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Pre-Columbian Foodways

Interdisciplinary Approaches to Food, Culture, and Markets in Ancient Mesoamerica

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Editors

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Claude Lévi-Strauss on the mythology of food and cultivated plants…

> *"It is not surprising that the acquisition of honey should go back to the mythical period when there was no difference between animals and men, since honey is a wild product belonging to the category of nature… it must have become the heritage of humanity when men were still living in a 'state of nature', before any distinction was made between nature and culture… myths about the introduction of cultivated plants… refer to a time when men knew nothing of agriculture and fed on leaves, tree fungi and rotten wood before the existence of maize… maize was like a tree in appearance and grew wild in the forest… men made the mistake of felling the tree, and they then had to share out the seeds, clear the ground for cultivation and sow maize, because the dead tree was not sufficient for their needs. This gave rise, on the one hand, to the different varieties of cultivated species, and on the other hand, to the differences between peoples, languages and customs…"* (Lévi-Strauss 1973, p. 73)

Lévi-Strauss, Claude 1973. *From Honey to Ashes: Introduction to a Science of Mythology: 2*. Translated by J. and D. Weightman. New York: Harper & Row Publishers, Inc.

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Pre-Columbian Foodways in Mesoamerica

John E. Staller and Michael D. Carrasco

This collaboration originates from our mutual participation in an invited session "The Role of Sustenance in the Feasts, Festivals, Rituals and Every Day Life of Mesoamerica" organized by Karen Bassie at the 40th Annual Chacmool Conference. *Eat, Drink, and Be Merry: The Archaeology of Foodways*. Hosted by the Chacmool Archaeological Association and the University of Calgary, Department of Archaeology, November 10–12, 2007 Calgary, Alberta. We are sincerely grateful to Karen Bassie for her encouragement in stimulating this collaboration and her support of this project.

Introduction

Pre-Columbian Foodways: Interdisciplinary Approaches to Food, Culture, and Markets in Mesoamerica assembles contributions from a wide range of fields to present current views on food, feasting, and markets in Mesoamerica. From the editors' own work on Pre-Columbian societies, it was apparent that it was only through a holistic approach that it would be possible to gain an understanding of the complex cultural patterns surrounding food and cuisine, as well as the various social institutions that governed their production, redistribution, and consumption. It was such illustrious anthropological scholars as Claude Lévi-Strauss (1969) who observed early on that to view culture through the lens of foodways is a powerful methodological approach for understanding the social practices and ideology surrounding food.

The interdisciplinary approaches presented in this volume bring together numerous fields that would otherwise find little in common to provide ever-increasing detail and direct evidence on the antiquity, evolution, cultural importance and socioeconomic roles of foodways in Mesoamerica. In doing so, this volume also gives scholars insight into how disciplines generate interpretations and stand at

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varying degrees of distance from their object of study. For instance, while anthropologists directly interact with modern indigenous peoples, the descendents of the ancient cultures examined in this volume, providing a kind of access not enjoyed by archeologists or ethnohistorians, it is only through the archaeologist's spade that art historians and epigraphers encounter the ancient art, symbolism, and texts that they interpret and reconstruct. However, the interpretations and reconstructions of art historians and epigraphers are instrumental in directing and refining research on ancient politics and religion across a number of disciplines, and even influence research programs focused on modern peoples. By placing these diverse approaches in conversation this volume is geographically, topically, historically, and methodologically more comprehensive in scope than most of the previously published literature, which has largely dealt with specific regions, cultures, or cultigens in Mesoamerica (Benes 1984; Scarry 1993; Monaghan 1995; Mills 2004; see also, Coe and Coe 1996; Arnold 1999; González 2001; Anderson 2005; McNeil 2006; Staller et al. 2006; 2009). In contrast to these more focused studies *Pre-Columbian Foodways* investigates cuisines and food within the larger context of economic, political, and religious systems. Thus, for instance, feasting is examined not simply within the context of ritual or the specific foods involved but also as one of the major examples of political reciprocity, the timing of which was often based on an agrarian based ritual calendar. Contributors to this volume also examine how the cultigens, and the foods derived from them, are often embodied in mythological and religious symbolism, and how in many cases their production often determined when ritual festivals took place in the annual cycle. This holistic approach to foods and cuisines allows for a more complex and nuanced understanding of Mesoamerican foodways studies and demonstrates the growing importance of this inherently interdisciplinary field for understanding ancient American cultures.

The study of Mesoamerican foodways embraces a diverse range of methodologies. Following this conception of collaboration across fields, various scholarly approaches to Mesoamerican foodways are presented in three major sections, which include data from archaeology, anthropology, linguistics, iconography, economics, ecology, biology, and bone chemistry reflecting the synergy that results from truly interdisciplinary research. Here we introduce Mesoamerica as a cultural region, briefly outline the history of foodways studies of this region and highlight some of the important roles food and cuisines had and continue to have among regional cultures. We conclude this chapter with a detailed description of each of the three subsections. Briefly, each section is based on an overall theme, scope, and approach. Part I includes contributions that deal with general syntheses or topics relevant to food crops from all of Mesoamerica or cover the history of particular cultigens and explores how they were managed, tended, as well as consumed. Part II presents case studies of particular regions, periods, or cultigens from a number of different fields including archaeology, ethnobotany, epigraphy, and anthropology. Part III includes more interpretive analyses that rely to varying degrees upon information obtained through the methodological approaches discussed in the first two sections (Fig. 1).

Fig. 1 Mesoamerica includes the geographic area of present day Guatemala, Belize, El Salvador as well as western Honduras and Mexico extending into northern frontier. The various subregions are indicated by their associated cultures

Mesoamerican Conceptions of Food and Culture

> *We live HERE on the earth* [stamping on the mud floor]
> *we are all fruits of the earth*
> *the earth sustains us*
> *we grow here, on the earth and flower*
> *and when we die we wither in the earth*
> *we are ALL FRUITS of the earth* [stamping on the mud floor]
> *We eat of the earth*
> *then the earth eats us*. (Knab cited in Broda et al. 1987:107)

Food and cuisine in Mesoamerica, a culturally unified region including central and southern Mexico, Guatemala, Belize, and El Salvador, as well as western Honduras (Evans and Webster 2001:ix), are inseparable from a worldview largely modeled on the life cycle of plants, particularly that of maize (Bassie 2008:19–31; Staller et al. 2006; 2009), directionality, agricultural practices, and systems of reciprocity (Taube 1994). Similar expressions of faith to the one cited above are found throughout Mesoamerica and over much of its known history (see Carlsen and Prechtel 1991). Like Europe or Asia which were culturally unified by Christianity and Buddhism/ Confucianism, respectively, Mesoamerica was linguistically, ethnically and culturally diverse. Nevertheless, nearly all Mesoamerican societies had a 260-day Ritual Calendar, shared similar cosmologies and religious practices, and relied on maize as a staple food crop after approximately 900 BC. Most students of Mesoamerican

Table 1 Basic periods of Mesoamerican history

Early Preclassic (early formative)	2500–1000 BC
Middle preclassic (middle formative)	1000–400 BC
Late preclassic (late formative)	400 BC–AD 200
Early classic	AD 200–600
Late classic	AD 600–900
Early postclassic	AD 900–1200
Late postclassic	AD 1200–1492
Colonial	1521–1821
Contemporary Mesoamerican people	

history are familiar with the Olmec, Maya, the City-States of Monte Alban and Teotihuacan, and the Post-Classic cities of Central Mexico, such as Tula, Hidalgo and the Aztec Imperial Capital of Tenochtitlan. However, there were literally hundreds of cities and towns and dozens of autonomous groups throughout this culture area. Thus, from central Mexico to western Honduras we find peoples who possessed basic cosmological assumptions, religious practices, similar material cultures, artistic conventions, political structures, and foodways. This is not to minimize the great diversity found throughout this region; however, in order to understand Mesoamerican peoples it is important to acknowledge a shared cultural and social history. Mesoamerica has been divided chronologically into periods approximating those presented in Table 1.

Cosmology, Mythology, and Time

One of the major tangible elements of Mesoamerican high culture is a long-standing interest in time, which was in part quantified through the empirical observation of seasonal change and the life cycle of plants and humans (Stross 1994:29–31; see also Flannery 1973, 1986; Freidel 1996; see Rice 2007). The art history and epigraphic record demonstrate an early and sustained engagement with elaborate calendric systems, vestiges of which are still in use in the Guatemalan highlands (see Tedlock 1982; Aveni 2000). There were two major calendars in use in the Maya area during the Classic period: the Calendar Round and the Long Count. The Calendar Round was composed of the ancient, pan-Mesoamerican 260-day Ritual Calendar, which consisted of a number cycle from one to thirteen running concurrently with a twenty days name cycle (*tzolk'in* in Yucatec; *tonalpohualli* in Nahua, lit. count of days), interlocked with what is sometimes referred to as the vague year or *Haab,* a cycle of eighteen months of twenty days and a final five-day ritually dangerous month known as *Wayeb* in Mayan and *Nemontemi* in Nahuatl. In the Maya system the Ritual Calendar was embedded in the Long Count, a continuous count of days that were reckoned from the beginning of the present era on August 13, 3114.[1]

[1]This date is based on the Thompson correlation of 584,285 days. For a full discussion of the issues surrounding the correlation of Maya and Western calendars see Sharer (1994:755–762).

The Long Count was associated exclusively with the Epi-Olmec (e.g., La Mojarra Stela 1) and Maya cultures and appears to have originated in the first centuries of the Common Era and continued in use in the Maya area until the arrival of the Spanish[2] (Houston 2004). Central Mexican cultures did not use the Long Count; however, they made extensive use of the *tonalpohualli* and less frequently the 365-day "Solar" year (Boone 2000:39; Aveni 2000:255). The earliest documented use of the 260-day Ritual Calendar dates to c. 600 BC and is associated with the ancient cultures of Oaxaca, more specifically, the Zapotec at the site of San José Mogote (Marcus 1976:43–45) though. Various theories have suggested that the 260-day Ritual Calendar was originally based on agricultural cycles, astronomy, or human gestation, respectively (see Rice 2007:31–39). Regardless of the exact origins of the Ritual Calendar, it has a clear reference to maize agriculture, because each day-sign seems to refer to specific stages of maize's development during the agricultural year (Stross 1994:29–31). If this analysis is correct then it provides insight into the fundamental religious importance of this cultigen and that ideation surrounding maize agriculture was incorporated into ancient Mesoamerican cosmologies.

Time, as manifested in the cyclical movement of celestial bodies, was perceived of spatially and informed the geography of the sacred landscapes presented in Mesoamerican mythology and worldview (Aveni 2000; Sachse 2008). Mesoamerican cultures perceived a horizontal world divided into four quadrants with each side oriented to a specific direction (Thompson 1970; Freidel et al. 1993; see also Christenson, this volume). The rising and setting points of the sun during the solstices possibly defined the corners of the terrestrial square, while the equinox defined the location of the critically important fifth direction of the world center. In art and mythic imagery a tree, mountain or hearth (Freidel et al. 1993; Carrasco, this volume) represented this central point or *axis mundi*. The union of space and time is well-illustrated in the first page of the Codex Fejérváry-Mayer (see Boone 2007:Fig. 65). This image depicts a quadripartite cosmos where each direction is associated with particular deities, trees, birds, and dates in the *tonalpohualli* (Boone 2007:114–116). Among the Maya, the quadripartite world was symbolized by the quincunx pattern, which in the syllabary of Maya phonetic signs represents the phoneme *bi*. It is suggestive that this sign was used to write the word for "road," *bih*, in Classic Ch'olan, the language preserved in the Maya Hieroglyphic script. Several inscriptions speak of the four roads of the Sun God presumably again referring to the solstices (Carrasco 2005:218–219).

Foods and plants figure prominently in Mesoamerican cosmological schemes and creation mythologies, particularly in descriptions of the four ages preceding the present era. Townsend (1992:120) notes:

> There is also the sense of a search for progressively better foodstuffs: in the first era the giants ate roots and wild fruit; the second era lists *acocentli*, pine nuts; the third era names *ace centli*, millium; and the fourth names *cencocopi*, or *teocentli*, a wild grasslike plant with seeds similar to that of primitive maize.

[2] It is commonly believed that the use of the Long Count ceased with the abandonment of lowland Classic Maya cities; however, the presence of k'atun and bak'tun signs in the Dresden codex suggest that the Long Count was probably still in use or understood until the Conquest.

This ancient cosmology describes the development of foods over the course of the four ages preceding the present era. Interestingly, it mirrors in some respect our scientific understanding of the Mesoamerican dependence upon distinct foodstuffs prior to domestication and a widespread reliance upon maize and other food crops, a time when root crops, such as manioc (*Manihot esculenta* Crantz), appear to have been the staple (see Brown, this volume). It is interesting that in this description the Nahuatl root *centli*, "dried ear of maize" figures in all but one of the foods listed. In fact, as Stross (2006:596) notes terms for maize were used as labels for other edible plants such as *ramón* nuts (*Brosimum alicastrum* L.), known by the name *iximte'* in Tzotzil, literally "maize tree." Among the Huastecs of San Luis Potosí various maize terms, particularly *thipaak*, also the name of the deity who brought maize to humans (Alcorn et al. 2006; see Ochoa, this volume), label the indigenous edible cycads *Dioon spp*. (Bonta et al. 2006) and *Zamia spp*. (Bonta and Osborne 2007). The use of maize terms as a metalabels for other edible foods or plants bearing a mimetic relationship to maize presents evidence for Pre-Columbian systems of classification, wherein maize was not only important to mythology, but also became a key *emic* category, possibly conveying the idea of "edible" (see e.g., Berlin 1992).

With the domestication of maize and its increasing cultivation in the Early Formative period evidence for Mesoamerican metaphoric extensions of food are squarely focused on agriculture and more generally the life cycle of plants, as well as hunting and predation. Throughout Mesoamerica maize in a variety of forms was and still largely is the major staple crop (Anderson and Tuxill, this volume). It is comparable to bread in the West and rice in East Asia (see Ohnuki-Tierney 1993) and, as with these staples, served as a key cultural metaphor. Like Christian religious metaphors in which bread and wine are analogous to the body and blood of Christ, maize was the substance from which humans were formed as well as a major deity in most Mesoamerican religions (Staller, this volume). In indigenous thought, maize becomes human flesh through its consumption, or in myth by a deity modeling it into human form (e.g., Christenson 2003; see also Christenson, this volume). This is in contrast to bread, which like the lamb, is seen as the body of God's son, the consumption of which is celebrated in the rite of Eucharist, where bread becomes flesh in the act of transubstantiation. For Indo-European and Semitic peoples animal husbandry offered an analogy for the relationship between humanity and god, as seen in Judeo-Christian mythology, especially in the metaphor of the Good Shepherd. Lacking large domesticated animals in Mesoamerica, the hunt or perhaps more generally predation took on a more dominant role as a structuring analogy in Mesoamerican thought, informing foodways, mythology and even warfare (e.g., the Jaguar and Eagle Warriors of the Aztec). For instance, the Deer (white-tailed, *Odocoileus virginianus* or of possibly less importance, the brocket deer, *Mazama americana*) is often associated with the Sun in Mesoamerican cultures (see Borgia Codex Page 5, Díaz and Rodgers 1993:Plate 33) and the gods of the hunt (Miller and Taube 1993:74–75). Among the Huichol, the harvesting of peyote was likened to a deer hunt, which also has associations with maize (Myerhoff 1976). So much so that Peter T. Furst (1971:182) states, "deer, maize and peyote are fused into a single symbol complex." In this instance, it is relevant to note that a prey animal is likened to a harvested plant item. This is in contrast to the role predatory animals played in Mesoamerican cultures, whose names identified the major military orders (Headrick 2007:Chap. 4) or occured as part of royal names.[3]

The social ubiquity of these ideas made them ideally suited for the articulation of political power, wherein the ruler or ruling elite either inculcated themselves or their ancestry into the life-cycle of plants, as is graphically illustrated on the sides of the sarcophagus of the Palenque ruler K'inich Janaab Pakal (Schele and Mathews 1998:119–123), or used predation and hunting as an analogy for their own exercise of power. The scenes of captive taking illustrated in much of Mesoamerican art were also likely meant to bring to mind hunting as well as predation. An idea given credence by the analogy made between the ruler and predatory animals, particularly the jaguar (*Panthera onca* L.) (McAnany 1995:149). Likewise, Sahagún recorded that, "[Spiny, Thorny] was said of some ruler, or of a nobleman, of one worthy of great honor. No one could draw very near to him: he was considered as a wild beast" (cf. Townsend 1979:60). Given the importance of the key metaphors of agriculture and hunting/predation, it is not surprising that rulers are both presented as maize embodied (Freidel and Reilly, this volume) as well as a hunter or predator either through scenes of capture or in ritual costume.

