.7 g/m³ for these excavations (Ford and Glicken 1987:493). This obsidian density is several times higher than the OD of .85 g/m³ I have reported from the 60 test-pits excavated by the PST Project in 2005-2006. I have attributed the difference in obsidian densities between the two projects to differences in excavation techniques more so than any difference in access to obsidian by the Classic inhabitants. In particular, one test-pit excavated by the PST Project at the probable communal midden from residential settlement east of the minor center of Ramonal produced 26 grams (22% of the PST collection by weight) of obsidian prismatic blade fragments from approximately 2 m³ of excavated material. This yields an OD of 13 g/m³ (the highest OD for any single test-pit in the PST sample) comparable to Sidrys’ (1976) original OD of 15.3 g/m³ for Tikal as a whole.

Of the 106 fragments (120 grams) of obsidian recovered from PST Project excavations, 100 (94%) pertain to prismatic blades. Ninety-nine of these appear to be latter stage pressure blades from the reduction of polyhedral cores of grey or black obsidian, presumably from the major highland Guatemalan sources exploited throughout the history of Tikal (see Fowler 1989; Moholy-Nagy et al. 1984). One overshot or core rejuvenation flake was the only other evidence of prismatic blade production; three non-descript “shatter” fragments could not be more precisely categorized. Two obsidian projectile points were recovered from a single 2 x 2 m test-pit placed off-plaza at Group 45. One of the two points is a nearly complete ovoid shaped implement visually consistent with Chayal obsidian. The second point is a stemmed proximal portion and appears to have been made of obsidian from the Ucareo source in central Mexico. In addition to this likely Mexican import, a small medial fragment of a prismatic blade recovered from a test-pit in the western block was made of green obsidian, likely from the Pachuca source of central Mexico.
The peripheral household data from the PST Project reported do not appreciably augment previous collections or drastically alter prior evaluations of lithic production, exchange, and consumption in these areas. The distribution patterns from the CPHEP, the Tikal-Yaxha transect, and the PST Project do all support the idea that obsidian prismatic blades were utilitarian goods available in small quantities to all Classic period residents of the central Peten area. The means by which prismatic blades were circulated to these residents is still debatable.

Hattula Moholy-Nagy (1976, 1990, 1992, 1994, 1997, 2003a, 2003b, 2008) has suggested that large obsidian cores were imported into Tikal with subsequent shaping and prismatic blade manufacture centrally controlled, based on the recovery of eleven large obsidian debitage deposits from architectural levels within the North Acropolis at Tikal. Unfortunately, thorough analyses of the Tikal deposits with an eye toward more precisely defining the reduction sequence have not been completed. It is also unclear whether any comparable deposits remain undetected in non-epicentral areas of the site. That is, have large deposits of obsidian reduction debitage present in the peripheries gone undetected? While it appears that obsidian cores were procured or imported and reduced within epicentral Tikal primarily for prismatic blade production, it is unknown if these blades were then circulated to peripheral inhabitants and, if so, how this was accomplished.

Chert Tool Production

The catalog of 53 whole and fragmentary bifacially worked tools made of chert recovered from the PST Project excavations came from 29 peripheral household excavations. Ford (1981) recovered 26 formal chert tools and fragments at 13 residential groups throughout the Tikal-Yaxha intersite area (Fedick 1991). We encountered no seriously elevated numbers of biface tools at any single location that could be taken as an indication of production or hording; neither did Ford. In our peripheral excavations, formal bifacial implements made from chert are fairly
abundant, occurring at most households in low volume, the ovoid (or celtiform) biface form was most common, followed in frequency by slimmer and longer bifacial implements with ground smooth tips referred to as elongated “picks.”

Chert projectile points were only occasionally recovered, mostly from Group 45: one fine chalcedony projectile point from a midden and two stemmed chert projectile points surface collected from the main plaza. One fine-grained light brown laurel leaf chert point or thin knife (resharpened), was recovered from an Early Classic level of the Group 1 midden. From a simple test-pit at Group 11B four large fragments of well-made fine-grained brown chert thin bifacial knives were recovered from refuse consisting of Late Classic sherds and chert debitage overlying a filled chultun. For reasons outlined previously, I suspect that these finely made specimens were made from locally available chert. In sum, the recovery contexts of all formal chert implements suggest that they were used and discarded or broken during production, not pieces destined for exchange. Of course, these were recovered from off-plaza refuse and represent an assemblage of discarded implements and not horded ones. Some are clearly more uniform and carefully crafted than others although it remains difficult to determine if any were manufactured by full-time specialists. Most if not all were produced from locally available chert.

Expedient chert flake tools were recovered from all PST Project household excavations. These appear to be unretouched and consistent with expedient tool production for household consumption and unspecialized work. Rarely were any chert flakes identified as production debris, only two outstanding deposits merit further comment. The first is a deposit of 156 chert flakes found in a cluster within a midden deposit from the minor center of Ramonal. I have characterized this particular instance as a single “baskerload” of flakes, measuring between ¾ and 2 inches long, likely produced from the reduction of a single chert nodule, perhaps from

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33 The chert debitage overlying this chultun did not relate to the production of the fine-grained brown chert thin bifaces, or any other bifaces as far as I could discern; it was consistent with expedient tool production.
the manufacture of a single bifacial tool. Within this “basketload” 20% of the flakes had some cortex, calculated by number, over 40% by weight. Some initial cortex removal is not represented and no distinctive bifacial thinning flakes were recovered either, suggesting that the deposit was secondarily dumped and does not represent the entire production sequence for manufacture of a bifacial tool. We found no other similar deposits of clustered reduction flakes in any other midden.

The second unusual recovery instance of production debris came from the 1.7 m-deep stratified midden at Group 1, where we recovered over 1000 chert flakes from a single 2 x 2 m test-pit. Over 11% of these chert flakes are large bifacial thinning flakes, up to 3 ½ inches long. Most, if not all, of these large biface thinning flakes have use wear on all edges; they do not represent primary deposition of freshly struck debitage. I have interpreted these flakes as production byproducts removed from primary production context and used as expedient cutting flakes without further modification before being discarded in a midden immediately adjacent to the Group. It is unclear whether these flake represent bifacial reduction of local chert at Group 1 or if they were collected from a primary production context farther away.

**Household Production and Specialization**

Technically, the term “production” refers to producing anything from jade composite masks to the removal of a single expedient flake from a chert nodule. At Aguateca, the terms “crafting” or “artistic creation” have been applied to the craft production of prestige items (i.e., shell tinkler necklaces or the king’s jester god diadem headband) as well as the carving of stelae. Although both lowland Maya centers are smaller than Tikal, examples from Aguateca and Copán point to either independent or attached specialists probably working part-time at low volume craft production for themselves and/or higher status elites living in direct proximity. Craft production evidence from Tikal is not entirely consistent with the examples of alleged attached specialists documented at Aguateca or Copán. At Tikal, some smaller
groups did produce craft items that they did not consume themselves. However, it has not been argued that wealthier elites obtained such items through client patronage or more formal attached (or tethered) specialist arrangements. It remains a distinct possibility that household-level craft production at Tikal was oriented toward the manufacture of freely alienable goods to be disposed of at the producers’ discretion. It does, however, beg the question of how resident craftpersons obtained marine shell for production in the first place. Aside from the anomalous inclusion of secondarily deposited chert bifacial production debris in the Group 1 midden, the PST Project did not recover mixed deposits of household refuse and production debitage. One is struck with the notion that the systematic production of many items by one or a few household-level specialists was rare at Tikal, although this may change with more intensive investigation.