The above observations are largely a result of a greater anthropological and archaeological engagement with Mesoamerican peoples over the last century, the decipherment of writing systems and pictorial codices and a clearer, more comprehensive understanding of Mesoamerican iconographic systems (Marcus 2003; Houston 2000; Boone 2000, 2007). It is important to note that Mesoamerica was the only region in the Americas in which a highly specialized literary tradition existed prior to the Contact Period (Houston 2004; Anderson et al. 1976). Native documents, as well as early colonial sources produced by native scribes, have been invaluable for scholarship on Mesoamerica foodways, as the contributions to this volume demonstrate. As our understanding of these indigenous documents improves, we will no doubt be able to explore in greater detail how foods, cuisines, and their production served as larger cultural metaphors. As we will see in the next section, while Europeans were duly impressed with indigenous botanical knowledge and saw the value of traditional cuisines and plant resources, the cultural metaphors discussed above were exotic to Western sensibilities. Consequently, they were largely ignored or lost in time, in part, because they were incongruent with European worldviews and cultural metaphors, since in some cases they were anathema to their religious values (Fabian 1983). Moreover, the colonial government was actively seeking to convert indigenous populations to Christianity and suppressing practices, rituals, festivals, etc., perceived as idolatrous (see e.g., Traboulay 1994; Las Casas 1992).

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[3] Jaguar, *Bahlam*, is particularly a common name among the Maya, but is also the given name of Lord 8 Deer (8 Deer is his name based on his birthday in the *Tonalpohualli*).

Colonial Sources and Perspectives on Mesoamerican Foodways

The beginning of the European study of Mesoamerican foodways, botanical knowledge and associated beliefs dates to the early Colonial descriptions and codices produced by missionaries and their indigenous informants and students.[4] These documents provide among the most detailed accounts of the uses of food crops, economic plants, tribute systems and dietary habits among the indigenous cultures of Mesoamerica at the time of European contact, as well as the cosmological systems through which indigenous foods and cultural institutions were rationalized (see e.g., Carrasco 1999; Schwartz 2000). Europeans were highly impressed with indigenous botanical knowledge so much so that Cortés could write of the Imperial gardens of Huaxtepec that they were,

> … the greatest and most beautiful and fresh ever seen, because it has two circuitous tongues of land, and through the middle runs a gentle stream, … There are small dwellings and very fresh gardens and an infinite amount of trees of a wide variety of fruits and many herbs and odoriferous flowers, and surely the elegance and greatness of this garden deserves admiration. (cf. Granziera 2005:87)

Huaxtepec was among the most ancient botanical gardens in the world (Maldonado 2000:170–177) and appears to greatly surpass what then existed in Europe. The clear importance of indigenous medicinal knowledge to colonial powers prompted the production of the Codex Bodiano (Gates 2000), a bilingual treatise in Nahuatl and Latin on medicinal plants interesting also for the continued use of a native pictorial idiom.

While European explorers and clerics saw the value in American plant resources and indigenous knowledge they also rationalized the cultural institutions in which this knowledge was embedded through the lens of their own worldview. Needless to say, the sixteenth century worldview, conditioned as it was by traditional medieval folklore, Holy Scripture, and classical literature saw little value in native cultural institutions.[5] Nevertheless, the discovery of the Americas had a profound impact on European and Asian foodways even if these imported foods were stripped of their original cultural context (Coe 1994; Schiebinger 2004) or their source cultures viewed unsympathetically (Sauer 1969).

Our current perceptions of Mesoamerican foodways are complicated by these initial cross-cultural exchanges in foods. Commodities such as maize, chocolate, vanilla, potatoes, chilies, and many other plant resources quickly spread through-

[4] Among the most important of these documents are the Codex Mendoza (1541), Codex Badiano de la Cruz 1552 (De la Cruz 1552 [1991]), and Florentine Codex (1590).

[5] The literate population of sixteenth century Europe was incredibly small, consisting primarily of clerics and members of the aristocracy and all were literate in Latin. The ways of life of most of the population continued to follow patterns typical of the Medieval world until the industrialization and the formation of the modern European nation states. However, most of the missionaries and a number of the conquistadors were from educated classes and therefore saw the world through a literary knowledge of biblical and the classical literature.

out the world by Spanish and Portuguese explorers (Schiebinger 2004). However, each cultural system tended to categorize these foods according to its own classificatory system (see e.g., Hopkins 2006). Thus, for much of European history maize was referred to as Turkish Corn and also “Turkey wheat,” because Turkish traders spread the plant throughout the Mediterranean and were said to have planted it when other grains were scarce (Finan 1950:159–160). For many centuries, European commoners believed maize was brought to Europe from the Far East instead of the Americas (Finan 1950; see also Camporesi 1993). The tomato was thought to be indigenous to the Old World, where it was called “apple of love” and “wolf apple” because of an association to Roman and Greek mythology (Gerard 1975[1633]:Chap. 60:346; Camporesi 1993; Coe 1994). Such misconceptions were, in part, derived from the reading of classical literature (Staller, this volume). Despite differences in European and indigenous conceptions of food, cuisines, and religious systems the colonial documents are a remarkable resource to modern scholarship, which is still heavily dependant upon these first- and secondhand accounts. Ethnohistoric documents were primarily written to be part of history, and are generally narrative and descriptive, and their value to the topic of Pre-Columbian foodways is that they provide a relatively pristine picture of Native culture (Carmack 1973; Carmack et al. 1996). Such documentary and historical evidence provides a basis to project cultural patterns and traditions into the past and, with ethnographic data, a basis to measure how certain customs and beliefs have changed over time in Mesoamerica (Serra and Lazcano, Ochoa, this volume).

Modern Research on Mesoamerican Foodways

Modern investigations of Pre-Columbian foodways have been largely focused on the cultural, economic, ritual, and political significance of consumables as a means to express status and hierarchical relationships within a culture, or among interrelated cultures. Since the manipulation and redistribution of food crops were often the basis of ancient Mesoamerican economies, archaeologists and anthropologists have used foodways and economic resources as windows onto issues of social hierarchy, the origin of civilization, and the development of complex social organization (Tannahill 1973; Goody 1982; Montanari 1994; Wiessner and Schiefenhövel 1996; Dietler and Hayden 2001; Bray 2003). Anthropological research on the role of food and feasting to marking status and hierarchy has historically been focused upon how high ranking elites manipulated consumables to reify status and consolidate labor, redistribution, and tribute systems (Dahlin et al., Freidel and Reilly, this volume). Accordingly, the recent literature has explored the economic significance of consumables, ritual feasting, and food’s importance to status and hierarchical relationships within cultures or among interrelated societies (Dietler and Hayden 2001; Bray 2003; Heine 2004). Since the manipulation, storage, and redistribution of food crops were often the basis of ancient complex economies, archaeologists and anthropologists have also used food and feasting to explore issues of adaptation, social hierarchy, the origin of civilization, and the development of complex social organization (Parsons, Williams, Cheetham and Freidel and Reilly, this volume; see also Tannahill (1973); Wiessner and Schiefenhövel 1996; Dietler and Hayden 2001; Bray 2004).

The literature on Old World cuisines have often been concerned with religious and symbolic themes (Simoons 1961; June and Parks 1981; Grimm 1996; Ohnuki-Tierney 1993; Adamson 2002; Allen 2002; Ruiter 2003; Halstead and Barrett 2004; Faas 2005; Fagan 2006). Like the West, where there has been a long history of religious prohibitions against the consumption of certain kinds of foods and plants (Hill 1761; Apperson 1916; Terry and Pellens 1928; Simoons 1961, 1968, 1998; June and Parks 1981; Heine 2004), research on Pre-Columbian foodways indicates that food restrictions and ritual fasting were also observed among cultures throughout this hemisphere. Many sixteenth century accounts from Mesoamerica emphasize that the consumption of certain dishes and drinks were restricted to a particular feast day in the annual cycle, or to the veneration of particular deities and mythological beings (Staller, Serra and Lazcano, Ochoa, this volume).

Foodways studies have also considered the role of specific plants, particularly economic staples, medicinal plants and herbs, and their various roles in both ancient and modern societies (Weatherwax 1954; Andrews 1982; Long-Solís 1986; Simoons 1998). With increasing access to and analysis of colonial accounts, medieval and ancient documents on Old World and Asian cuisines, the study of the kinds of foods consumed, their cultural contexts and significance continue to inspire considerable scholarly research (Kirsch 1973; Tannahill 1973; Rose 1989; MacLeod and Rawski 1998; González 2001; Halstead and Barrett 2004; Heine 2004; Freedman 2007).

In Pre-Columbian studies, a growing number of anthropologists, archaeologists, and art historians have produced extensive field research on the significance of food and cuisine to culture, ancient economy, and ethnic identity. These studies have generally revealed that the cultural roles that foods and cuisines played are complex and diverse, in some cases, they differ dramatically from culture to culture. This is due in part to the role that certain food plants play in the construction of ethnic identity (Tuxill et al., this volume). They demonstrate that food, like art, conveys an array of social meanings and offers testament to ancient economy and social complexity (Coe 1994; Taube 1989, 1996, 2004). The purpose of this volume is to introduce prospective readers to state-of-the-art, interdisciplinary research on Mesoamerican foodways. This volume presents various scholarly approaches and perspectives on food, culture, and markets in Mesoamerica divided into three major sections each organized by theme and scope as well as approach. The editors' goal is to present differing emphases and kinds of data generated among and between fields, in order to illustrate the comprehensive breadth and scope generated by truly interdisciplinary research.

Part I: Agriculture and Social Complexity: The Roles of Feasting and Ritual Economies

The contributions presented in the first section focus largely upon adaptation, cultivation, the management of plants and food crops, and the ethnohistoric information surrounding such themes. It also includes syntheses of plants that were of particular importance to Mesoamerican societies because of their association with elite status and their consumption in the context of rituals and feasts marking the annual cycle (Serra and Lazcano, and Joyce and Henderson, this volume). Cecil Brown explores the linguistic history of forty food crops through a glottochronological study of terms from many Mesoamerican languages. His conclusions regarding the antiquity and spread of certain crops is in most cases consistent with the archaeological evidence reported thus far. Historical linguistics provides a basis for the earliest presence of certain food crops among various cultural groups and indirectly addresses questions surrounding the dependence upon agricultural economies in different regions of Mesoamerica (Brown, this volume). Contributions also explore the many roles of domesticated and wild plants to the development of complex sociocultural institutions in Mesoamerica. The chapter by Jeffrey Parsons challenges our current understanding of domestication and the role of domesticated plants and animals in the rise of civilization. The scale and extent to which wild species such as maguey were managed and cultivated, and the degree to which aquatic insects and algae were intensively exploited, distinguishes central highland Mesoamerican civilization from other New World civilizations. The pastoral niche in Mesoamerica involved economic resources that were of secondary significance to agro-pastoral societies in other parts of the world (Parsons, this volume). The large-scale management and consumption of the maguey cactus, aquatic resources, and algae questions how scholars define the parameters of cultivation, the domestication process, and more generally an agricultural economy. These contributions present a general overview of the region, early European perceptions of Mesoamerican cultures, and explore the nature of the prehistoric economy across time and space. The appearance of both Native and European words and names referring to certain food crops, provide readers with a basis for estimating their antiquity within specific Mesoamerican cultures. These terms also provide insight into how and why Western cultures perceived them in the past and present day (Staller and Brown, this volume). Much has been written regarding how certain food and drink associated with ritual feasting were preserved and filled the markets and warehouses as forms of tribute (Staller and Dahlin et al., this volume). Authors pose questions and present evidence on the role of foodways to the ancient agricultural economy and how ritual economies and tribute in the form of consumables were critical to cultural complexity. These chapters analyze how foodways had a generative and dynamic relationships with ideological expression and symbolic associations, which directly reference ethnic and cultural identity (Serra and Lazcano and Joyce and Henderson, this volume).

Ethnohistoric documents and accounts explore the social, ritual, and symbolic significance of foodways since the conquest period. The different roles of food and cuisine as well as their preparation and social and symbolic importance are explored in diverse chronological and cultural settings. Researchers also discuss the economic importance of Mesoamerican foods in the modern world and how their preparations and uses contrast and compare to what is revealed in the colonial accounts and archaeological record (Staller, Serra and Lazcano, Parsons, and Williams, this volume). Although Western culture generally measures the importance of food crops by their economic potential, plants such as maguey, maize, and cacao appear to have had complex and varied relationships to deities, mythological beings, as well as to status and cultural identity in ways that have few equivalents in the secular modern world.

Part II: Ethnography, Ethnobotany, Language and Diet

Part II presents archaeological, anthropological, linguistic, and ethnobotanic approaches to specific cases. Enormous strides have been made toward deciphering the symbolic and literal association of food plants, and beverages to ancient Mesoamericans (e.g., Taube 1989, 1996; Houston et al. 1989). Ceramicists and art historians have long studied ancient pottery to identify distinct levels of status and rank in ancient Mesoamerican societies. Contributors to this volume employ ceramic analysis and linguistic and iconographic interpretation on ancient pottery to offer considerable insights into the diet of ancient Mesoamericans (Cheetham, Beliaev et al., and Hull this volume). Some of the contributors explore how food and drinks were recorded in ancient hieroglyphic texts painted on ceramic vessels (Beliaev et al., and Hull, this volume). This research has also revealed "ancient recipes," as well as the social context of the consumption of the food and drink that these vessels contained. Chapters also explore how certain plants were prepared and consumed, and highlight the continuity of particular cuisines and beverages from Pre-Columbian times to the present. Data from experiments on cacao beverages, using ingredients from Tabasco and Oaxaca, indicate that ritually prepared "calcified" *pataxte* (*Theobroma bicolor*) was successful in raising foam (Strupp Green, this volume). Scholars focused upon cacao and the various beverages associated with its consumption have long been puzzled by how ancient Mesoamerican cultures created the height and density of the foam in their beverages. These data suggest that it was probably related to the preparation and fermentation of this related species. Authors also present macrobotanical evidence and data on the chemical and psychotropic properties of certain plants and how this plays a central role in their consumption (Strupp Green, Goldstein and Hageman, this volume). Amber O'Connor presents ethnographic evidence, which indicates that food in Mesoamerica is not simply about nutrition, but can also be manipulated to symbolically express aspects of religious belief and gender relations. Maize, cacao, chiles and other important economic floral and faunal resources were commonly left as offerings at major Mesoamerican temple centers (Long-Solís 1986; López-Luján 1994; Taube 1996). Researchers also explore the kinds of plants and animals that were commonly left as offerings at sacred centers during ancient times and how these cultural patterns vary across time and space (McNeil 2006; McNeil et al. 2006; see also McNeil, this volume). Other contributors present evidence from contemporary societies dealing with the role of foodways and certain food crops in the preservation of cultural traditions and identities. Eugene Anderson traces the development of the cuisine of the Maya of Quintana Roo to show how syncretism and acculturation by Spanish colonialism and later integration into a world economy have changed cuisines and foodways (see also Fedick et al. 2003). John Tuxill and his collaborators present ethnographic evidence from the Yucatan, where slash and burn *milpa* agriculture still provides most of the basic foodstuffs. Their research has identified over fifteen distinct maize varieties or landraces. They discuss the importance of these landraces in marking ethnic identity and the Yucatec Maya's struggle to balance the phenotypic integrity of certain varieties with the need to introduce more biologically productive and diverse landraces (Tuxill et al., this volume). These chapters demonstrate the enduring importance of regionally and locally distinct foodways to ethic identity. They lend support to the idea that unique maize varieties are still a living agricultural heritage integral to the Yucatec Maya sense of self and community.

In recent years, paleodietary research using a variety of methods and techniques in stable carbon and strontium isotope analysis has clarified and provided detailed data on the dietary importance of certain plants and other resources in distinct regions and time periods (see e.g., Chisholm and Blake 2006; White et al. 2006; Mansell et al. 2006) Strontium isotopes and elemental analyses of biochemistry involving human skeletons as well as plants and animals can determine whether people, plants, or animals were displaced or brought from areas other than where they are identified archaeologically (Freiwald, this volume). Howie and her collaborators use stable carbon isotope approaches to explore the social biographies of individuals as well as compositional analysis of funerary vessels to provide information on the movement of finely crafted ceramics in the ceremonial center at Altun Ha, Belize. Authors also combine isotopic approaches with microscopic analysis of ceramics associated with Maya burials, to explore ways in which food and ceramics were used in ritual and as funerary offering to signal ethnic and class identity (McNeil, Howie et al., this volume). Such data and integrated approaches greatly expand our understanding of how animal species and certain food crops were manipulated and used by ancient societies and their relationship to ethnic identity. Isotopic research has also increased our understanding of human adaptation, and in some cases challenge long-held theories about the spread and impacts of domesticated and wild plants, aquatic, and terrestrial resources to the development of civilization. Such paleodietary data have provided direct dietary evidence that challenges previous published research of the economic role of particular food staples and their role to development of Mesoamerican civilization.

Part III: Food as Metaphor: Mythology and Iconography

The third section explores symbolic, mythological, and art historical evidence from Mesoamerica. Much of the current scientific literature on Mesoamerican foodways presented in Parts I and II and in other venues is focused upon language, ecology, archaeology, ethnohistory, ethnobiology, ethnobotany (Berlin et al. 1974; Alcorn 1984; Alcorn et al. 2006; Anderson and Tzuc 2005; Lentz 2000; Ortiz de Montellano 1990) and, especially in the case of ancient societies, on the reconstruction of diet (White et al. 2006). These studies have been critical for our current understanding of Pre-Columbian societies and have greatly expanded the discourse on this important topic. However, with notable exceptions, particularly involving maize and chocolate,[6] current literature does not always address the greater cultural dimensions of food, as is the case in the study of foodways in other cultural contexts (see Ohnuki-Tierney 1993).[7] Studies focused on these issues reveal precisely how food and eating can be as taboo laden as sex, as communicative and symbolically rich as art, and as fundamental to religious and mythological thought as ultimate sacred propositions. These aspects of foodways were never separate from ancient economies, markets, and political power, no matter how much we view these institutions as separate in the modern world. The studies presented in Part III explore many of these important issues in the context of Mesoamerican. The religious and ideological basis of foodways is explored particularly with reference to their roles in myth and as larger cultural metaphors.

Carolyn Tate tracks the social, dietary, and symbolism of the *axolotl*, a kind of amphibian (*Ambystoma mexicanum*), to reveal how an important aquatic resource became an important symbol in the iconography of the Early Formative. Using ethnographic and ethnohistoric data, Lorenzo Ochoa analyzes the importance of landscape and place to foodways in his examination of the connection between Huaxtec regional cuisine, place and cultural identity through the intriguing theoretical approach developed in cultural geography called *topophilia*. He suggests that through topophilia it is possible to delimit micro-cultural subregions on the basis of the distribution of certain ingredients from specific Huaxtecan dishes.

The chapters of Stross, Christenson, and Carrasco examine how ritual, myth, and daily practices, such as cooking, eating, and feasting become encoded in myth, religion, and other cultural metaphors. Brian Stross examines the role of food in Maya religion. He observes that food was classified into three major categories: food for

[6] Houston et al (2006:Chap. 3) have examined ingestion as a concept in ancient Maya culture; however, there is little additional literature dedicated to the examination of concepts surrounding agriculture, animal husbandry, hunting, cooking, and eating. By contrast, the scholarship on the symbolism of maize (see Staller et al. 2006; 2009) and chocolate (see McNeil 2006) as well as their use in both ancient and modern ritual is vast (e.g., Coe and Coe 1996).

[7] While it is true that Claude Lévi-Strauss (1971) focused on food in his *Mythologiques* nevertheless he looks more to food in mythology as opposed to the symbolic implications of food in the ebb and flow of daily life. Lévi-Strauss (1978) also considered the role of food and feasting to status and hierarchy and has emphasized importance of foods to memory and to particular festivals in the annual cycle.

people, including topics such as feasting, fasting, and forbidden foods; foods for or otherworld inhabitants; and food for the soul. His analysis demonstrates the complex roles of foodways in many spheres of cultural ideation. Christenson approaches similar issues through the lens of feasting in the Guatemalan highlands. He underscores the importance of ritual and feasting not only as part of myth, symbolism and ritual practice, where, for instance, a *cofradía* house can be transformed into the interior of the sacred mountain, but also as a means of consolidating community among living members, ancestors, and even strangers. Carrasco looks to the importance of agriculture and domestic practices, particularly the fundamental act of the changing or building of a three-stone hearth, to argue that these acts were perhaps as formative of Maya and Mesoamerican mythology as astronomical phenomena. The important chapter of Freidel and Reilly investigates how myth and symbolism can be used to understand ancient market-based economies and how storage and tribute played roles in the development of Mesoamerican civilization. They challenge the prevailing perception that Mesoamerican social hierarchies were primarily achieved through coercion, and instead present evidence that the basis of Mesoamerican economies was a symbiotic interdependence among ruling dynasties and their subject populations. Through this examination they present a compelling analysis of the recently discovered Cascajal block and propose that instead of representing a glottographic script that it presents the contents of sacred bundles.

Conclusions

In this volume, we have brought together specialists from a wide range of fields to reflect on the current state of foodway studies in Mesoamerica. *Pre-Columbian Foodways* incorporates detailed evidence regarding paleodiet, plant domestication, early agriculture, cultural geography, ethnobotany, anthropology, art history, epigraphy, and especially archaeology. It is a testament to the vitality of this area of study that, while we have tried to be as comprehensive as possible, this volume is much more a selection of exquisite *hors d'oeuvres* than a complete meal. For this we make no apologies. Consideration of the psychotropic and medicinal properties of plants is beyond the scope of this volume, and the contributions only begin to address the extensive faunal resources that supplemented the ancient Mesoamerican diet (Freiwald, Goldstein, and Hageman, this volume). Likewise, the foods and plant and animal resources represented in the art historical record are only touched upon and unrepresentative of the extensive literature on such data.

We believe that this volume underscores a trend in recently published research that indicates that the study of foodways is presently at a crossroads. There appears to be a shift from research focused on certain important food crops and plants, which had considerable symbolic and economic importance to Pre-Columbian cultures, to a more holistic approach that incorporates the metaphorical and economic importance of a whole host of cultigens and other species central to Mesoamerican foodways. It is apparent that the study and analysis of Pre-Columbian foodways only begins to become intelligible through interdisciplinary approaches and collaborative research strategies that make use of the vast ethnobotanical, biological, and historical data available for this region.

This volume provides a comprehensive overview of the various disciplines that touch on the potential for foodways studies and will be of value to students and scholars of Pre-Columbian studies working in Mesoamerica on this topic. Scholars and students will find that *Pre-Columbian Foodways* provides state-of-the-art research on a variety of topics that are critical to the field on a number of different levels. The various contributions provide examples of the value of interdisciplinary research and collaboration, and demonstrate that the roles of foodways in Mesoamerica are complex, diverse, and play a central role in all areas of culture from basic dietary needs, to revealing the nature of ancient economies, agricultural and domestic practice, and the ritual and mythological importance of food crops and cuisines to ethnic and group identity. These spheres of ideation are interconnected to varying degrees through foodways. While each chapter is autonomous, the three sections of the volume, as well as the arrangement of the chapters build on one another, from general to more specific or provide different disciplinary views of how food crops, cuisines, and the manipulation and management of such resources were critical to understanding Mesoamerican culture past and present.

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Part I
Agriculture and Social Complexity: The Roles of Feasting and Ritual Economies

Ethnohistoric Sources on Foodways, Feasts, and Festivals in Mesoamerica

John E. Staller

Introduction

In the last 30 years, archaeologists worldwide have expanded their interests to include the significance of foodways to our understanding of prehistory. Many of the theories and ideas scholars currently have regarding the economic and cultural significance of food to the development of Mesoamerican civilization were directly influenced by ethnohistorians and sixteenth century documents, indigenous pictorial codices, and interpretations of hieroglyphic writing[1] (Las Casas 1971 [1527–1565]; Gerbi 1985 [1975]; Boone 2000).

In this study, sixteenth century documents, pictorial codices, as well as iconographic and hieroglyphic texts are evaluated in order to consider how earlier Indo-European perceptions of the New World influenced our current understanding of the roles and importance of food to human sociocultural development. The goal of this analysis is to demonstrate that such colonial documents (both Native and European) are particularly useful for the purposes of studying foodways in general, and the roles and uses of certain plants and dishes in particular. Numerous figures in this study are derived from pre-Linnaean herbals from the sixteenth century. These botanical sources were of course not selected for their scientific value regarding taxonomy or classification, but rather, for what they can tell us about inherent European biases and perceptions regarding New World plant species and their subsequent roles in these cultures and their cuisines. The names given various food crops and statements made about them can potentially reveal a great deal

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[1] European arrivals in the New World initiated processes of cultural change that were sometimes rapid and catastrophic, sometimes protracted and complex. The only region in the New World in which a highly specialized native literary tradition already existed before the Contact Period was Mesoamerica (Anderson et al. 1976).

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about how they were perceived in the sixteenth century. Much regarding the roles of ancient foodways was transformed during the Age of Enlightenment. However, many earlier beliefs and preconceptions continued in various ways to influence our understanding of how New World food crops subsequently changed cuisines throughout the world. Emphasis is therefore given to inherent biases, both cultural and religious, and how such differences in perception may have influenced subsequent research on the roles of food crops and economic plants to our understanding of ancient political economy and the rise of Mesoamerican civilization. The earliest primary and secondary accounts regarding the role of food to rituals, festivals, and ancient economy are given priority (see e.g., Schwartz 2000; Anderson et al. 1976; Barber and Berdan 1998).

All ethnohistoric documents were written to be part of history and they are most often narrative and descriptive, but they provide a picture of relatively pristine Native culture (Carmack 1973). The only regions where Native documents compare in ethnohistoric value to the Spanish sources are those written in Mexico and Guatemala during the sixteenth century[2] (Carmack 1973; Carmack et al. 1996; Barber and Berdan 1998).

A New World

The earliest European contact with Neotropical cultures took place in the Caribbean, what was referred to as Hispanola, and then later in Mesoamerica to New Spain (Fig. 1). Much has been written on colonial expansion and warfare, but the discovery and settlement of the New World also had a profound effect upon Western Civilization. During the fifteenth and sixteenth centuries, the Church sanctioned much of political authority through a symbolic, and in some cases literal, association to ruling families. The ruling aristocracy attained great wealth, and in some cases, absolute power over their subjects through a divine right to rule. Before the sixteenth century and for several centuries later, Holy Scripture provided the basis for European perceptions of all things great and small, as well as the creation of heaven and earth. The writings of the Classical Age appeared at end of the fourteenth century, when there was a general revival of learning associated with the Italian Renaissance (De Vorsey 1991:17). Within these writings was the *Geographia* of Claudius Ptolemy, a complete cartographer's handbook, originally written in the second century in Greek. He described a method for producing maps of a curved surface; in other words in latitude and longitude (*ibid*.). Columbus (1930 [1507])

[2] Spanish influence in part stimulated the rich corpus of native Quichean documents written during the sixteenth century. The fact that some of the Spaniards as well as the Mesoamerican scribes were literate is important for the study of Native culture and therefore of potential value to archaeological reconstruction (Carmack 1973; Carmack et al. 1996; Schwartz 2000).

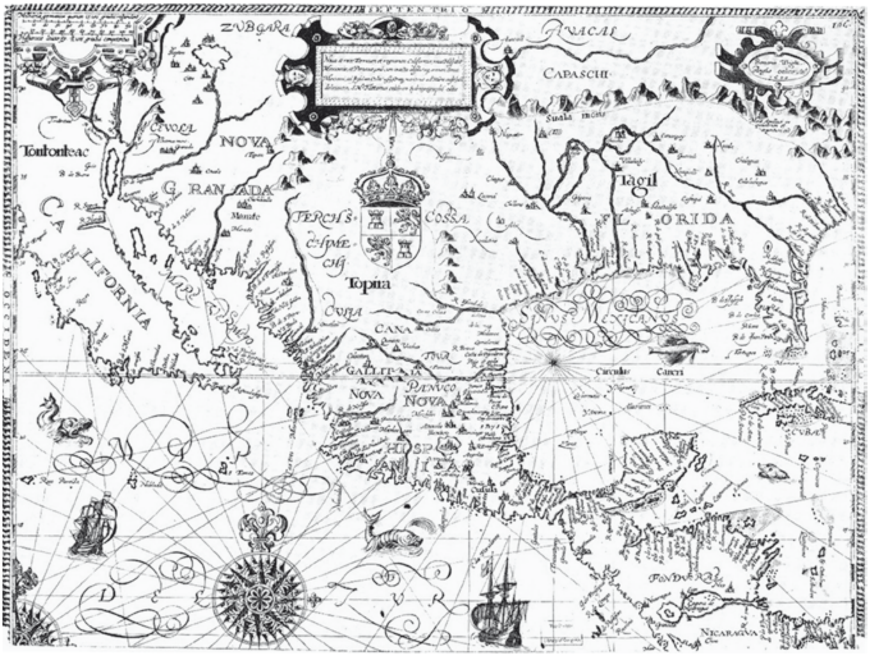

Fig. 1 An sixteenth century Map by the English chart maker Gabriel Tatton engraved in 1600 showing the Empire of New Spain (*Nova Hispania*). European interests by this time appear to have shifted from Hispanola to Mexico, Nova Granada, California, and the northern part of Florida, which was the focus of an expedition by Hernando de Soto in 1540–1543 (from De Vorsey 1991:89) (Courtesy of Library of Congress, Geography and Map Division)

applied the Ptolemaic concept of a west to east extent and of a habitable world or "*oecumene*" to be 180° or half the earth's circumference, thus extrapolating the known world from Western Europe to eastern India and China.