**Mechanisms for Craft Goods Circulation**

A kingdom or polity with a basically neolithic technology, lack of transportation infrastructure (without roads or navigable waterways), no wheeled vehicles, nor beasts of burden seems unlikely to have developed intensive agriculture for an export market. The sociopolitical and economic systems of such an agrarian society are also less likely to have developed to the extent of those from a society with such advantages. The previously reviewed population estimates also suggest that, if anything, agricultural product had to be imported into Tikal just to feed the local population. In this final section I will review the previous theories concerning the circulation of craft goods throughout the Tikal kingdom. I will then evaluate the distribution patterns for ceramic vessels from the PST Project excavations against previous theories.
Previously Theories on the Circulation of Craft Items throughout the Tikal Kingdom

Moholy-Nagy (2003a:88) has placed the circulation of craft items produced by specialists through “some kind of market system” in early Late Preclassic times (ca. B.C. 300). Interpreting the lithic production waste associated with elite contexts within the North Acropolis as evidence of the centralized production of both domestic and status artifacts, she also has concluded that non-marketplace modes of redistribution, including attached specialization (Moholy-Nagy 2003a:108), were also practiced. In sum, she asserts that a well-ordered market system must have developed at Tikal by the Early Classic period.

Some items likely produced by craft specialists and circulated at Tikal were definitely made from raw material not available locally. Of course, obsidian was always an imported substance at Tikal and all other lowland Maya centers and it remains unknown how this material entered the center prior to tool manufacture. Of particular interest, two out of thirteen thin bifaces made from grey obsidian recovered from Tikal and subsequently subjected to compositional analysis (Moholy-Nagy 1999; Moholy-Nagy et al. 1984) were congruent with the Ixtepeque source in highland Guatemala. The other eleven were linked to various Basin of Mexico sources. At Teotihuacán most thin bifaces are made from grey obsidian from highland Mexican sources and even the exportation of grey obsidian blanks for biface production has been hypothesized (Spence 1981 see Clark 1986 for rebuttal). Green obsidian thin bifaces recovered from Tikal likely represent products made from raw material originating at the Pachuca source of central Mexico. Although unconfirmed by compositional analysis, many of the thin bifaces of grey obsidian recovered from Tikal are suspected to have been produced from raw material originating at central Mexican sources. Representing only a fraction of the overall quantity of obsidian circulated throughout Tikal, it remains unknown if items made from central Mexican obsidian arrived at Tikal in finished form, or if they were crafted within the site from raw material imported from central Mexico.
Aoyama (2001:357) has interpreted the recovery of green obsidian at Copán as an indication of its “social and symbolic rather than economic importance during the Early Classic period.” Spence (1996) has voiced a similar conclusion for the recovery of green obsidian at Tikal. While it is certainly conceivable that thin bifaces made from central Mexican obsidian entered a market system at Tikal, it is highly unlikely that importation of these implements was the primary catalyst for the development of marketplace exchange there. The more obvious candidate for a marketable commodity at Tikal is the numerically dominant prismatic obsidian blade, available to all households in small quantities. Even the more ubiquitous obsidian prismatic blade might have been redistributed without ever entering a market system; one or more transactional modes could account for the distribution pattern recovered from archaeological investigations.

“As a vehicle for the distribution of goods, trade may have to take its place in the queue behind plunder and gift. Trade may also have to be distinguished from commerce (i.e. ‘big business’): the transfer and exchange of goods over long distances can be accomplished without developed market mechanisms, let alone state regulation, and do not necessarily have major economic implications.” (Cartledge 2002[1998]:27)

We are left with many gaps when attempting to reconstruct the obsidian distribution mechanisms for Tikal. Obsidian for prismatic blade production had to be acquired from highland Guatemalan sources hundreds of kilometers away. At some point, the raw material had to have been shaped into polyhedral cores and evidence suggests that this work was done in the central precinct at Tikal. Subsequent reduction of cores for the production of blades was likely completed in different areas of Tikal, both central and peripheral. All obsidian prismatic blades recovered by the PST Project were symmetric later stage blades. The distribution pattern for large macroflakes, either interred with ‘workshop dump’ debitage in the North Acropolis or cached after incising as ‘ritual’ offerings in central contexts, does suggest that the very early stages of reduction occurred centrally, while final consumption by peripheral households was dominantly of the latest stage of reduction.
Early reduction stage obsidian debitage is not the only class of artifact found to conform to a spatially limited distribution pattern. The majority of jade or greenstone, obsidian and chert eccentrics, and 95% of the shell debitage recovered from Tikal by the University of Pennsylvania project between 1956 and 1969 falls within Zone 1, a .25 km radius centered on map square 5D, the heart of the civic-ceremonial core of Tikal. This highly restricted distribution pattern for numerous ‘exotic’ artifacts has been interpreted by Moholy-Nagy as an indication of both urban production and urban consumption, much like the market system proposed for the Aztec capital of Tenochtitlan. Evaluating the distribution patterns of ‘exotic’ craft goods at Tikal is severely hindered by the lack of intensive excavation programs from beyond a 2 km radius from the epicenter.

Consumption of Ceramics at the Household Level

Ceramic Assemblage Sizes

Considering the consumption of pottery at the household level as the fundamental ‘demand’ side of any exchange system at Tikal, I have reviewed a number of studies that report the size of ceramic vessel inventories from New World agrarian households. Phillip J. Arnold (1988:361-365) contrasted the very low counts of vessels per household he recorded from the Sierra de los Tuxtlas, Veracruz, Mexico [n=50, mean=6.58, median=6] with ethnographic reports of much higher counts from other Mexican communities. At the high end, Nelson (1985) had reported an average household assemblage of 57 vessels from San Mateo Ixtatan [n=51] and Foster (1960) recorded a 61.22 average from Tzintzuntzan [n=3].

The three Mesoamerican case studies of archaeologically recovered household ceramic vessel assemblages that I reviewed in Chapter 7.3 all derived from exceptional preservation contexts: Aguateca in the Petexbatun region of the southern
Maya lowlands of the Classic period, Classic period Ceren in El Salvador, and epiclassic Xochicalco in central Mexico.

Probably home to a small nuclear family, Aguateca Structure M8-10 contained 78 whole vessels when it burned (Inomata and Stiver 1998: Figure 5). The smaller M8-35, perhaps occupied by two individuals, had the lowest tally at 28 vessels (Inomata and Stiver 1998:442). Other domestic groups produced counts ranging from 62 to 95 vessels. Given the ‘utilitarian’ character of the pottery, range of common household forms (bowls, jars, dishes, and the occasional comal), and distribution in tight clusters, the recovered assemblages likely approximate the original number and distribution of vessels while inhabited in the Classic period (Inomata 2010:372).