When European rulers sent explorers to find new routes to India and the Far East to gain direct access to its wealth and spices, they came upon a world entirely different than what they had ever seen in depictions of other lands or heard about in scripture (see e.g., Fernández de Oviedo 1969 [1535]; Sepulveda and Las Casas 1975 [c. 1540]); Hernández 1942 [1570]; Sahagún 1963 [1590]). Some clerics and explorers began to comprehend that Holy Scripture did not take into account the existence of this New World. The plants, animals, and cultures were in fact totally alien to anything written or spoken about by the Church in Rome. Europeans nevertheless tried to fit these alien entities into a cultural and religious framework consistent to what was known and familiar to them[3] (Carrasco 1999:11–13). Their

[3] Gruzinski (2001) *Images at War* also provides an examination of this process with regard to images.

efforts have preserved among the richest documentary sources on Pre-Columbian foodways. This New World revealed something that Europeans could never have imagined – a world of untold riches, exotic customs, and strange and wondrous sights. The fact that all things great and small were not mentioned in the Holy Scripture was tantamount to heresy in the minds of ecclesiastics and the aristocracy. It was perhaps for this reason that speculations continued unabated for hundreds of years, and in some cases have become part of European folklore. Fanciful perceptions regarding the origins and roles of plants in Pre-Columbian and later European history were in some cases associated with such speculations and preconceptions. The Spaniards, and later to a lesser degree, the French, English, Dutch and others, nevertheless recorded their impressions of Native cultures from the arrival of the first Conquistadors or Pilgrims to the retreat of the last European official during the colonial periods and wars of independence. Indeed, the propensity of the European colonial officials to keep detailed records of their affairs in their colonies has been of considerable value to students and scholars of the Pre-Columbian New World (Carmack 1973; Carmack et al. 1996; Gadacz 1982; Spores 1980, 1986; Carrasco 1999; Schwartz 2000).

Primary, Secondary, and Native Accounts

Since all ethnohistoric documents were written before the advent of anthropological science and for an audience consisting of European aristocracy and the Holy See, they are most often idiographic, that is, narrative and descriptive (Carmack 1973). However, these documents (e.g., Cortés 1963 [1485–1547]; Cortez 1991 [1519–1526]; Díaz del Castillo 1953 [1567–1575]; Landa 1975 [1566]; Durán 1971 [1581], 1994 [1588]) often have an immediacy and freshness in their descriptions, full of personal impressions and details not found in later documents, which were themselves often compilations of these early firsthand accounts (Carmack 1973; Carmack et al. 1996; Gadacz 1982; Barber and Berdan 1998; Schwartz 2000; Townsend 2000). The earliest conquistador and ecclesiastic accounts largely consist of firsthand accounts and are particularly valuable because they represent direct observations of nearly pristine indigenous culture. In fact, scholars noted that sixteenth century Spanish accounts, as a body of information about native life, fare well with documents produced by indigenous authors (Anderson et al. 1976; Carmack et al. 1996). Most of the pre-Contact codices were destroyed in various campaigns to eradicate pagan idolatry (Acosta 1961 [1590]; Durán 1971 [1581]; Landa 1975 [1566]; Las Casas 1992 [1552]; Sepulveda and Las Casas 1975 [1540]). Those codices produced after the conquest were by large commissioned by Spanish nobility and illustrated by converted indigenous and mestizo scribes. Consequently, some of the content may have been conditioned to varying degrees by sixteenth century European perceptions and cultural biases. Codices and indigenous writings and their associated artistic traditions provide a basis for understanding the conquest from different points of view.

European accounts are largely unsympathetic toward native culture, and most of the earliest *relaciones* were predicated on an underlying desire to gain privilege from their patrons, the European aristocracy, and the Holy See (Innes 1969; Carmack 1973; Adorno 1992; Brooks 1995; Newsom and Deagan 1994; Barber and Berdan 1998). Until archaeologists and historians rediscovered them at the turn of the twentieth century, accounts by the Conquistadores, ecclesiastics, explorers, and soldiers of fortune were largely relegated to the dusty archives of history, or to monastic repositories and libraries in the former colonies of France, England, Portugal, and particularly Spain (Carmack 1973; Gadacz 1982). These firsthand descriptive narratives have had a profound influence on our understanding of ancient Mesoamerican peoples. Documents and Native codices created through the interaction of Europeans and indigenous populations, or those authored by natives who had become proficient in the Latin script, such as the later codices, have provided valuable insights into Pre-Columbian foodways (see e.g., Sahagún 1963 [1590]; Baird 1993; Berdan et al. 1992 [1541–1542]). The earliest colonial accounts are the primary sources, that is, Conquistadores writings, and *relaciones*, which recorded what natives told colonial officials in the context of legal claims, tribute, and religious practices (Innes 1969; Gadacz 1982). These documents offer a rare window onto the ways Mesoamerican societies perceived their world, which, in many ways, was totally alien to the perceptions of their European counterparts.

Using Ethnohistoric Sources

Ethnohistoric sources have become increasingly important to archaeological research since the early 1980s (Gadacz 1982; Spores 1980, 1986). The examination of early ethnohistoric accounts, particularly colonial botanicals or herbals, have played an important part in our understanding of the economic roles of native food crops in the development of Pre-Columbian civilizations. The accuracy of colonial accounts is another matter, and we can only speculate about the extent to which the personal ambitions of many explorers and Conquistadores colored their decisions, actions, and accounts regarding the conquest of Tenochtitlan and the Aztec Empire, the Maya and other cultures of this region[4] (Cortez 1991 [1519–1526], Cortés 1963 [1485–1547]; Díaz del Castillo 1953 [1567–1575]; Durán 1964 [1588]; Tezozómoc

[4]The conquistador Hernán Cortés de Monroy y Pizarro wanted his reports to the Spanish crown to justify his actions and those of his army. He had essentially absolute power in the Mexican capital of New Spain and a distinguished author, Francisco Lopez de Gómara (1966 [1553]) write the history of the conquest for him (Schwartz 2000:159–161).

1944 [c. 1598]; Gómara 1966 [1553]). Both historians and literary scholars have subjected the letters of Hernán Cortés to analysis since they were published. Brooks (1995:149) suggests that Cortés fictionalized certain events in order to fit his actions into the framework of Spanish legal and political theory.[5] Rolena Adorno (1992) demonstrated that Díaz's account represents the fusion of eyewitness and authoritative or official accounts. These studies suggest that in some cases the Conquistadores formally agreed upon a story before ultimately submitting it to the written word (see also Cerwin 1963; Saenz and Maria 1984).

Western Conceptions of New World Traditions

The civilizations, cultures, landscapes, plants, and animals of the New World fascinated as well as troubled European explorers. Since New World societies were not found in the Old or New Testament, many European clerics and biblical scholars searched for explanations for their existence even into the eighteenth century, during the Age of Enlightenment (Traboulay 1994). Spanish chroniclers in fact speculated that the indigenous cultures and civilizations of Mesoamerica were descendants of the ten lost tribes of Israel (Durán 1994 [1588]:3–7). This widespread belief was based on the Book of Genesis, and persisted in various forms into the nineteenth century and even to the present (Durán 1994 [1588]:8–10). As trusted subjects of the Crown, expedition leaders such as Christopher Columbus and Amerigo Vespucci speculated that Native Americans came to this hemisphere as a result of the Great Biblical Flood (Columbus 1990 [1492]; Traboulay 1994). The Jesuit Jose de Acosta (1961 [1590]:45, 54) imagined they came from Africa, although he was more objective and scientific in his assessment stating, "*we would like to know how and why they came*." Jesuit clerics and chroniclers who encountered the Native societies in the Andes speculated that they were descendants of the ancient Chaldeans[6] because societies worshiped and provided offerings to natural features such as mountains, lakes and springs, as well as celestial bodies in the night sky (Valera 1968 [1594]:153–154; Hyland 2003:96; Staller 2008b:269). Although European explorers and ecclesiastic accounts could provide Biblical explanations for the societies they encountered, the natural world was another matter.

[5]This may be in part why Bernal Díaz del Castillo's (1953 [1567–1575]) first-hand accounts of the conquest were rewritten years after the events he witnessed had taken place. Díaz's account was completed about 1567 and sent to Spain in 1575, where it remained unnoticed in the papers of the Council of the Indies and was finally published in 1632 (Cerwin 1963; Saenz and Maria 1984).

[6]Chaldeans were a Babylonian society that occupied the Plain of Sennaar in the Persian Gulf in the 6th century BC. Chaldean oracles played an important role in Hellenistic religious cults between 100 BC-AD 100. Knowledge of such ancient societies came to Europe with the revived interested in the writings of the ancient Greeks and Romans.

The study of ethnohistoric sources also reveals a great deal about the nature of indigenous economies. These sources provide yet another window into how ancient political economies were organized socially, and how both food crops as well as other subsistence and utilitarian resources were managed, stored, and redistributed by the elite to their subject populations (see e.g., Berdan 1982; Berdan et al. 1992 [1541–1542]). Present day economic staples such as maize (*Zea mays* L.), peppers (*Capsicum* spp.), and squash (*Curcurbita* spp.) were unknown in Europe prior to the arrival of Columbus in 1492 (Schiebinger 2004). The trade and commerce of these and other food crops and economic plants into the Old World and Asia had far reaching effects upon cuisines and foodways worldwide (Coe 1994; Schiebinger and Swan 2005).

First Impressions

When the Italian explorer first set foot on Watling Island, a place he named San Salvador in the central Islands of the Bahamas on Friday the 12th of October in 1492, he found naked people who were by all accounts, " *...very well made, of very handsome bodies and very good faces*" (Columbus 1990 [1492]:30–31; Rouse 1992), who he believed would be "*... good servants and intelligent, for I observed that they quickly took in what was said to them, and I believe that they would easily be made Christians, as it appeared to me that they had no religion*" (Columbus 1990 [1492]:38). A religious alliance between the Spanish Crown and the empire of the Great Khan in the Far East, directed against Islam, was a longstanding goal in the European mind, extending back to the Crusades and the writings of Marco Polo. Columbus in fact carried a 1485 edition of Marco Polo's travels on his voyages (Sauer 1969:7, 16; Bradford 1973:79). Columbus also agreed to be engaged in matters concerning the service of God and the Catholic religion, "*necnon benefficium et utilitatem nostram*"[7] (Ife 1990:xvii). He believed he had discovered the

[7]According to the *Capitulaciones*, the formal agreement between the Spanish Crown and Christopher Columbus, the explorer would become the viceroy and governor-general of any and all lands and islands he discovered (Columbus 1970 [1492]:23; Ife 1990:xvi). The Spanish Crown would take ninety percent of all the income generated from the territories under his jurisdiction (Ife 1990:xvi–xvii). In the prologue to the Journal of the expedition itself, it is written; "*Your Highnesses, as Catholic Christians and princes devoted to the holy Christian faith and the furtherance of its cause, and enemies of the sect of Mohammed and of all idolatry and heresy, resolved to send me, Christopher Columbus, to the said regions of India to see the said princes and the peoples and lands and determine the nature of them and of all other things, and the measures to be taken to convert them to our holy faith; and you ordered that I should not go by land to the East, which is the customary route, but by way of the West, a route which to this day we cannot be certain has been taken by anyone else*" (Columbus 1990 [1492]:23). The accounts provide considerable detail regarding religious rituals because many ecclesiastics and political authorities were focused upon identifying "pagan idolatry." Thus, accounts by religious clerics are generally rich sources of information for Pre-Columbian scholars.

outlying islands of Southeast Asia, and accordingly referred to the inhabitants of the new lands as, "*Indios*," or Indians (Sauer 1969:4–6). Later this identification grew to encompass all the indigenous peoples of the New World (*ibid*.).

After Europeans had begun to settle in different regions of the Neotropics, they soon realized that there were no large domesticated herbivores or pack animals, like the horses, cattle, oxen, and donkeys as in Europe. The primary New World economic staples were almost all plant species and most all societies obtained most of their meat from hunting terrestrial mammals and birds, or exploiting the rich aquatic resources in the streams, lakes, and coastal lagoons (Sauer 1969:58–62; see also Scholes and Roys 1968; Williams 2004; Parsons 2006; Ochoa and Jaime 2005). The tendency of the conquistadors to evaluate what they observed in their initial encounters with Amerindians in terms of relative size and similarity to their own civilization is useful for understanding how certain food crops came to have a role in the colonial cultures of the New World and Europe (see e.g., Las Casas 1971 [1566]; Díaz 1953 [1567–1975]; Fernández de Oviedo 1959 [1526]; Landa 1975 [1566]).

Many of the Europeans that came to the New World after the arrival of Columbus and later Cortés were not searching for a passageway to India, but rather escaping religious persecution. The discovery of the New World coincided with the Protestant Reformation and the spread of literacy beyond the clerics and political elites, due to inventions such as the printing press.[8] Many Western ruling families were seeking wealth by establishing trade routes and colonies in other parts of the world (Sauer 1969:13–17).

Early explorers preserved a detailed record of the cuisines, customs, plants, and animals they encountered in New Spain. The aristocrat Gonzalo Fernández de Oviedo y Valdés (1969 [1535]) and the Dominican priest Fray Bartolomé de Las Casas[9] wrote accounts of the New World that later had a profound impact in both

[8] The Protestant Reformation threatened the power and authority of the Catholic Church in Europe, as many Catholics were troubled by what they saw as false doctrines within the church, particularly the teaching and sale of plenary indulgences (Tentler 1977). When Rome was sacked in 1527 by the mutinous troops of Charles V, Holy Roman Emperor, this marked a crucial victory for the Holy Roman Empire over the League of Cognac, which allied the Vatican with France, Florence, Milan and Venice (*ibid*.). The sacking of this great religious and cultural center was a harbinger of the overall decline of the authority and power of the Catholic Church throughout Europe in later decades (Coe 1994:32). Another factor that fostered the Protestant Reformation was the spread of literacy, particularly the invention of the printing press by Johann Gutenberg c. 1439. Such advances had a direct effect upon how and to what detail discoveries in the New World were recorded and disseminated.