Excavations at Ceren take considerable time to penetrate the thick volcanic ash, but the recovered assemblages had surely not been disturbed since buried in the eruption. Partial excavation of Ceren Household 1 recovered 74 ceramic vessels, including damaged and retained vessels; perhaps another dozen vessels are expected upon completion of this excavation (Sheets 2002). The bodega of Household 2 produced 24 ceramic vessels, roughly the same number as recovered from the bodega of Household 1 (Sheets 2002); hence, it is likely that both households had ceramic vessel assemblages in the 80+ range.

Horizontal excavation of burned multiple-room house compounds at Xochicalco, likely the residences of extended families, recovered very large ceramic vessel inventories as well. Assemblages had a typical domestic character with vessels for cooking and serving food, water storage, and ‘ritual’ purposes (miniatures, incensarios, suhumadors) (Hirth 2006a:35). A total of 87 vessels were recovered from the excavation of one of these extended household compounds (Operation H). In the Epiclassic period the household was probably comprised of three related
nuclear families, on the order of 15-20 people (Hirth 2006a:Table 2.4). Excavation of another household, Operation I, produced 42 ceramic vessels (Hirth 2006a:Table 2.6).

Although not statistically robust, these three case studies characterized by exceptional preservation certainly document the very large ceramic vessel assemblages maintained by Mesoamerican households in the past. Ceramic vessels are recovered from household tombs and caches at Tikal as well as from horizontal excavations. The abundance of pottery sherds discarded around households and used as fill for construction give the distinct impression that ceramic vessel inventories for the Classic period at Tikal were comparable to those just reviewed from Aguateca, Ceren, and Xochicalco.

The high percentage of ‘serving wares’ recovered from household excavations at Tikal indicate to some that this class of vessels must have been distributed through markets (e.g.; Fry 1979, 1980) while others do not feel that the volume of exchange in these vessels precludes their having been acquired through non-market mechanisms (Stanton and Gallareta N. 2001; Rice 1987a). The PST project data certainly confirm Robert Fry’s (2003) and T. Patrick Culbert’s (2003) previous computations of the high consumption rates for this composite category. From several large midden collections in different areas of Tikal, I calculated a 42.6% frequency of serving ware rim sherds. I hold to the opinion that the high percentage of serving wares recovered from household excavations at Tikal simply indicates that this vessel class was consumed at a high frequency, whatever the mechanism of distribution. I have sampled a variety of serving wares recovered from peripheral Tikal in order to assess the relative number of production units producing these and the distribution of the products of these production units in an attempt to evaluate the overall complexity and structure of the Classic period exchange system.
Ceramic Production at Tikal

Only Group 4H-1 has been identified as the residence of potters working at Tikal. The inferential argument for this identification (Becker 2003a) is most strongly supported by the archaeological recovery of a massive deposit of sherds considered de facto wasters from pottery production. Regrettably, since initially investigated in 1962 and 1963, neither this group nor the ceramics from this deposit have been the focus of further investigation. The area around this group could be clear cut in an attempt to locate ceramic production debris, including kiln debris. Horizontal stripping excavation of this area would likely recover such evidence of production, ending all doubt concerning Group 4H-1 as a ceramic production locale. Analysis of the sherds recovered in the 1960s or a new sample excavated in the future would also provide invaluable data concerning the range of form, decoration, metric standardization and paste composition of pottery from a single production unit.

In the absence of multiple secure production locales or collections of ceramics known to have been produced by distinct production units, I have analyzed the PST Project collection of sherds from peripheral excavations in order to indirectly evaluate the specialized production of pottery at Tikal, and the distribution patterns of these products. In this final section I will review the evidence for specialized production and evaluate the distribution patterns for recovered ceramics, focusing on the probable mechanisms of circulation during the Classic period.

Specialized Production

“Indeed, ‘exchange’ (or transfer) is an implicit part of all ‘specialization’ because in ‘specialized’ systems producer and consumer [of the craft item in question] are not the same individual.” (Costin 2000:397)
The most basic definition of specialization asserts that any production for exchange outside the immediate household qualifies as specialized production. Under this minimal definition of specialization the documentation of any exchange beyond the immediate household is proof of specialized production. In regard to the recovered distribution patterns of artifacts from peripheral Tikal, only formal chert tools are somewhat likely not to meet this most fundamental definition of specialization and even these implements were just as likely produced by fewer households than consumed them. In fact, higher numbers of these artifacts at Group 4F-1 and 4F-2 suggested to Becker (1973b:398-399) that these tools were being produced at these groups for exchange outside these households. Likewise, Becker (1973a, 1973b, 1999) and Haviland (1970, 1972, 1985) have interpreted several lithic debitage deposits from non-epicentral contexts as evidence of household-level production for exchange, but the relative paucity of such deposits is suggestive of a low producer-to-consumer ratio. While this is a plausible interpretation of these deposits, they may also represent production for elevated household consumption in the production or processing of another product. They may also indicate “embedded specialization” (Janusek 1999) for exchange along kinship lines within an extended corporate group.

Obsidian blades may also have been produced at the household level for direct consumption, although it is highly unlikely that none of the prismatic blades produced from the reduction of polyhedral obsidian cores were exchanged beyond the limits of these producing households. The large epicentral debitage caches reported from the North Acropolis excavations suggest that some centrally located obsidian reduction was undertaken by attached specialists, either for an elevated demand in the heart of the center or for exchange beyond. Central location does not automatically equate to central control, and even centralized control has degrees. The fact that obsidian is a raw material imported or procured from ca. 300 km away does suggest a degree of organization likely emanating from central elites. Just how obsidian made its way from the quarry to Tikal and on to the final consumer is unknown and there are many
possibilities to be explored within this procurement-production-exchange-consumption chain. It is clear that core forming did take place in the epicenter, although perhaps not all. It is also clear that non-epicentral households produced obsidian blades, although perhaps not enough to supply the consumption demands of the entire Tikal populous. The relatively low household consumption rate of obsidian blades coupled with the high production volume possible with just a few producers makes this implement a likely candidate for the development of specialized production and subsequent exchange. This does not negate the possibility of household-level part-time specialization for limited exchange.

The PST Project lithic artifact distributions recovered from our peripheral test-pitting program do not shed considerable light on the subject of specialized production or exchange. In fact, in the absence of data published prior to our excavation program, it would be easy to conclude that the specialized production and exchange of lithic tools were minimally developed. The limited scope of our excavations likely accounts for the low numbers of recovered implements. It is not surprising that test-pit sampling off plaza at household groups produced few tools. However, we did not recover production debris interspersed with household refuse either. It remains unknown if any of the groups test-pitted by the PST Project was the physical locale for specialized production, although all groups did produce evidence of expedient chert tool production.