[9] The clergy were generally the most literate and highly educated of the Europeans who first came to this hemisphere, and they were the first to focus upon and learn to speak the native languages. Around 1540, Las Casas came to the defense of the Indians of Guatemala and initiated his program of peaceful pacification in Veracruz (Las Casas 1992 [1552]). The *Apologética Historía de las Indias* remained in manuscript form until 1909, when it was published in Madrid (Sepulveda and Las Casas 1975 [c. 1540]). The sympathetic, ethnographic tradition of the Dominicans persisted for over two centuries. The Franciscans, who first came to the New World in the 1530s, never developed an ethnographic tradition equal to that of the Dominicans. Nevertheless, their excellent dictionaries (Quiche and Cakchiquel) attest to an early interest in proselytizing and the native cultures (Ochoa and Jaime 2005).

the social and natural sciences.[10] Fernández de Oviedo's (1959 [1526]) book on the natural history of the Indies was first issued in 1526 in Toledo in the form of a summary, and represents the first systematic attempt at a natural history of the New World. European wood carvers and illustrators used Oviedo's descriptions of exotic plants and other objects from this book, and many became part of Western folklore. Oviedo's book described and illustrated plants used by Native Americans such as the pineapple and tobacco among other things, as well as provided information on hammocks. A fanciful depiction of a hammock from the 1st edition of Oviedo's *De La Natural Hystoria de Las Indias* was described as follows: "*The beds on which they sleep are called hamacas* [hammocks]*, which are pieces of well-woven cotton cloth and of good and pretty tapestry*" (*ibid.*). When European ship builders, sailors, and explorers subsequently incorporated hammocks on their ships, it forever changed long-distance travel on the Seven Seas (Sauer 1969:236). Oviedo (1959 [1526]:239–243) also wrote extensively on the pineapple, and it became quickly popular with European aristocracy. The pineapple gets its name from Peter Martyr who described it as having the shape and color of a pinecone (Martyr 1912 [1516]:262), and this is reflected to some extent in this fanciful German wood cut (Fig. 2). Oviedo not

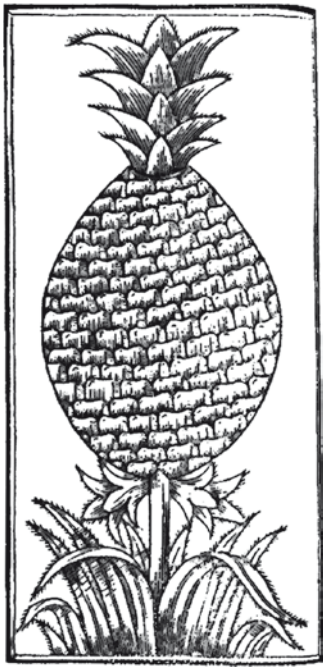

Fig. 2 Earliest image of a pineapple from the 1st edition of Oviedo's *De La Natural Hystoria de Las Indias*, Seville c. 1535. Peter Martyr stated that King Ferdinand of Spain tried a pineapple and confided it was the best fruit he ever tasted. Most of the botanical wood cuts made in Nuremburg were based upon descriptions by Oviedo from his *Sumario* and later editions of his natural history (Courtesy of Field Museum Library, Chicago) (Photograph by John E. Staller)

[10] The first part of Oviedo's *De La Natural Hystoria de Las Indias* appeared during 1535 in Seville. However, the complete work was not published until 1851–1855 for the Spanish Academy of History. Though written in a diffuse style, it embodies a mass of curious information collected first hand. The incomplete Seville edition was widely read in the English and French versions published respectively in 1555 and 1556 (Fernández de Oviedo 1969 [1535]).

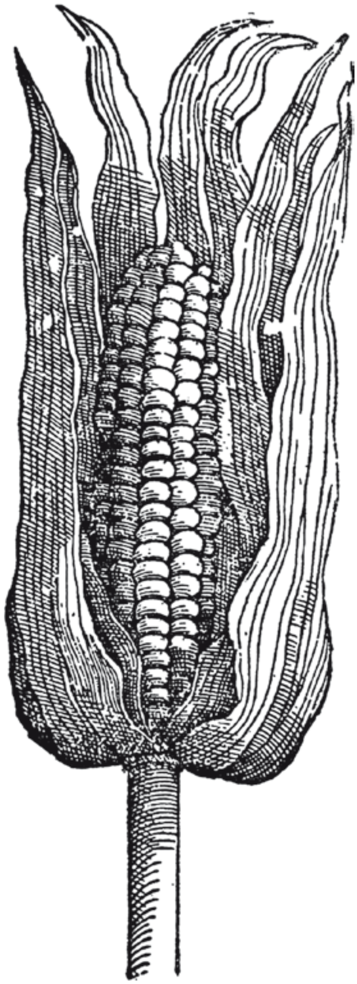

Fig. 3 This wood cut was long believed to be the earliest printed depiction of maize (*Zea mays* L.) presumably a floury popcorn from Oviedo's *De la Natural Hystoria de Las Indias*, Seville. Originally it was believed to have been in the 1535 edition. Scholars have recently documented that it first appeared in the 2nd edition of *Natural Hystoria* c. 1552. Many herbalists believed Turkish traders brought maize into Europe from the East (from Finan 1950:Fig. 1)

only reported on what kinds of plants Native societies consumed, but how they consumed them. He observed for example, that Caribbean islanders would only consume maize by roasting the ears or parching dry seeds (Sauer 1969:236). Maize was a source of wonder and fascination to Renaissance Europe. An early printed depiction of maize comes from the complete 2nd Spanish edition of *Natural Hystoria*, and it appears to be a floury popcorn variety (Fig. 3). Some pre-Linnaean herbals give the clear impression that within a century after the conquest, the general perception among European explorers, clerics, and botanists was that maize represented a primary economic staple (Fig. 4). Essentially the equivalent to wheat in the Old World, and in some herbals, they even call it 'Turkish wheat' (Gerard 1975 [1633]:81). In sixteenth century Europe, most people believed Turkish traders spread maize to regional food markets throughout the Mediterranean

Fig. 4 These maize stalks called *Türchisch Corn* (Turkish Corn) are now believed by many botanists and historians to represent the earliest printed depiction of maize to appear in Europe. During this time when maize was sold at regional European markets, it was called by this name (from Fuchs 1973 [1543]:*fol*. 473). (Courtesy of Field Museum Library, Chicago) (Photograph by John E. Staller)

(Weatherwax 1954). Spanish traders initially spread maize throughout the Mediterranean in the early 1500s. Venetian traders subsequently traded it to the Far East (Tannahill 1973:246). The Portuguese introduced maize to Africa where it was quickly integrated into the local economies. The extent to which maize was perceived to be a "staff of life," is implied in the 1633 herbal by John Gerard[11] (1975

[11] Maize was initially referred to by its common name, which is taken from the Taíno-Arawakan word *mahiz* or "life-giver" (Weatherwax 1954; Sauer 1950). Such references may have predisposed Europeans to emphasize its economic importance to the rise of New World civilizations. Gerard (1975 [1633]:81) has an image of the "Corne of Asia" suggesting that at this time some botanists believed maize may have come to Turkey from the Far East.

[1633]:81–82) where maize is named 'Turkish wheat' as well as in the German herbal by Leonhard Fuchs as "Turkish Corn"[12] (1978 [1543]: *fol*. 473). Fuchs calls the plant *Frumentum Turcicum* believing it was brought into Germany from Asia by Turks, who were said to have planted it when other grains were scarce (Fuchs 1978 [1543]:*fol*. 473; Finan 1950:159). Maize was the equivalent of wheat in the Old World, and such perceptions no doubt played roles in how the food crop was later disseminated and integrated into the world's cuisines and economies (Weatherwax 1954). Chronicler accounts repeatedly indicate that Spanish explorers preferred maize over most other economic staples, and later demanded it in large quantities as tribute during the Colonial Period. In reference to the Yucatecan Maya, Diego de Landa (1975 [1566]:66) states "*Their principal diet is maize, from which they make various kinds of food and drink; and even though it is drunk* [instead of eaten] *it serves them for both food and drink*." Nevertheless, most of all the early sources describe the most prevalent indigenous cultigens in the agricultural plots of the Caribbean as consisting of *yuca*, that is, cassava or bitter and sweet manioc (*Manihot esculenta* Crantz), and sweet potatoes[13] (*Ipomoea batatas* L.) (Fernández de Oviedo 1969 [1535]:12–14). Tubers and root crops in general were very important to the Pre-Columbian Caribbean and Middle American diet because they were not as susceptible to climatic perturbations (rains, hurricanes, etc.,) and able to withstand drought when maize crops would have been destroyed.

Another important staple food crops are plants from the family Curcurbitaceae, which include squashes (*Curcurbita* spp.), fig leaf squash (C. *argyrosperma*), curcurbit (*Lagenaria siceraria* L.), and gourds (*Lagenaria* spp.) (Smith 2005). Squashes and gourds were not only food staples, but also famine food, and some varieties served as important economic plants. Pumpkin seeds were ground whole to make *sikil*, an important ingredient to certain maize breads consumed at festivals or in the context of rituals (Coe 1994:40). Sixteenth century confectioners in Mexico City markets ground squash seeds to make a praline-like confection, which continues to be consumed this way (*ibid*.:37–41, 238). Winter squashes and

[12] Leonhard Fuchs was one of the founding fathers of botany. His herbal *De historia stirpium commentarii insignes…*" was first published in Latin in 1542, and attempted to identify plants described by the classical authors. The 1543 German edition has descriptions of about 100 domesticated and 400 wild plant species as well as their medical uses (*Krafft und Würckung*) in alphabetical order. Fuchs made no attempt at a natural system of classification, but the wood cuts were however based upon first-hand descriptions, as well as botanical samples and are anatomically and morphologically accurate. Many later sixteenth to eighteenth century herbals have copied images from this herbal. Fuchs' herbal includes 512 images of plants, largely locally grown, and printed from woodcuts. These include some of the earliest depictions of maize and chili peppers in the Old World. Portraits of the illustrators, Heinrich Füllmauer and Albert Meyer, as well as the woodcutter Veit Rudolph Speckle, are contained in the volume. Like the original Latin edition of 1542, the 1543 German edition was printed at the famous shop in Basel (Finan 1950:159).

[13] Austin (1988) postulated that the sweet potato (*I. batatas*) was originally domesticated somewhere between the Yucatán Peninsula and the mouth of the Orinoco River at least 5,000 years ago and spread into South America at around this time.

pumpkins[14] (*Curcurbita moschata* L.) were consumed for their flesh rather than solely for seed (Fig. 5). Scholars have long asserted that some squashes as well as calabashes or bottle gourds (*Lagenaria siceraria*) were initially transported by

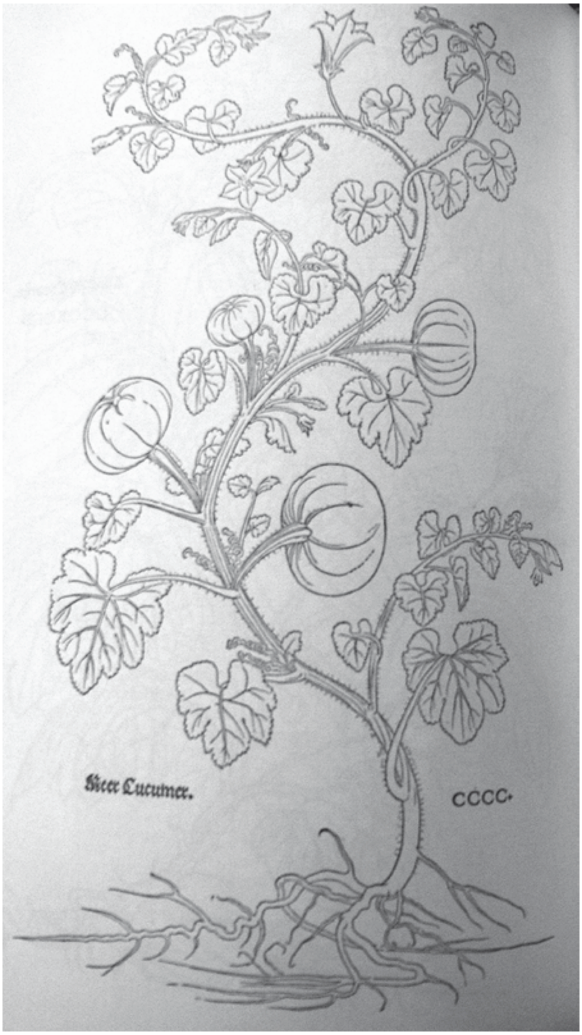

Fig. 5 Illustration of squash, probably pumpkin (*Curcurbita moschata* L.), which was called "*Sicer Cucumer*," suggesting it was thought to be related to an Old World species of melon (*Cucumis melo* L.), and with other tendril-bearing plants from the family Cucurbitaceae (from Fuchs 1973 [1543]:*fol.* 400). (Courtesy of Field Museum Library, Chicago) (Photograph by John E. Staller)

[14] Pumpkins may get their symbolic association with Halloween or Feast of All Souls because it is at around this time of the year when they ripen in the northern hemisphere. What are generally called winter squashes were probably famine foods in the Neotropics, since they usually ripen around the middle of the dry season.

ocean currents as well as overland by humans across the Bering Land Bridge, or crossed oceans to different regions of the Americas (Lathrap 1970). Recent accelerator mass spectrometer (AMS) dating of archaeological specimens indicate that domesticated bottle gourds date to 8000 BP in the Americas, making them among the earliest domesticates[15] (Erickson et al. 2005; Smith 2005). Bruce Smith (1997, 2005) has provided evidence from Coxcatlan Cave to indicate acorn or summer squash (*Curcurbita pepo* L.) may be of comparable antiquity.[16]

When gourds were introduced into Europe in the sixteenth century, they were associated with Old World species of cucumbers and melons (see Fig. 5). Many New World introductions of the family Cucurbitaceae, which is predominantly distributed in the tropics, were confused with similar edible fruits from the tropical regions of the Old World. Gourds and melons were amongst the earliest cultivated plants in both the Old and New Worlds.[17]

Gourds were commonly used as storage vessels and containers. In many rural regions of Mexico, calabash (*jícaro*) are still dried and carved hollow to create a *bule*, a container to carry water much like a canteen. Diego de Landa states that the Yucatan Maya would make balls of maize dough that would, "*last several months and only become sour* [but do not go bad]. *From the rest they take a lump and mix it in a bowl made from the shell of a fruit which grows on a tree and by which God provided them vessels*" (1975 [1566]:66–67). Landa may be referring here to coconuts (*Cocos nucifera* L.), but they could also have been gourds that were used for such containers. Early Colonial Period observations emphasize that gourds were used as containers. They continued to be used widely as containers in Mexico until recently when plastics appeared. New World cultures often planted squash with maize and beans, as the cornstalk provided support for the climbing beanstalks, and also shade for the squash (Mt. Pleasant 2006). What also interested many of these explorers was the identification of what crops constituted the primary economic staples, and many Colonial officials were interested as to whether any such food staples were used in the context of religious rituals and symbols as bread and wine were in the Catholic Mass (Sepulveda and Las Casas 1975 [c. 1540]; Acosta 1961 [1590]).

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[15] Ancient DNA sequence analysis of archaeological bottle gourd specimens and comparison with modern Asian and African landraces indicate the species is native to Asia. Bottle gourds were used as containers and may have been domesticated by hunters and gatherers at the beginning of the Holocene (Erickson et al. 2005).

[16] The earliest uncalibrated AMS dates from macrobotanical squash and gourd remains at Coxcatlan Cave in the Tehuacán Valley include a domesticated *Curcurbita pepo* seed dated to 7100 BP, and bottle gourds (*Lagenaria siceraria*) dating back to 6300 BP, but fig leaf squash (*C. argyosperma*) appeared more recently than previously estimated, with AMS samples ranging between AD 1420 and 1520 (Smith 2005:9442:Table 1). The sudden increase in curcurbit and gourd species in the sixteenth century may be related to their role as famine food among New World populations. The destruction of regional redistribution networks no doubt had widespread devastating, and in some cases catastrophic effects in different regions of Mesoamerica (see e.g., Sepulveda and Las Casas 1975 [c. 1540]).

[17] The phylogenetic relationships between cucumbers and melons have only recently been unraveled through molecular biology (see Ghebretinsae et al. 2007).

Mesoamerican Farming Practices

Mesoamerica is most famous for "*chinampas*," a form of intensive agriculture that was carried out at a massive scale in and around Lake Texcoco (Fig. 6). Aztec engineers artificially constructed small rectangular-shaped areas of fertile arable land[18] called *chinampas* to grow crops on the shallow lakebeds in the Valley of Mexico (Parsons 2006). These floating areas of fertile land were referred to as "floating gardens," by Spanish explorers. *Chinampas* were used primarily in Lakes Xochimilco and Chalco near the natural springs that lined the south shore of those lakes (see Fig. 6). *Chinampas* fields were used to cultivate maize, beans, squash, amaranth, tomatoes, chilies, and a diverse array of flowers, which were particularly important

Fig. 6 Map of Lake Texcoco c. 1519

[18] Chinampas were stationary artificial islands that measured roughly 30 by 2.5 m (Townsend 2000).

to festivals and feasts (*ibid*.). The *chinampas* fields around the imperial capital are estimated to have provided enough food to feed one-half to two-thirds of the populace of the city of Tenochtitlan (Townsend 2000:80–84; Parsons 2006).

Most farming involved simple slash and burn field agriculture. It was Oviedo who first described "slash and burn farming," which is how agricultural plots were fertilized by cutting and burning vegetation to clear ground, stating that: "*The Indians first cut down the cane and trees where they wish to plant it* [maize]... *After the trees and cane have been felled and the field grubbed, the land is burned over and the ashes are left as dressing for the soil, and this is much better than if the land were fertilized*" (Fernández de Oviedo 1969 [1535]:13–14). Initial preparation of agricultural plots was followed by the construction of small earthen mounds or platforms, measuring one foot high and three to four feet in diameter in some areas. Upon such mounds they cultivated their various crops (Fig. 7). Ultimately, the fields or "*conucos*" consisted of a series of small circular earthen mounds, on which a variety of plants were described as having been grown (Newsom 2006:328; Sauer 1969:51–54; Las Casas 1971 [1527–1565]:110). About two centuries later, English and French explorers along the northern border of the United States found Iroquois societies practicing similar multiple cropping,[19] cultivating the so-called "Three Sisters," maize, beans, and squash, on relatively larger earthen mounds (Mt. Pleasant 2006:529).

When traveling through the Maya lowlands, Spanish explorers encountered raised field systems near the Candelaria River, although they did not recognize their significance. Passage along this river of the Chontal Maya, the chronicler Francisco López de Gómara (1966 [1553]:91) informed Cortés in 1519 that their agricultural fields;

Fig. 7 Most New World cultures encountered by Europeans were agricultural societies. The European engraver used Oveido's description of the Arawaks small circular mounds or *conucos* upon which their cultigens were grown. Natives carry water directly to their fields, a form of pot irrigation, in this wood cut from Oviedo's *De la Natural Hystoria de Las Indias* c. 1535 (Courtesy of Field Museum Library, Chicago). (Photograph by John E. Staller)

[19] Agronomists define multiple cropping as growing two or more crops in the same field within the annual agricultural cycle (Mt. Pleasant 2006:534). Multiple cropping was common to various regions of the Caribbean and Mesoamerica and has been found to enhance environmental quality as well as cultivation, particularly in regions prone to flooding (*ibid*.:530–531).

"*both worked and in fallow...*" [are] "*difficult to cross...*" [that those on foot could], "*walk on a straight line, crossing ditches at each step.*" On the Gulf Coast, the Cempoalans channeled water through a series of aqueducts that flowed from the river into storage tanks or cisterns (Ochoa and Jaime 2005:39). From these storage facilities, water was channeled to other cisterns through aqueducts until finally emptying into canals. Maize, beans, and cotton provided large surpluses, which were stored in silos (*ibid.*). Many sixteenth century accounts emphasize the importance of large-scale storage of consumables. Chroniclers also report maize as an important staple in the Gulf Coast. Cacao was actually the most important commercial crop during pre and post-Contact times, and cacao beans, like vanilla beans, also served as forms of currency (Sauer 1969:129; Coe 1994:53–54, 58–59; Brown 2005:117). Other important commercial crops include beans, manioc, yam, squash, and plantain.

The flooded landscape of the Chontal Maya along the Gulf coast of Tabasco represents a unique geography and ecology. Dominated by the Grijalva–Mezcalapa drainages, they comprise one-third of all the wetlands of Mexico (Olmsted 1993:657). This is a region where societies had historically been dependent upon aquatic resources and traded such resources along with plant crops throughout this region of the Gulf Coast (Brown 2005). Adaptation to coastal mangrove forests, and the intense exploitation of aquatic resources as well as crustaceans, were critical to human adaptation in this part of Mesoamerica.

What Native Americans Ate and Drank

Europeans brought their own dietary categories, which they intentionally or subconsciously imposed upon the foods and cuisines of the New World. Some staple foods such as maize fit easily within the category of grains such as wheat. However, many of the foods and processes used in their production were alien and at times revolting to European tastes. Particularly distasteful were insect based or rotten foods such as, "*large fat spiders, white worms that breed in rotten wood, and other decayed objects*" (Tannahill 1973:244), did not find cognates within European cuisines or suit of established tastes, despite the fact that rotten foods such as aged cheese, and pickled fruits and aged smoked meat were important components of Western diets. Since Columbus encountered the Taíno tribes on friendly terms, the "*other decayed objects*" probably included a specialty-zamia bread, manufactured from a species of cycad, made by grating the zamia root and then shaping the pulp into balls. These were left in the sun for two or three days until they began to rot, turn black in color, and become wormy (*ibid.*). When suitably ripe, the little spheres were flattened into cakes and baked over fire on a griddle. The Taínos informed them that, "*If it is eaten before it becomes black and is not full of... worms, the eaters will die*" (*ibid.*:245). They were of course correct; unless zamia pulp is fermented or very thoroughly washed, it may be highly toxic. The societies of tropical America had, in fact, a long tradition of eating the plump insects and algae that abounded in those latitudes. The *maguey* worm (*Aegiale hesperiaris*) or *chinicuiles*

Fig. 8 Maguey worms (*Aegiale hesperiaris*) known as *chinicuiles* or *tecoles* are larvae from a moth and were a delicacy greatly favored at the Aztec court and relished all over the Basin of Mexico. These *tecoles* were photographed at a present day market in Mexico City. There was a long New World tradition of eating various insect species – a cuisine most chroniclers and clerics found disgusting. Red maguey worms of various types are commonly left in bottles of mescal and tequila. Tequila is made from the blue agave plant

was a delicacy greatly favored at the Aztec[20] court and is still relished today (Parsons 2006:113–116) (Fig. 8). Far more acceptable to the Spaniards, was a bread made from another toxic plant, *yuca*, that is, cassava or bitter manioc (*Manihot esculenta* Crantz)[21] (Sauer 1969:53–55). Manioc roots were peeled and grated, and the unwholesome juices squeezed out under heavy pressure (Fig. 9). These, if boiled, could be used to make the harmless cassareep sauce, which could be transformed into that innocuous dish we know as tapioca (Tannahill 1973:245). The pulp itself was sieved and then shaped into flat cakes, which were cooked slowly on a griddle. Soft and flexible when fresh, this cassava bread could be dried and kept for 2–3 years (*ibid*.). Spaniard explorers enthusiastically adopted cassava: in some accounts even claiming it was superior to wheaten bread (Gerbi 1985:32–33; Weatherwax 1954:28–30; Fernández de Oviedo 1969 [1535]).

The realization that Mesoamericans consumed maize as bread, that is, tortillas and tamales rather than as *chicha* or beer, reinforced the European perception it was the New World equivalent to wheat and barley. Rather than make bread from cassava or

[20] Note: The Aztecs did not call themselves by that name, but rather the "Mexica." Although this term is commonly used in the recent ethnohistoric literature (see e.g., Schwartz 2000; Ochoa and Jaime 2005), I have, for the sake of clarity chosen to refer to them by the name they are commonly known in the literature.

[21] Manioc leaves cannot be consumed raw since they contain free and bound cyanogenic glucosides, which convert into cyanide in the presence of a naturally occurring enzyme in cassava. Cassava varieties are often categorized as either "sweet" or "bitter," signifying the absence or presence of high toxic levels of cyanogenic glucosides (White et al. 1998).

Fig. 9 Manioc (*Manihot esculenta* Crantz) was called *yuca*, in this illustration from a 1633 British herbal by Gerard (1975 [1633]:Ch. 155:346). *Yuca* includes both bitter manioc, and sweet manioc. It was, according to chroniclers, intensively exploited, and as stated in the image, "*The root whereof the bread Casua or Cazava [cassava] is made*." Manioc was also called cassava and *mogo* or *mandioca*. Manioc is a woody shrub of the Euphorbiaceae family, native to South America, and presently the third largest source of carbohydrates in the world (Courtesy of Field Museum Library, Chicago) (Photograph by John E. Staller)

manioc, societies in Costa Rica made maize cakes, again reinforcing the perception that maize was the 'staff of life' (Fernández de Oviedo 1959 [1526]:Ch. 4, 1969 [1535]:10–12; Layfield 1995 [1598]:15). The Italian explorer Girolamo Benzoni recorded three steps involved in making corn cakes: boiling the maize in lime, grinding husked corn to make dough with *mano* and *metate*, and then patting this dough into small cakes that were cooked on a *comal* (*comalli*) or griddle (Staller 2006:Fig. 32-1B). These detailed woodcarvings and illustrations also emphasize the importance of gender in the construction of social space and community space in the preparation of certain foods such as the *tamal* or *waah* (tamales and tortillas respectively). Stone *manos* and *metates* have been identified in archaeological sites throughout eastern Mesoamerica, and they continue to be used in these regions (Fig. 10).

Early chroniclers recognized the importance of Chiles (*Capsicum annuum* L.) as a food source and many observed that Mesoamerican societies lived mainly on maize, beans, squash, tomatoes, and chile peppers. Aztec commoners only paused

Fig. 10 Maize kernels were usually ground into flour with stone *mano* and *metate* as depicted to the left in the background of this figure. *Comales* or griddles such as the one used here in Zinancantan, Chiapas, were used throughout Mesoamerica to prepare certain foods particularly *tortillas* (Courtesy of John Tuxill) (Photograph by John Tuxill)

from their work for a bowl of maize porridge sweetened with honey or spiced with red pepper (Tannahill 1973:250). Beans (*Phaseolus vulgaris* L.) when consumed with maize and chili peppers supplied some needed protein to the diet, and were usually boiled, although if young and small they may have been eaten fresh. Native societies in the Valley of Mexico do not appear to have extracted cooking oil from plant seeds, and the meat they used was usually wild game, turkey, as well as water fowl and aquatic resources, which provided very little fat (Parsons 2006). The only domesticated meat protein came from a species of dog. Significantly, the *refrito*, a dish of boiled, mashed beans, fried in lard and topped with grated cheese, so common in the country today, only appeared after the Spaniards had introduced dairy products derived from cows and other domesticated animals to New Spain (Tannahill 1973:250).

Tomato (*Solanum lycopersicum L.*) is in the *Solanaceae* or nightshade family, related to chili peppers, tobacco, and potatoes (Fig. 11). The word "*tomate*" has Mexican origins, where apparently one of two "wild" species still grow.[22] In Mexico,

[22] The common tomato is native to South America where seven wild species have been identified, ranging from Ecuador into Chile (Coe 1994:47). The husk tomato (*Physalis philadelphica* L.) was initially domesticated in Mexico and identified archaeologically in the Tehuacán highlands in levels dated to between AD 825 and 1225 (*ibid.*).

Fig. 11 The tomato (*Solanum lycopersicum* L. or *Lycopersicun esculentum*) domesticated by the Aztec was a small yellow variety called "golden apples" by European chroniclers. John Gerard (1975 [1633]:Ch. 60:346) noted in his herbal that the tomato was originally called "apples of love" or *Poma amoris* in Latin. The name 'apples of love' at that time referred to an association with Greek legend and mythology (*ibid*.:345). The common red tomato (*Solanum lycopersicum L.*) or *jitomate* may have been brought into Mexico from South America in pre-Hispanic times. The variety depicted in this sixteenth century herbal appears to be the commom tomato (*Solanum lycopersicum* L.). Surprisingly, it took several centuries for tomatoes to be integrated into Old World dishes, although it is now integral to cuisines throughout the world, particularly the Mediterranean (Courtesy of Field Museum Library, Chicago) (Photograph by John E. Staller)

the Spanish word *tomate*, or *tomatillo,* designates husk tomatoes, that is, *Physalis philadelphica* L., while *jitomate* denotes *Solanum lycopersicum* L. the common tomato. (Coe 1994:47). Tomatoes are sometimes identified in the archaeological record as weeds in maize fields (Smith 1994). Thin shavings of unripe tomatoes are found in a number of Mexican dishes, while the ripe fruits were often combined with chili peppers to make a tangy sauce for a bland dish of beans that was also a valuable source of vitamins A and C (Tannahill 1973:250).

The type of tomato introduced into Europe in the sixteenth century was called "Golden Apple" for its bright yellow color (Gerard 1975 [1633]:Bk II:346). Evidence exists that the earliest domesticated tomatoes were a little yellow fruit, ancestor of *Solanum esculentum* grown by the Aztecs. They called what we know as the common tomato, *xitomatl*, which means "plump fruit" or "plump thing with a navel," while the general Nahuatl term for husk tomatoes was *miltomatl* (Coe 1994:46–47). In the 1633 herbal *General History of Plants* by John Gerard (1975 [1633]:Bk II:345–346), the tomato or 'golden apple' is called the "apple of love" as well as "wolf-fruit" or "wolf-apple" (Camporesi 1993). Spaniards brought the tomato to their colonies in the Caribbean and also into Asia (Camporesi 1993; Smith 1994; Coe 1994). Although cultivation began in Europe as early as the 1540s, the earliest known cookbook that included tomatoes was published in Naples in 1692[23] (Smith 1994). The historical documents suggest it took several centuries for tomatoes to play a prominent role in cuisines worldwide (Camporesi 1993).

The pepper (*Capsicum* spp.), with its very high vitamin-C content, is classified into, red peppers, the large "sweet" type, and smaller spicy, hot "*chilies*" (Long-Solís 1986). Cultivation and human selection increased the yield and number of pepper varieties (Fig. 12). At least 40 varieties were in cultivation when the Spaniards arrived (Tannahill 1973:250–251). Varieties of spicy *chili* are cooked in meat dishes, pickled to make Tabasco sauce, and dried and powdered into cayenne (Fig. 13). Mesoamericans used *capsicums* with everything: in stews and soups, fresh peppers with fish, and sometimes with salt and tomato to moderate their impact (Long-Solís 1986). The exotic nature of New World cuisine, the complicated processing technologies associated with the preparation of certain foods, and certainly toxic plants were what in part inspired early archaeologists and anthropologists to study Pre-Columbian cuisine and the processing techniques and associated material culture (see e.g., Tannahill 1973; Mitchem 1989).

New World Preparations and Intoxicants

On Christopher Columbus' last voyage, they were traveling along the coast of what is today Costa Rica (Veragua), searching for gold. A youth of 14 named Ferdinand wrote, "*They have for their nourishment also much maize... from which they make wine and red wine, as beer is made in England, and they add spices to their taste by which it gets a good taste like sour wine...*" (Sauer 1969:133). Despite the fact that the youth was aware that maize was an economic staple in this region, he was more interested in the beer that was made from its kernels (*ibid.*). In the area west

[23] In certain areas of Italy, such as Florence, the fruit was used solely as tabletop decoration until the late seventeenth or early eighteenth century when it was finally incorporated into the local cuisine (Camporesi 1993; Smith 1994).