Specialized Ceramic Production and Exchange

Unlike the equivocal evidence for specialized lithic manufacture and exchange encountered by the PST Project, pottery recovered throughout the peripheries at Tikal was immediately recognizable as ‘specialized’ production, not crude utilitarian pieces fired in cooking hearths or a limited range of forms made in

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34 Two exceptions to this trend have been discussed; they do not significantly alter this interpretation.
an unwieldy number of pastes. The ceramics of Tikal were made in a range of forms with various surface decorations. This diversity is not haphazard and has long been recognized by researchers at Tikal and other Maya centers. Ceramics recovered prior to the PST Project excavations have been classified using the Type-Variety system, as well as by form class (Culbert 2003). Different paste recipes are evident as well, often correlating with form and/or surface decoration.

The study of standardization has resulted from the observations that uniformity of ceramic vessels (see P. Rice 1996:179) results largely unconsciously as a function of repetition from an increased intensity of production or purposeful as an attempt to increase efficiency for greater output (Costin and Hagstrum 1995:624). Ethnographic studies substantiate the association of high-rate production with more uniform vessels (i.e., evidencing highly consistent metric attributes) and less uniform vessels produced by potters working at lower intensity levels (e.g., Arnold and Nieves 1992; Kvamme et al. 1996; Longacre et al. 1988; Roux 2003).

Defined as the sample standard deviation divided by the sample mean then multiplied by 100 and expressed as a percentage, the Coefficient of Variation (CV) has become the standard statistic employed in studies of variation as an excellent measure of uniformity and, hence, standardization (Eerkens and Bettinger 2001). I reviewed calculated CV values from ethnographic studies and the comparison of intra-group variability in ceramic assemblages in Chapter 6.2. Very Low CV values (1 to 3%) are consistently correlated with high-rate production. Values in the 4 to 8% range have been found to be somewhat equivocal, and high values (over 10%) are consistently interpreted as representing low-rate production in the ethnographic present. Assessing the degree of standardization apparent in any archaeological assemblage of ceramic vessels requires comparison with either ethnographic assemblages or as a relative comparison between or among various archaeological assemblages (i.e.; X is more or less standardized than Y; Y is more or less standardized than Z).
Evaluation of archaeological assemblages is confounded by a difference in temporal scales. It is debatable whether or not a valid comparison can be made between archaeological assemblages representing vessels produced over long periods of time (i.e., 80 to 150 years) and ethnographically analyzed assemblages from a single potter, a single workshop, or one community produced within a short period of time (i.e., from 1 day to 1 year). A phenomenon labeled “cumulative blurring” refers to the compounded dissimilarity of vessel attributes, when calculated by measures of uniformity (i.e., CV values), produced over long periods of time. Cumulative blurring works at different scales of production as well as time. A single potter’s vessels produced over the course of a year might evidence a slight drift in metric proportions; the cumulative effects of multiple potters producing at high rates in manufactories will introduce a degree of cumulative blurring on a single day and this will be exacerbated over longer periods of time. Accordingly, it is usually quite difficult to assess the relative degree of cumulative blurring expected from archaeological assemblages produced by an unknown number of hands over an unknown period of time; some analysts hold little hope for comparing archaeological assemblages with ethnographic ones.

I reviewed a pertinent case study employing the calculation of CV values worth revisiting in this conclusion, in fact, this is the study most-often cited in reviews of ceramic production uniformity and the genesis of the “cumulative blurring” postulate. The partial waster stack of 27 monochrome slipped open bowls recovered from Tell Leilan, Syria analyzed by Blackman et al. (1993) suggests that high-rate production of these vessels was practiced ca. 2200 B.C. Kiln fired as a group in a single event, the height of a full stack of these vessels is estimated at two meters. I have interpreted the analysis of this production instance to indicate that this vessel type was being produced in quantity beyond household-level production. Contextually, it appears likely that the firing of large stacks of similar vessels equates to either one potter producing at high output, multiple potters manufacturing similar
vessels and firing them together at a shared kiln (nucleated industry), or multiple potters producing vessels side by side in a workshop or manufactory context and firing them together.

Measurement of the metric attributes of these vessels produced CV values just under 10%, rather high for a high-rate production context and single firing episode. Valentine Roux (2003) interpreted the relatively high CV values calculated for these vessels as an indication of low-rate production. I prefer the interpretation that this particular study calls into question the validity of using CV values to evaluate standardized production. Rather than interpreting the CV values as an indication of low-rate production, I have proposed that the totality of contextual information suggests high-rate production of less-than-uniform vessels and have hypothesized that multiple potters worked side by side in a single workshop or manufactory and fired their pooled product as a single production event. In other words, I find the archaeological evidence of a single firing event incontrovertible, and the possibility of multiple potters producing the same type, with the same paste recipe, at vastly different locations to be improbable. There is also little room for any great discrepancy in the timing of vessel firing; vessels must be formed, dried, and fired in a relatively short period of time, a fact certainly known to any potter or group of potters firing two meter stacks in kilns. In sum, I feel that the calculation of CV values for archaeological assemblages produced by an unknown number of hands over an indefinite (but surely long) period of time to be of limited value. Computing CV values from archaeological collections is most valuable as a relative measure of the duplication of production units.

CV Values Computed for Vessels from the PST Project Collections

I calculated CV values for three different form classes from the PST Project collections from peripheral Tikal: incised black surfaced bowls of the Manik ceramic complex, lateral-ridge dishes of the Ik ceramic complex, and deep dishes with
slightly-outflaring walls of the Imix ceramic complex. The calculation of CV values was conducted independently of the compositional analysis utilizing INAA, and sherds, not whole vessels, were usually used although these were most often rim to base pieces capable of providing the necessary information. I have simply used the term “vessels” in the text, although it is acknowledged that the metric attributes of vessels were calculated from partial vessels.

The most ‘standardized’ group of vessels that I analyzed consisted of black surfaced, incised bowls of the Balanza ceramic complex (Lucha Incised or Urita Gouged-Incised). This subset of recovered vessels appeared to form a group while I was still collecting them in the field. Macroscopic inspection suggested that they conformed to a fairly consistent paste preparation tradition, form, surface finishing, and plastic design. The calculated CV score from this group of vessels was 8.9 for rim diameter, 9.3 for wall thickness. After removing a single outlier I re-calculated a CV of 4.3 for rim diameter. These CV values are lower than those for the other two form classes that I analyzed. In order to put these CV values (admittedly from small numbers of vessels) into perspective, I cross-referenced the compositional data from INAA against this set of vessels. Surprisingly, the “Blacks” compositional reference group did not subsume all Balanza group specimens. Three prime candidates for inclusion (see Figure 9.5.3, A-C) based on visual inspection were excluded from this group based on INAA. Without INAA data on paste standardization, I would not have recognized these specimens as the product of a different ceramic tradition likely imported into Tikal.