Fig. 12 An early German wood cut of *Breyter Indianisher Pfeffer* (whiter Indian pepper) from the herbal by Fuchs (1973 [1543]:*fol*. 420). The description provided in this name may refer to the color of the fruit (Courtesy of Field Museum Library, Chicago) (Photograph by John E. Staller)

of present day Panama City, referred to by the chroniclers as Coiba, toasted ground maize was stirred into water and drunk. This beverage is identical to the drink *pinole* of Mexico, and "wine" or maize beer was similar to what the Colonial Mexicans referred to as *tezvin* (Sauer 1969:271). In the interior of the region of Coiba, the indigenous populations made "wine" or maize beer from a small-grained and floury lineage of maize known as Early Caribbean (see Fig. 3). This landrace

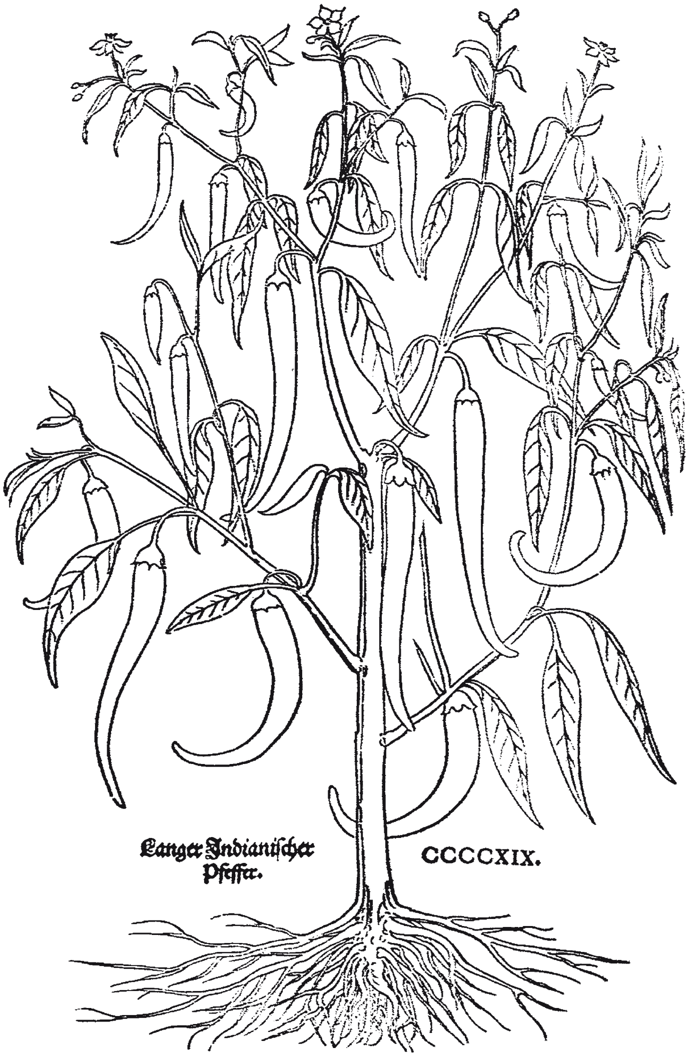

Fig. 13 An early German wood cut of chile pepper (*Capsicum annum* L.), called *Langer Indianisher Pfeffer* (long Indian pepper), from the German edition of the Pre-Linnaean herbal by Leonhart Fuchs (1973 [1543]:*fol*. 419). Similar varieties of pepper were later ground to make paprika and came to play an important role in a variety of European cuisines. Although spices and other ways of preparing peppers have become part of European and Asian folklore, all species of the genus *Capsicum* are native to the New World (Courtesy of Field Museum Library, Chicago). (Photograph by John E. Staller)

is believed to have been one of the earliest varieties introduced into Europe and appears to be only distantly related to any known varieties in either Central or South America (Newsom 2006:330:Fig. 23-2; Newsom and Deagan 1994:Table 13.1, 215–216). The chronicler accounts suggest that consumption of maize as beer in

Mesoamerica was restricted to certain sub-regions such as Guatemalan highlands, and this is supported by archaeological and linguistic evidence (see Staller 2006).

However, cultures in these latitudes consumed a host of other fermented intoxicants, collectively referred to as *pulque*, made from a variety of fruits and succulents, but rarely from maize. Landa (1975 [1566]:68) mentions a wine or *pulque* made by the Maya from, "*...honey and water and a certain root of a tree which is cultivated for this purpose, with which they make the wine strong and foul-smelling*." Landa is apparently referring to *baalche*, which is made from the roots of a fruit-bearing tree of the species *Lonchocarpus violaceus*. It is also possible that Landa was referring to agave or the century plant maguey (*Agave Americana* L.). Maguey was an important economic plant, traditionally cultivated for its fibers or to make alcoholic *pulque* (Parsons and Parsons 1990). The management of the century plant, its use in the manufacture of cloth and fermented intoxicants, along with the intense exploitation of aquatic resources, algae, and aquatic insects, sustained the ancient inhabitants of Central Mexico (Parsons 2006). Maguey is distilled to make mescal and tequila, while "*pulque* maguey" is only productive at elevations above 1800 m asl. Various codices from both Central Mexico and the Maya lowlands indicate that foods derived from plants and crops like maize (*tamales*) and fermented drinks commonly appear as offerings to deities and mythological beings. Chroniclers stated Maya beverages were usually honey-based and that Mexican highlanders generally fermented maguey (Landa 1975 [1566]:68, 153).

Chronicler accounts state that maize was the principal food crop among the Yucatec Maya. In the highlands, the Maya would make "*maatz*," a gruel drunk solely during ritual ceremonies and associated with the planting of *milpas* in Santiago Atitlán (Christenson 2001:123; Sachse 2008:140). *Maatz* was prepared by making flour from toasted maize and then mixing this with ash and water and used finely ground maize to "extract a milk" which they thickened over a fire to make a kind of porridge or gruel and also made a drink from "raw" ground maize kernels and bread in a number of different ways (Christenson 2001:123). *Maatz* can symbolize mother's milk or semen and its consumption is connected to concepts of life-renewal, rebirth, and regeneration from death (Freidel et al. 1993:180; Christenson 2001:123; Sachse 2008:140). This beverage was of central importance during feasts and was served in elaborately painted ceramic vessels which were themselves of significant ritual and political importance (Landa 1975 [1566]:68–69; Coe and Coe 1996:43–54; Henderson and Joyce 2006; Joyce and Henderson 2007). The Yucatecan Maya also made a ceremonially important foaming drink from toasted and ground maize and *kakaw* (chocolate) or cacao (*Theobroma cacao*) and chilli pepper (*Capsicum annuum* L.). Landa (1975 [1566]:67) states that, "*From ground maize and cacao they make a foaming drink with which they celebrate their feasts*." Maize and cacao have clear and unambiguous associations to high-status individuals in Mesoamerica, as well as mythological beings (Taube 1985, 1989; Stross 2006; Stuart 2006; Coe and Coe 1996; McNeil et al. 2006).

Cacao is linked to fertility, the rebirth of ancestors, the feminine, and maize in iconography (McNeil 2006:360–362; McNeil et al. 2006:Figs. 11.12–11.15; Pugh 2006:369–372). It was of such importance in the production ceremonial drinks that a substantial trade network developed along the coast of the Yucatan, Tabasco, and Veracruz to supply this critically important ingredient (Henderson et al. 2007). Honey, and occasionally maize and chiles were used in these drinks (Las Casas 1971 [1527–1565]). Drinking vases inscribed with lists of ingredients or the names of specific drinks, particularly *atole* and those based on cacao, have been identified through the study of epigraphic and ethnohistoric data and hieroglyphic inscriptions on Classic Maya ceramics (Stuart 2006:191; Houston et al. 1989, 1992, 2006). McNeil (2006: 348–351) has pointed out that mixed drinks based on *atole* and cacao are still widespread in Guatemala (see also Rain 2004: 17–18; Coe and Coe 1996:64–66).

The Maya of Northern Guatemala sometimes flavored their *atole* beverages with vanilla (*Vanilla planifolia* L.), as well as ground maize flour (*nixtamali*), what the Spaniards call *masa*, and cacao, water, and honey (Rain 2004:16–17). Aztecs and Maya lords as well as Spanish Conquistadores relished this beverage (Brooks 1995). Aztecs called vanilla "*tlilxochitl*," or 'black flower,' after the mature bean. Vanilla beans come from the only species of orchid that produces an edible fruit.[24] The Totonacs of the Gulf Coast are generally credited with domesticating the vanilla bean. As with cacao beans, the Aztec lords demanded vanilla beans as tribute, and both cacao and vanilla beans were used as forms of currency in different regions of Mesoamerica (Coe 1994:58–60; Rain 2004:2–5, 19–20; see also Barlow 1949; Correll 1953). Aztecan and Mayan lords, and later the Spanish Conquistadores, relished vanilla flavored drinks (Correll 1953; Rain 2004). After vanilla was introduced to the Old World, European aristocrats considered it the ultimate aphrodisiac, and primarily used it as perfume (Rain 2004:34). In fact, the introduction of vanilla preceded the arrival of Cortés in Veracruz. In 1502, Spanish explorers in Cuba sent it to the Crown along with indigo and cochineal dyes, and since the Spaniards could not communicate with the native populations, they assumed it was a perfume (Correll 1953:292; Rain 2004:31). Along the Gulf Coast, the Totonacs are credited with spreading the vanilla bean to different sub-regions of Mesoamerica. Of all the New World spices, vanilla has perhaps had the most powerful influence upon foodways worldwide (Rain 2004:18–19). The chronicles emphasize that many primary staples as well as fruit crops were also consumed as liquids and fermented intoxicants.

The evidence from Mesoamerica suggests that the most important plants associated with the preparation and consumption of fermented intoxicants and non-fermented drinks were cacao, maguey, maize, and chiles. The drinks associated with these plants also appear to have considerable symbolic referents and metaphorical as well as literal associations with mythological and spiritual beings and individuals of high status. Pre-Columbian Mesoamericans made fermented drinks from a number of different plants, which were categorized under the general term of *pulque*. The ethnohistoric evidence further reveals that the perception of such food crops and their associated uses,

[24] The orchid family is one of the largest (with 880 genera and 25,000 species) pertaining to the family Orchidaceae (Rain 2004:2–5). The word "vanilla" first entered the English language in 1754, in a gardener's dictionary where a botanist wrote about the genus (Correll 1953:292). By the mid 1700s, vanilla spread all over Europe, and for over three centuries Mexico was the leading producer of vanilla (Rain 2004).

economic importance, and subsequent integration into European cuisines was largely biased by early observations and written descriptions. The extent to which such cultural perceptions have influenced later scholarship in this area of the Americas remains to be determined. The sixteenth century accounts also demonstrate that the preparation of food and drink by indigenous peoples was also at times conceived of as a ritual, and in some cases, even a sacred act – regardless of whether the foods were prepared for human consumption or as ritual offerings to deities and sacred places.

Early Economy, Markets, and Foodways in New Spain

The power, glory, and riches the explorers sought would be found in the Basin of Mexico at Tenochtitlan, the capital of the Aztec Empire (Díaz del Castillo 1953 [1567–1575]:180–182; Cortés 1963 [1485–1547]; Tezozómoc 1944 [c. 1598]). The rapid rise of the Aztec civilization is a mixture of legend, myth, and history (Schwartz 2000:8–12). From their mythic home Aztlán ("Land of the Herons") to the northwest, they migrated to a region they called Chicomoztoc or Seven Caves (Schwartz 2000:5; Coe and Coe 1996:69–70). They migrated to Lake Tezcoco around the year 1250 A.D. (Berdan 1982; Townsend 2000). Driven to marginal lands, they were despised by the settled societies of the lake, but were used at times as mercenaries in the internecine fighting (Townsend 2000:65–68). Eventually, around 1325 A.D., they settled on the adjoining marshy islands in the midst of the lake (Carmack et al. 1996; Townsend 2000). There, according to legend, was an eagle perched on a cactus devouring a snake, an epiphany that symbolized this place as sacred, and so the capital city of Tenochtitlan was established[25] (Sahagún 1963 [1590]:*folio* 5). The Aztec lords considered their capital a sacred center that symbolized the foundation of heaven, and the political, symbolic, and ritual center of the universe (Carrasco 1999:18, 21–25; Schwartz 2000:6, 221–222). A sacred center is where the qualities of being made manifest in space encounter one another, and therefore appear most fully; this is symbolized by the eagle on the cactus consuming the snake. This suggested that this was sacred space, where all modes of being (primordial and temporal) converge, and where communication and passage among the cosmic layers occurs (Eliade 1959:20–29; Staller 2008b:282). Davíd Carrasco (1999:25) has interpreted the frontispiece of the Codex Mendoza as symbolizing the arrival of the Aztecs, led by their patron and war deity, the hummingbird Huitzilopochtli, and thus, Tenochtitlan also the seat of conquest and civil authority (Fig. 14).

[25] The religious scholar Mircea Eliade (1959:20–21) spoke of this phenomenon in terms of religious thought by comparing it to the conceptual realization of the heterogeneity of geographic space, in that, "… *some parts of space are qualitatively different from others… this spatial non-homogeneity finds expression in the experience of an opposition between space that is sacred… and formless expanse surrounding it*." He goes on to observe that "*When the sacred manifests itself in any hierophany, there is not only a break in the homogeneity of space; there is also revelation of an absolute reality, opposed to the non-reality of the vast surrounding expanse*. The selection of this island capital in Aztec mythology suggests this was a major cultural and religious center to the Aztec and Mesoamerican people.

Fig. 14 The frontispiece map of Tenochtitlan from the *Codex Mendoza* represents the symbolic and cosmological importance of the Aztecan capital as central place or sacred center. The intersecting lines, presumably canals, divide the island city into four quarters, representing the cardinal directions. Anthropomorphic, zoomorphic, and botanical images cluster around the center represented by an eagle on a cactus. This symbol evokes the origins of Tenochtitlan when their mythological ancestors came upon an eagle standing on a cactus consuming a snake. This sacred sign signified this place as a center of the universe or *axis mundi*. The skull rack or *tzompantli* to the right was seen as emblematic of the temple of their patron deity Huitzilopochtli, represented by the image above the eagle. Below the central image is a shield, representing the conquest of the Valley of Mexico. Ten Aztec leaders called *calpulli* are seen with their names listed on their tunics (*tilmatli*). Nine have 'pillar of stone' or *temillotl* hairstyles symbolizing their achievements as warriors. The single *calpulli* without this hairstyle with the glyph emanating from his mouth to the left of the center is Tenoch, the Chief Speaker. They are primarily surrounded by maguey cactus. Below, early Aztec conquests of neighboring city-states of Culhuacan (Curved Hill) and Tenayucan (Rampart Hill) are depicted by traditional imagery of taking prisoners and burning temples. Legend, rulership, mythology, social organization, and history are encoded in this Aztec pictograph (Courtesy of Bodleian Library, University of Oxford) (Photograph by John E. Staller)

The Aztecs initially established a political foothold as dependents of Azcatpozalco, but by c. 1426, they emerged from a subordinate role under series of rulers to one of increasing power conquering much of Mesoamerica (Berdan 1982; Carrasco 1999; Schwartz 2000). The Aztec Lords dominated most of Central Mexico by 1470 A.D., extracting labor and tribute from surrounding villages and towns located in some cases hundreds of kilometers from the Imperial capital. Aztec imperial expansion was accompanied by increasing centralization and by changes within the society itself (Barlow 1949; Carmack et al. 1996). The Aztec oversaw large-scale management of maguey or century plant in the highlands for the manufacture of *pulque* as well as cloth, and they developed highly complex forms of intensive agriculture.