The second form class analyzed consisted of Ik complex lateral-ridge dishes for which I calculated CV values over 12% for five different metric attributes. After removal of the five largest rim diameter outliers, recalculated CV values for four of the five metric attributes were slightly lower, with rim diameter at 9.2% and maximum wall thickness at 11.1%. These values would indicate low-rate production in the ethnographic present, if they were calculated from vessels known to have been
produced over a very short period of time. Taking the cumulative blurring postulate into account, it could certainly be argued that a degree of uniformity indicative of standardization is apparent in this analysis. In their compositional analysis of ceramic vessels produced within the Petexbatun region of the Classic Maya lowlands, Foiás and Bishop (2007) interpreted CV values over 10% as an indication of numerous production units manufacturing highly similar vessels at each center, not for widespread intra- or interregional exchange. The profile illustrations of these Ik dishes (see Figures 9.5.9 and 9.5.10) highlight morphological differences among them. Some are slightly round sided, others have practically straight upper walls, and others are slightly outflaring walled. Rims range from symmetrically rounded to beveled to everted. Lateral ridges vary in size, some barely pronounced and others prominent and even ticked or formed with cut-outs.

Twenty-six (72%) out of 36 of these Ik lateral-ridge dish sherds were subjected to INAA. Nine of these specimens were assigned to one of the five compositional reference groups while 17 samples remained unassigned. It appears that this form was made with a multitude of paste recipes and that the form cannot be equated with one or a few production units or traditions. A few of these Ik dishes grouped together with numerous other sherds from different form classes to form each compositional reference group; there is even one Ik dish in the “Blacks” group. Almost twice as many specimens remained unassigned after compositional reference group formation, suggesting that this particular form class was produced in a large number of paste traditions.

The combined CV values and compositional analysis strongly attest to a lack of standardization indicative of highly specialized production. Of course, the majority of these vessels were produced by ‘specialists’ in the sense that they were destined for exchange outside the producer’s household. One specimen, KS0154, a Saxche Orange Polychrome dish with interior glyphic band recovered from Group 45 (see Figure 9.4.5) was certainly painted by a literate, steady-handed artist, and is also
an excellent candidate for a gifted vessel. This sherd was recovered from fill collapsing out of a western structure, and was likely discarded into a midden that was later used as construction fill. Another specimen, KS0161, also a Saxche Orange Polychrome, was cached whole within the eastern structure of Group 47.

I suspect that the lateral-ridge dish form class represents a basic mental template shared by large numbers of potters and should not be interpreted as an identifiable product from one or a few production units based on the form class designation. The analysis of these Ik dishes, combined with the formation of the five compositional reference groups, argues against the notion of workshop production of a form-class and suggests that these dishes (and other forms) represent a constellation of modes or community-wide conventions.

The third series of vessels for which I calculated CV values was comprised of Imix complex slightly outflaring-walled dishes. The resulting CV values were as follows: 10.3% for rim diameter, 15.1% for wall thickness, and 9.9% for vessel height. Again, I was surprised that these CV values were so low. In an ethnographic present context these values would indicate low-rate production but, taking the cumulative blurring postulate into account, one might argued that a degree of uniformity is apparent in this set at a different temporal scale. Unlike the Ik complex lateral-ridge dishes, these Imix complex dishes were not assigned to all five compositional reference groups. A few examples were assigned to just the “Saxche” and “Imix B” compositional reference groups. Numerous examples simply did not have similar elemental compositions as a number of other sherds of any shape class to form a compositional reference group, suggesting that this very broad and inclusive shape class does not represent the product of one or a few manufactories or production units. Although not as evenly spread throughout a comparable number of

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35 Mode is used here in the Type-Variety analysis sense of a community-wide convention; however, it does appear that the “community” is the case of the lateral-ridged dish was extremely large. My analysis suggests that these dishes were not the product of community specialization, but rather a widespread form convention produced in a large number of communities following their own paste recipe traditions.
paste traditions as the Ik dishes, this finding may also have been influenced by sample size; Ik dishes were the most numerous recovered and sampled. I do not feel that these findings warrant the suggestion that dish production became more specialized between the Late Classic Ik [A.D. 550 – 700] and Imix [A.D. 700 – 850] complexes, although the data might be interpreted this way. The CV values suggest that Ik dishes and Imix dishes were relatively equally standardized. Future analysis could address this issue with a larger sample.

In general, I do not put a great deal of weight on CV studies, and accept the limited utility of these analyses – they are not worthless to report, but they do not provide a reliable objective test of the intensity or organization of pottery production in archaeological contexts. Longacre et al. (1988) and Allen (1992) stress the fact that emic vessels categories will almost always be missed by archaeologists, thus confounding CV values. I am less worried about this phenomenon (which is undoubtedly a serious concern in their respective studies) with Classic Maya ceramics. In fact, I was surprised when the group of vessels with the lowest CV values represented a mix of different paste recipes, that these vessels were likely not produced by a single production unit.

While CV values are helpful in determining the intensity or rate of production by comparison with ethnographic studies, this does not help much when applied to Classic Maya ceramics. The hand-made pottery of the Maya is just not the same as wheel-thrown pottery from Spanish or Indian potters. In cross-cultural comparisons, there is much ambiguity in the ca. 5-9% variation range, about as fine as any Classic Maya assemblage will ever get. It is difficult to disentangle the effects of multiple hands producing similar pottery, or the effects of drift in proportions over time in archaeological assemblages. Both of these kinds of cumulative blurring impart an unknown amount of expected variation – we simply don’t have a corpus of similar assemblages to compare archaeological ones to, and we never will.
Compositional Reference Groups

The formation of the five compositional reference groups has been discussed in Chapter 9.5. Here I will summarize the trends apparent after group formation. I have interpreted these groups as representing long-term traditions of raw material procurement, paste preparation, and production, not necessarily individual workshops or single potters. These groups perhaps represent multiple related groups of potters or even entire communities specializing in pottery production. Two of the five groups are formed from both Early Classic and Late Classic sherd; we obviously tracked broad inclusive groups representing generations of potters utilizing consistent paste preparation traditions when formulating the “Cylinders” and “Imix A” groups.

The graphic representation of the Principle Component Analysis (PCA – see Figure 9.5.1) displays a discreet separation for the “Blacks” compositional reference group. This group represents the most successful isolation of related pottery and I will discuss this group further in a moment. The “Cylinders” group was also discreetly separated from all others, although this group represents a long-term production tradition. The remaining three groups, “Saxche,” “Imix A,” and “Imix B,” overlap slightly in the PCA graph. I suggest that this overlap might indicate that various production units were exploiting similar raw materials that do not contain enough elemental variation to successfully discriminate them into more specific groups with the number of samples used here.

In general, the five compositional reference groups do not represent traditions for the production of a narrow range of shape classes. That is to say, no one group contained only dishes, only hemispherical bowls, or only barrels. In fact, Ik complex lateral-ridge dishes were made in all five isolated paste traditions and four out of five groups contain Manik complex basal-flange dishes. Only the “Imix B” group is made up of mostly dishes, and these are split between Ik and Imix specimens; one bowl and one barrel were also assigned to this group. At the ceramic group or type level, there
is some indication that the five compositional reference groups do correlate fairly well with ceramic groups (as defined through Type-Variety classification) as Ball (1993:345) once suggested. The “Saxche” group is dominated by pottery of the Saxche and Palmar ceramic groups with two or three Aguila Orange types as well. The “Cylinders” group is likewise dominated by pottery of the Saxche and Palmar ceramic groups. About half of the specimens assigned to the “Imix A” group are Dos Arroyos ceramic group types, the other half of the samples are a hodgepodge of forms and types. Over half of the specimens assigned to the “Imix B” group could not be assigned a ceramic type or group affiliation, and the rest are Aguila, Saxche, or Palmar group types.

The majority of the “Blacks” compositional reference group members are black surfaced pottery and half of these are Balanza ceramic group types: Lucha Incised or Urita Gouged-Incised (see Table 9.5.2 and Figure 9.5.2). Four specimens do not have black surfaces, and two of these appear to be transitional late Manik/early Ik forms (see Figure 9.5.2 L and M). While half of the “Blacks” group members are bowl forms with incised plastic designs, the remaining half of the group members vary by form, no two the same, and surface treatment – although three are black surfaced and one of these is incised, although it is a jar and not a bowl. Two more of my specimens identified as Balanza group types also did not sort into the “Blacks” group; one was assigned to the “Cylinders” group (see Figure 9.5.6, C) and one assigned to the “Imix A” group (see Figure 9.5.7, F). Nineteen other ceramic samples already in the Maya ceramics database compiled at the Smithsonian Institution were assigned to my “Blacks” compositional reference group, including specimens recovered from Tikal that are Urita Gouged-Incised and San Clemente Gouged-Incised types.

Most interestingly, another eight sherds of Balanza group pottery from our peripheral excavations at Tikal and chosen for INAA because I had identified them as Balanza group types did not sort into the “Blacks” compositional reference group (see Table 9.5.3, Figure 9.5.3). Furthermore, these eight sherds do not form a
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compositional reference group of their own; they are eight individual pieces not sorted into any group, and many were likely imported into the Tikal area, although I would not have labeled them as imports prior to compositional analysis. These results clearly demonstrate that more than one paste recipe was used for the production of Balanza group ceramics. They also suggest that one ceramic production unit for Balanzas may have been larger or produced at a higher intensity than others.

The totality of evidence from this compositional analysis suggests that visual inspection alone is inadequate to definitively place sherds or vessels into groups representing production traditions. The knowledge of shape classes, modal attributes, and surface treatments (as well as specific constellations of these) appears to have been widespread. Ceramic analysts cannot easily correlate these constellations of attributes (i.e., types) with individual production units or even broader production traditions (i.e., community specialization). This analysis should at least be considered a “spoiler analogy” in John Yellen’s (1977:6-12) words; demonstrating that analysis at the shape class or type level (or even both combined) is simply not adequate to discriminate the product of different production units.

Organization of Ceramic Production at Tikal

This analysis has demonstrated that there were almost certainly multiple ceramic production units of unknown sizes manufacturing pottery for circulation throughout the northern and eastern portions of Tikal in the Classic period. It remains speculation if similar testing of areas to the west and south would confirm this pattern or if distinctions in the geographic distributions of related ceramics would appear. That is, at a greater scale, it might become apparent that north and south Tikal did not receive equal amounts of pottery from the same production units; that a Tikal-wide circulation system (if one existed) would break down into subsystems with greater sampling. It also remains to be demonstrated if other classes of pottery (i.e.,
utilitarian vessels) conform to the same distribution pattern as serving wares appear to. This is beyond the scope of this thesis.

I have reviewed population estimates for Tikal in Chapter 2 and again in this concluding chapter. Obviously, the circulation of pottery was influenced by a number of factors, all dependent upon population density in some way. Most archaeologists who have dug even a few test-pits anywhere at Tikal are aware that pottery is abundant – it is the most commonly recovered artifact by far. This initial impression does need to be quantified and the ubiquity of the artifact class need not imply that it was of great economic importance. Nonetheless, the questions of how much pottery was produced and how much was circulated (and how far) are of paramount concern in the reconstruction of the economic and social organization of the Classic Maya at Tikal and elsewhere across the lowlands.

The review of sizes of household ceramic vessel assemblages suggests that the Classic Maya at Tikal kept at least dozens and perhaps scores of these in and around their dwellings at all times. Pots were broken, discarded, and replaced. They were also produced and circulated. My analysis does not support a model of highly specialized ceramic production at a few large manufactories; however, it is congruent with a number of other possible scenarios. Household level production seems the most likely possibility, but this is a monolithic category and I wish to define production more precisely. I cannot definitively state how many households exploited the same resources or how many households produced a specific shape class or type. I am not even sure if pottery production was dominantly in the hands of women or men or equally split.

My analysis does suggest that pottery production traditions were not highly specialized to produce a single shape class or type, although I suspect that production units produced a somewhat limited range of vessel shapes and types, not the entire range produced throughout the entire center and its peripheries; the compositional
study supports this conclusion. I conclude from the compositional reference group formations that different households, and probably groupings of households, engaged in pottery production well beyond household consumption levels. This has been obvious for some time, and I am not proposing a radical new theory here. I am suggesting that the degree of specialization of pottery production has been assumed rather than demonstrated for too long. I hold hope that, with greater sampling and geographic coverage, future analysis of ceramics by combining Type-Variety classification, shape class, modal variation, and compositional analysis of pastes will produce finer-grained results. I also firmly believe that compositional analysis must move beyond paste to encompass slips and paints. No single analytical technique will provide simple or straightforward answers to basic questions, but a combination of several productive techniques will bring us closer to answering our fundamental questions.

Distribution Patterns and Circulation Mechanisms within the Kingdom of Tikal

Part I – The Marketplace Exchange Hypothesis

Despite the theoretical importance of the development of marketplace exchange for discussions of socioeconomic organization, to date only Fry’s (Fry 1979, 1980, 2003; Fry and Cox 1974) analysis of ceramic vessel circulations has been specifically designed to evaluate the possible mechanisms or institutions that facilitated and structured the circulation of pottery (or any other craft item) at Tikal. Although still referenced in support of marketplace exchange, this study remains largely untested either by reanalysis of the same data or with a new investigation program and different analyses utilizing a fresh set of data. Although Fry’s analysis suggests the existence of a complex distribution system for Late Classic ceramic vessels, it does not clearly demonstrate that this system was primarily market-oriented. His ceramic distribution study certainly suggests that this class of goods
might well have been exchanged throughout the entire kingdom of Tikal. The greatest drawback to Fry’s study is that ceramic vessels were not sufficiently discriminated by production unit; a difficult and dubious task to be sure.

“Standardization” is a tricky word to evaluate as used in the anthropological discussion of archaeological data (see Chapter 6). Fortunately ‘standardization’ has been a focus of attention and evaluation; unfortunately, this has not led to any great analytical break-through. Standardization is a relative quality, not an absolute one. Pottery that is immediately identifiable as the product of a culture group or a single center might be called “standardized” initially because it is recognizable as a type or ware and also represents high quality craftsmanship. This impression does not quantify the number or size of production units making this pottery or explain how it was circulated. In both the Aztec and Inka empires recognizable ‘national’ or ‘imperial’ styled pottery was produced and circulated in quantity. The uniform appearance of these wares was long assumed to indicate that they were intensively produced in large, probably state-controlled centralized manufactories. Provenience studies based on INAA data now suggest a much greater redundancy of production units making these wares than initially expected in both these empire cores (D’Altroy and Bishop 1990; Hodge et al. 1993). It now seems much more likely that these wares were produced at a number of settlements largely for regional, not interregional exchange. While these wares were certainly produced in quantity for exchange, they were not standardized to the degree that had originally been hypothesized. In the case of the Inka ceramics, these were likely redistributed through an extensive government bureaucracy; the Aztec ceramics were almost certainly circulated through interconnected markets.

My analysis of the peripheral Tikal pottery suggests that a number of production units made similar ceramics, often the same shape class and type. I suspect that household production was dominant, but cannot say how many households made pottery as a single production unit. That is, I am unable to
discriminate production at a single residential group, such as 4H-1, from a more complex household industry involving multiple groups, such as the combined nine peninsular groups suspected to have been inhabited by an extended lineage (Becker 1973b, 1999, 2003a; Haviland 1985, 2003, 2008). I do not know the locations of production; no analysis of raw materials was conducted in an attempt to associate compositional reference groups with geographic locations. I can say that the compositional reference groups do represent pottery making traditions that are best viewed as resource exploitation by a number of households. Therefore, the distribution of ceramics from the different compositional reference groups likely reflects the exchange of pottery among households.

The distribution patterns discussed in Chapter 9.5 suggest that the circulation of serving ware pottery in the peripheries of Tikal was complex. There were no indications that any pottery produced in a tradition represented by a compositional reference group was not distributed to the other areas of the peripheries sampled. I believe this suggests that pottery was likely circulated through peripheral markets, although not necessarily exclusively so, and that these alleged marketplaces were heterarchically organized at the very least. The assemblages of pottery consumed at peripheral groups suggests that pottery from multiple different traditions, likely indicating separate production units, was acquired by various households. That is, peripheral groups consumed the products of multiple different production units, not a limited number. Peripheral groups had access to well made pottery which was almost certainly produced by members of other households and I suspect that they acquired some of it through marketplace exchange, although I do suspect this is not the only mechanism of circulation. Also, other durable craft items, perishable things, and even services likely circulated alongside pottery in any marketplace exchange scenario; pottery is simply the most ubiquitous artifact I could recover and analyze. It may not have been of great economic importance, although the amount of pottery recovered from household excavations does suggest that ceramics might have provided
substantial opportunity for economic gain. Given the quantities of pottery circulated, I accept ceramic distributions as a good indicator of exchange networks.

I have noted the discrepancy between the distribution of exotic artifacts within Tikal’s monumental core and its periphery. However, when we formulated my compositional reference groups from sampled peripheral pottery, a number of pottery samples from central Tikal excavations always grouped with them. This suggests that peripherally produced pottery did circulate to central Tikal and perhaps vise versa. The existence of peripheral marketplaces does not negate the possibility of a large centrally located marketplace. The paucity of exotic artifacts recovered from the peripheries might be a function of sampling skew or it might indicate higher intensity exchange of these items among central residents. Pottery and other goods exchanged in peripheral marketplaces might also have been funneled into a central marketplace, or this alleged central marketplace might have been a collection point for merchants to take goods out to the peripheries for further exchange. These possibilities are largely beyond the focus of my dissertation and my data set; they remain to be investigated.

**Part II – Gift-Giving Exchange**

Archaeologists are notorious for associating specific practices with certain socio-political or economic organizational modes. I will not argue that Classic period Tikal was a state-level society and therefore must be associated with market exchange. I have tried to test this assumption with data collected and analyzed. In regard to this habit of proffering hypothetical correlations, and claims of concomitants or incompatibilities in certain contexts, William Haviland pointed out the following analogy:

“[T]he ‘vision quest’ widespread among native peoples of North America seems to have originated among early foragers (Furst 1976:5-6) but persisted in the very different context of a large Maya city like Tikal (Haviland and Haviland 1995:308)” (Haviland 1997:444).
I do not believe that the size or complexity of socio-political organization at Tikal, or any other Maya center, precludes the widespread practice of gift-giving, or other forms of non-market-based exchange, either concurrent with, or in addition to marketplace exchange. The gifting of ceramic vessels has been consistently theorized and documented for the Classic Maya on a limited, elite level (Adams 1977:412; Marcus 1983:477; Reents-Budet 1994; Rice 2009). I do not see any reason to discount the possibility that this practice was more prominent among a wider group of elites at life-crisis rites (i.e., death and burial) or more widespread among the folk or peasantry segment of society at more numerous occasions annually or in accord with life-stages (i.e., at puberty, marriage, childbirth, or as brideprice or dowry). These gift-giving exchanges do not negate the existence of marketplaces or commercial exchanges; the two institutions can intersect and be complexly intertwined. A strict dichotomy between simple gift-giving and complex market exchange is an oversimplification of the realities of living communities.

Part III – The Multi-centric Economy

The main obstacle to identifying a multi-centric economy is that one does not know what to look for, almost by definition. If it is difficult to differentiate market exchange patterns from redistribution patterns, then it must be nearly impossible to discern a multi-centric exchange pattern from any one or even a series of artifact distribution. I have concentrated on ceramic distributions in my dissertation, but these have not been contrasted against any other artifact distribution of similar resolution. I simply cannot discriminate production units for lithics as well as I can those for ceramics. The multi-centric economy hypothesis also implies that the same artifacts were circulated through different mechanisms. Again, this is an interesting theory, but largely beyond the scope of this dissertation. I can only comment that a number of reciprocal or redistributive practices were likely practiced concurrently with marketplace exchange. I am unsure how to proceed with the investigation of a multi-
centric economy. My own ceramic distribution study should be confirmed, augmented, or dispelled with a larger sample with greater geographic spread. I hope that I have effectively argued the potential for such studies.

Final Comments

On the first page of this 250,000+ word document I listed several questions pertinent to my analysis that I hoped would be answered (or at least addressed) in the intervening 900+ pages. I will simply list and answer them here.

1) Was any production organized above the level of the household?

There is no hard evidence from the PST Project peripheral excavation program in support of production beyond household-level industry. We never encountered direct evidence of large-scale production, although the ceramic distribution analysis does suggest a few things. I have interpreted the INAA of pottery to indicate a redundancy of production units. No shape class, type, or variety sorted into a large compositional reference group, and I suspect that no Tikal pottery production unit was ever organized as a very large manufactory dedicated to the production of one distinct pottery type not produced by any other production unit. The study does not indicate that there were no larger workshops, just that there is no good evidence in the data to reach this conclusion.

2) How redundant were production units, i.e., how many units produced the same things?

The compositional reference groups suggest that a specific shape class or type was produced by many different production units. It is difficult to specify a number of production units for any isolated product. The compositional reference groups suggest that serving wares of the Manik, Ik, and Imix complexes were produced in multiple different paste traditions; only the “Blacks” compositional
group contained a relatively more limited range of vessel types. The discussion of Ik complex lateral-ridge dishes suggests that this form represents a mental template of what a Late Classic dish was supposed to look like. The widespread production and circulation of slight variations on this form suggests to me that knowledge of the form was passed down along kinship lines through many, many potting families.

3) Was any production centrally sponsored or controlled?

I do suspect that some types were produced by a larger workshop or more intensive production unit organized as a series of households, and this might be what my “Blacks” compositional reference group represents. The fact that about half the Lucha Incised and Urita Gouged-Incised sherds sampled sorted into a single group does imply that there was one larger production unit, although certainly not exclusively producing these types; some products visually identical were also manufactured by other units. The fact that this compositional reference group also contained member from previous excavations in the Lost World complex suggests that a centrally located, although not necessarily centrally controlled, production unit produced vessels for inclusion in elite tombs as well as for circulation to the peripheries. Alternately, a peripheral production unit might have produced more elaborate vessels for elite patrons in addition to producing vessels for more widespread circulation. I also imagine that the redundancy of production units also included attached or tethered specialists producing pottery on demand that was virtually identical to the product of other units producing freely alienable vessels.

4) Did any segment of society maintain more restricted production or distribution networks outside of those operating throughout the entire settlement?

The distribution study suggests that serving vessels from all paste traditions were available to all peripheral households tested and that any differences in the
consumption rates of serving vessels from different traditions were proportional, not absolute. Although there was a higher percentage of consumption of pottery from some traditions in some areas, no area exclusively consumed pottery from a tradition not consumed elsewhere in the peripheries. In other words, while the Ramonal/Chalpate excavations produced more pottery from some traditions, pottery from these traditions was also recovered from households in the northern earthwork corridor. I believe this supports a hypothetical reconstruction of a pottery circulation system focused on localized production and consumption, not one focused exclusively on centralized marketing.

5) **Does the distribution data suggest a single integrated economic system?**

As just mentioned, there are both indications of widespread exchange and proportional differences in sub-regional consumption rates. I am not sure if this indicates more heterarchically organized circulation through peripheral markets with higher consumption rates for locally produced pottery or a more hierarchically organized solar or dendritic market system primarily organized to funnel more product into the central district of higher consumption demand. I do not believe that either of these hypothetical models suggests a single integrated economic system. I am not proposing that the economy of Tikal should be characterized as a market economy; it will never meet the criteria for this designation. Peripheral inhabitants might have been largely self-sufficient and never very dependent on marketplace exchange. Because my own general model of the organization of Tikal stresses lower population densities than most other models permit, I question the need for food importation from very far off and even the periodicity of markets. Marketplace exchange may have occurred daily in the center and periodically in peripheral locals (like Yoruba communities); or it may have been semiannual or intermittent – more like bazaars or fairs in Europe during the Middle Ages. It is beyond the scope of this analysis and the data set to answer this more precisely. Better information on the replacement or
consumption rates for different vessel classes as well as more accurate population densities would help sort out the demand for pottery, but the fact remains that pottery would be only one craft item circulated through markets. Any markets at Tikal were certainly organized around household needs apart from ceramic consumption (i.e., food items, fire wood, herbal medicines, field meat, ornamental flowers, tree resins, baskets, nets bags, gourds, wooden containers, etc.).

6) Does a market based model fit the data better than a redistributive one?

It does, slightly. However, a mixed system, of reciprocity, redistribution, and marketplace exchange might fit the data better. I have only suggested that pottery was circulated widely throughout peripheral Tikal, any number of alternate circulation mechanisms likely accompanied and intersected with any market exchange (i.e., gift-giving, itinerant peddling, direct procurement, marriage negotiations, life-stage events, and local redistribution among lineage or other corporate group affiliations including fraternal societies, estate redistribution, or various cult institutions).

Last Words

Many topics have been introduced and discussed in this dissertation. While writing it, I have largely rejected some analytical techniques because they do not discriminate alternate hypotheses sufficiently (e.g., central place theory, CV values). I also reviewed multiple archaeologically and historiographically derived scenarios for cross-cultural comparison. These have been introduced for the sake of discussion and to provide alternative models, not one-to-one analogies. To be honest, the closest analogy to the organization of Classic Maya sociopolitical complexity is probably the Kingdom of Dahomey, and even this case likely provides as many differences as similarities. I do believe that the cross comparison of polities that developed in southeast Asia, West
Africa, and the Maya Lowlands are the most fruitful in general, largely based in similar ecological conditions. Yes, I still follow a largely cultural ecology model and have not become entirely caught up in recent theoretical concerns with buzz-word categories to the exclusion of fundamental concerns.

I have attempted a very broad-stroke analysis of the total economic system of the Classic Maya – more so as an exercise than a definitive conclusion. I have many doubts and fewer answers. I do not feel comfortable with many reconstructions of the Classic Maya. Unable to reconcile population densities with agricultural production, I reject the high populations argued for Maya centers. I just don’t think that the Maya are less important or their accomplishments insignificant if fewer people were responsible for them. I am also uncomfortable with the current market economy thrust – why must all ancient societies be categorized as market-based or, worse still, market economies? This all seems like a swing of the theoretical pendulum to me, ignoring previous theory (and definitions) to move forward and prove a thought. I prefer investigation of the structure of exchange and the complexities of production, exchange, and consumption.

Without denying the extreme importance of interpreting data through appropriate models (and testing alternate hypotheses) I cannot stress enough my own very real conviction that data collection is imperative at this stage. The main thrust of this dissertation is the circulation of common things over a politically unified area. To get closer to an accurate assessment of the actual system of circulation in Classic times, more data will be needed – no model will more accurately organized the current data and no analogy will provide a perfect fit. More data, and more logical modeling based in theory derived from contemplation of historical documents are in order.

As unsophisticated as it may sound, I do not wish to debate categories that I cannot investigate archaeologically. Understanding the theoretical underpinnings and fundamental tenets of feudalism or segmentary states, or specialization or redistribution, is important for the development of new theory, not as an end in itself. Specific case
studies were discussed to provide alternate explanations for artifact distributions. The observed patterns can be compared to and contrasted against expectations under specific arrangements. While large households at Tikal are not just like Greek or Roman estates, they can certainly be dealt with as possible largely self-sufficient entities, and there possible connections to market systems evaluated. Likewise, the distribution of ceramic vessels by Kalinga women put pottery circulation mechanisms in perspective – if women working in groups of 2-3 relatives or friends have produced and circulated thousands of vessels per year over a considerable distance, then this same organization could have been responsible for distribution patterns from the archaeological record.

In summation, I hope that the investigation of production, distribution, and consumption of all things circulated (or not) in Classic Maya society will be investigated from an objective perspective. Distribution patterns can be recorded without immediately deciding that they do or do not support a specific reconstruction. The untapped archaeological record is robust while the interpretive corpus of literature continues to grow. This massive body of literature is highly redundant and I have have only added to this. This dissertation has shown that INAA can discriminate production (to a degree) and hopefully further analysis will bring us closer to understanding how things were made, circulated, used, and discarded in the past.
Appendix A

The Instrumental Neutron Activation Analysis (INAA) Eigenvalue Extraction used for the Formulation of the Compositional Reference Groups through Principle Component Analysis (PCA)

Component Loadings

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Variance Explained by Components

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Percent of Total Variance Explained

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Factor Loadings Plot

Latent Roots (Eigenvalues)

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Coefficients for Standardized Factor Scores

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