Tenochtitlan and the Great Market at Tlaltelolco

When the Spaniards arrived at the great city of Tenochtitlan, they found it built in the middle of a great lake and were astounded by its scale and beauty (Díaz del Castillo and B 1953 [1567–1575]:177–182). The city plan included four great causeways representing the cardinal directions and leading to the ceremonial center. Barrios were organized in pairs of 20 communal corporate groups or *calpulli* and in temple-maintenance groups (Fig. 15), each with their own temples and schools to look after; the cosmology and calendar were physically represented by the city's organization and the placement of different sectors of the population (Schwartz 2000:226). The Aztec were also great engineers holding out the brackish waters of the eastern side of the lake to protect their crops (Townsend 2000:80–83). The four great causeways extended from the lakeshore to connect the city to the other cities and towns that surrounded the lake (Fig. 16, see also Fig. 6). At the center of this magnificent city lay Tlaltelolco, perhaps the greatest market of Mesoamerica. Bernal Díaz del Castillo, the young soldier who first saw the city in 1519, gave voice to the awe that many of his companions felt when taken to the great market at Tlaltelolco:

> "*... the great market, called Tlaltelolco, we were astounded at the number of people and the quantity of merchandise... and at the good order and control that was maintained, for we had never seen such a thing before... Each kind of merchandise was kept by itself and had its fixed place marked out... dealers in gold, silver, and, precious stones, feathers, mantles, and embroidered goods ... traders who sold great pieces of cloth and cotton, and articles of twisted thread, and there were cacahuateros who sold cacao. In this way one could see every sort of merchandise that is to be found in the whole of New Spain. There were those who sold cloths of hennequen and ropes and the sandals with which they are shod, which are made from the same plant, and sweet cooked roots, and other tubers which they get from this plant, all were kept in one part of the market in the place assigned to them. In another part there were skins of tigers and lions, of otters and jackals, deer and other animals and badgers and mountain cats, some tanned and others untanned, and other classes of merchandise. Let us go and speak of those who sold beans and sage and other vegetables and herbs in another part, and to those who sold fowls, cocks with wattles, rabbits, hares, deer, mallards, young dogs and other things of that sort... and let us also mention the fruit-*

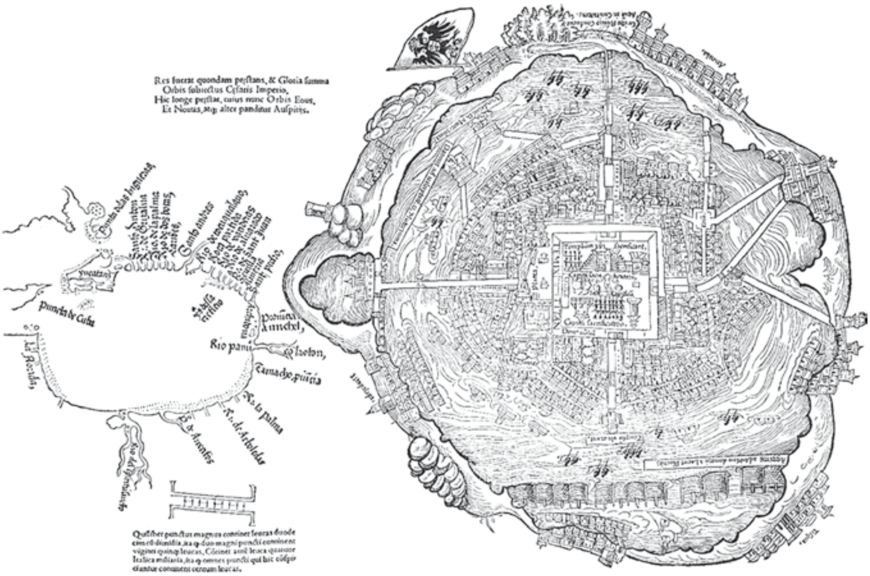

Fig. 15 Maps of the Gulf of Mexico and Tenochtitlan from the *Praeclara Fernandi Cortesii de Nova Maris Oceani Hispana Narratio*, Nuremberg, 1524. Hernán Cortés printed these maps on a single sheet of parchment with the second letter to Charles V, Emperor and King of Spain. The German engraver in Nuremberg used Aztec pictographs to prepare the woodblock as suggested by Pietro Martyr d'Anghiera (Peter Martyr) who stated that the original Aztec map of the capital was "thirty feet long and not quite so wide" painted on white cotton cloth and a smaller "native painting representing Temistitlan (Tenochtitlan) with its temples, bridges and lakes." (Courtesy of Library of Congress, Rare Book and Special Collections Division)

> *erers, and the women who sold cooked food, dough and tripe... every sort of pottery made in a thousand different forms from great water jars to little jugs, these also had a place to themselves; then those who sold honey and honey paste and other dainties like nut paste, and those who sold lumber, boards, cradles, beams, blocks and benches, each article by itself, and the vendors of ocote* [pitch pine for torches] *firewood, and other things of a similar nature...* " (Díaz 1953 [1567–1575]:196–197).

This firsthand account by the conquistador Bernal Díaz del Castillo provides a compelling description of a highly organized market place on a scale unknown in fifteenth century Europe. This description of the Tlalteloco market reflects a highly structured and well-organized economy, with an incredible array of goods and resources from all over the region: consumables, economically valuable plants, and cloth from various fibers – all brought to this center and sold in a highly organized and systematic manner. Chronicler accounts of the various markets of Central Mexico, Tabasco, Veracruz, and the Maya lowlands imply that the Pre-Columbian economy of Mesoamerica was market driven: that is, organized by powerful lords into an elaborate tribute and ritual system, largely characterized by the ritual redistribution

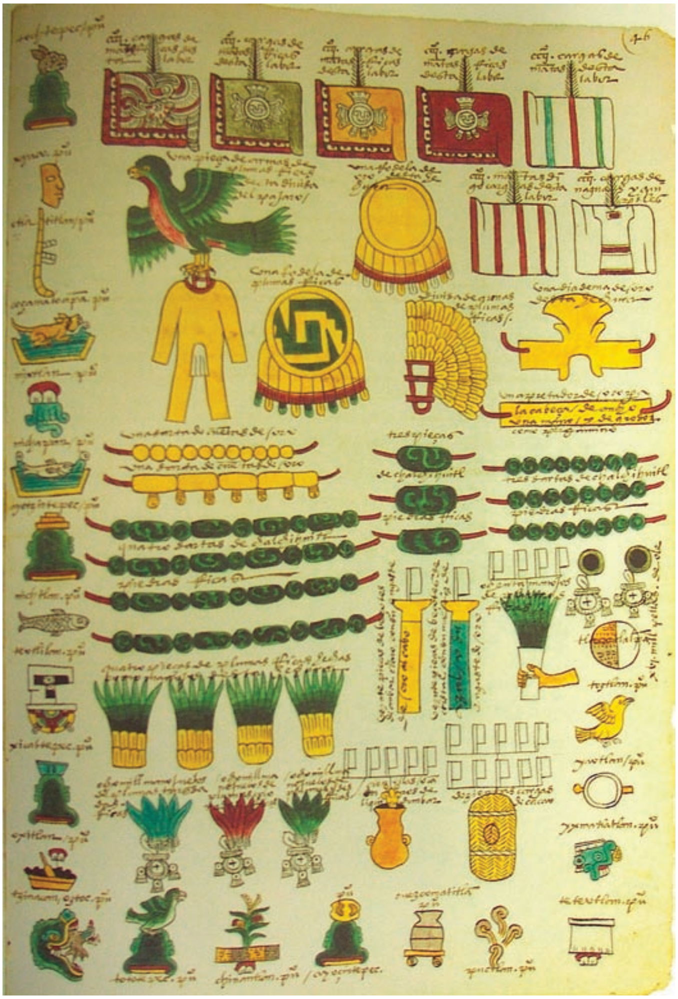

Fig. 16 The *Codex Mendoza* includes indigenous inventories of items given in tribute to the Lords of Mexico. Captions in Spanish and Nahuatl describe each item. These goods and commodities given as tribute were derived from the 22 pueblos named and listed vertically down the left side and horizontally along the bottom and vertically half way up the right side of the image. The items listed top down and left to right are as follows: seven loads of 400 mantas with the design shown (*first row*): A warrior costume of feather of this bird style; One gold shield of this fashion; Two loads of 400 mantas of the design shown (*second row*); One shield of rich feathers; a device of rich feathers; one gold diadem and below it a gold headband (*third row*): Two strings of gold beads and below them four strings of greenstones (*chachihuitl*), rich stones; Three pieces of large rich stones (*chachihuitl*), and below these, two sets of 20 lip plugs one of amber, and the one on the right, plugs of stone crystal set in gold; 80 handfuls of rich feathers, and at the far right, two sets of 8,000 balls of rubber (*fourth row*): Four pieces of rich feathers made into handfuls into this form (*fifth row*): three sets of 8,000 feathers in various colors, turquoise followed by red and the third, green feathers; 100 pots or jars of liquid amber and 200 loads of cacao (*bottom row*) (Courtesy of Bodleian Library, University of Oxford) (Photograph by John E. Staller)

and destruction[26] of wealth, in the form of consumables, textiles, prestige goods, labor, and other economic resources that sustained a complex system of supply and demand (see Fig. 16). The massive storage facilities described by chroniclers sustained ever-increasing populations in urban centers in the Basin of Mexico and other regions of Mesoamerica (Schwartz 2000:Figs. 18–19; see also Barlow 1949; Durán 1964 [1588]; Sahagún 1963 [1590]; Scholes and Roys 1968; Ochoa and Jaime 2005). Mesoamerican cultures kept inventories of tribute paid to high-ranking lords as evident in the *Codex Mendoza* and various other Mesoamerican pictographs and codices[27] (Carrasco 1999:19–28; see also Boone 2000). Such inventories not only took into account what was given but also how much and from where the various commodities and consumables came (see e.g., Barlow 1949).

In the great markets of Tenochtitlan and Tlaltelolco, Aztecans could obtain prepared food. The traditional Aztec meal at the time of the conquest consisted of tortillas, a dish of beans, and a sauce made from tomatoes or peppers (Sahagún 1963 [1590]). Tortillas appear to have been the foundation of the Mexican diet, but some chroniclers noted that its flour could not be kneaded like wheat. Diego de Landa (1975 [1566]:67) states that, "*They make bread in a number of ways; and it is a good and healthy bread; but it is bad to eat when cold so the Indian women go to pains to make it twice a day*" (see Fig. 10). Maya and other Mesoamerican societies used maize, beans, and peppers for stews, which would sometimes include a variety of other vegetables, fish, and particularly deer meat and/or wild and tame fowl (*ibid.*). Many such meals and dishes could be obtained in their great markets.

[26] The Aztec destroyed large amounts of prestige goods and even ritually sacrificed humans in the course of their state/court rituals and festivals suggesting both redistribution and ritual destruction of wealth was a huge driving force of their economy. Contact Period political economies were based upon tribute, storage, redistribution as well as destruction of material wealth, goods and human resources (Carrasco 1999:81–85).

[27] The first Viceroy of New Spain, Antonio de Mendoza commissioned the *Codex Mendoza*, at the behest of the Crown, with the goal of creating a history of the Pre-Columbian Aztec and the Mexíca people (Carrasco 1999:19). The pictorial document consisted of seventy-one folios on Spanish paper, which although directed by the head of the Aztec painters guild, Francisco Gualpuyogualcal was overseen by the Spaniards, and its contents conditioned to some extent by them. The images are described in Spanish by the cleric Juan Gonzalez, with extensive commentaries and annotations (Carrasco 1999:19–20; Schwartz 2000:221–222). The manuscript was sent to the Crown in Spain, but lost in transit to French pirates. The French humanist André Thévet ultimately sold it to the British scholar Richard Hakluyt (Schwartz 2000:222). After Hakluyt died in 1616, it was translated and published in 1625 by Samuel Purchas, and finally came into the possession of John Seldon, who ultimately donated it to the Bodleian Library at the University of Oxford (Carrasco 1999:20–21).

Classification, Storage, and Redistribution

The ethnohistoric accounts imply and in some cases document that the redistribution of food was under the auspices of the various high-ranking lords. This becomes evident when Cortés and his army first landed in Veracruz. The various social elite they encountered would initially leave large quantities of food for them as provisions (Díaz 1953 [1467–1575]:90). When Motecuhzoma II heard of the arrival of Cortés' ships in present day Veracruz in 1519, he ordered provisions consisting of honey, turkeys, fish, eggs, maize-bread (*tortillas* and *tamales*), stressing that everything was to be provided in abundance (Díaz 1953 [1467–1575]:90, 166–167; Durán 1994 [1588]:509). In this case, each of Cortés' soldiers was given a basket of *tortillas* for themselves and another for their horse (Durán 1994 [1588]:510). These accounts reinforce more recent research that emphasizes the role of foodways in defining and redefining status and class in the ancient world, and its role in reinforcing status differences through its redistribution. Control over land, tribute, and economic resources are a pretext of the right to rule and to the production and reproduction of socioeconomic differences and hierarchical relationships. Many of the pictographic and hieroglyphic documents left to us from Central Mexico deal either directly or indirectly with storage and keeping track of the movements and redistribution of various commodities (Berdan et al. 1992 [1540–1541]).

There is much written in sixteenth century accounts about what was demanded and provided as tribute by the various city-states. The basic plant diet of the Aztecs at the time of the conquest was maize, amaranth, beans, curcurbits, and chilies (Durán 1994 [1588]:40n). Maize (ears and flour) beans, sage or *chia* seeds, amaranth, and pumpkin seeds along with various kinds of peppers were important as forms of tribute. Durán (1994 [1588]:412) mentions that Tlatelolco warriors laid sacks of ground cacao before Motecuhzoma II as tribute, as well as sacks, "*of toasted maize, maize flour, bean meal, loads of maize bread (tortillas), loads of chilies and of pumpkin seeds*." Maize was also stored in large quantities in the royal storehouses of the various polities (Fig. 16).

The importance of maize to the Aztec diet is also reflected by the complex vocabulary associated with its cultivation. Sahagún (1963 [1590]) states that the Aztec differentiated "tender maize stalk" by the term *xiutoctuli*; *compala* referred to "rotten maize ear," and so on. Such vocabularies were common among all Meso american cultures at the time of the conquest and continue to varying degrees in the present (Hopkins 2006). According to the chronicles, food crops, cotton, maguey, and other primary resource commodities were differentiated and classified on the basis of where they came from geographically (Sahagún 1963 [1590]). Hopkins (2006) has observed that the Maya divided the vertebrate world into four life forms, based on their manner of locomotion: fliers, walkers, crawlers, and swimmers. It is possible that they used such classifications to organize their great markets.

Mesoamerican elite obtained great wealth through taxation and tribute and, thus, were able to sustain large populations with economies of scale that involved elaborate and complex forms of irrigation technology, floating gardens, and elaborate draining technologies. Large-scale management, cultivation, and exploitation of wild plant and animal resources such as maguey, as well as an array of aquatic insects and algae, sustained and distinguished highland Mesoamerican civilization (Parsons 2006). Such resources were also provided in tribute to Mesoamerican lords. According to the *Codex Mendoza* (1540s), the *Relaciones Geográficas* (1580s), and various other chronicler accounts, much of this irrigation technology and changes in the hydrology was involved in the cultivation of maize and amaranth (*Amaranthus* spp.) and in the exploitation of aquatic resources, crustaceans, as well as algae and various insect species (Schwartz 2000; Ochoa and Jaime 2005). Amaranth seeds were consumed in the form of a gruel called *pinole*, and sometimes with ground maize in tamales. Intensive agriculture was practiced in various regions of Mesoamerica, particularly along the Gulf Coast, Maya Lowlands, and the Basin of Mexico as well as in western Belize. Although such cultivation involved various plant species, maize was the primary food crop during the Contact Period.

Mesoamerican Commerce and Foodways

The Chontal Maya had a profound political, economic, and cultural influence on the rest of Mesoamerica (Thompson 1970). During the Contact Period, this region was referred to as Acalan or Acalan-Tixchel and the inhabitants were referred to as the Putun in some accounts (Coe and Coe 1996:59). J. Eric Thompson (1970:7) called the Chontol Maya the "Phoenicians of the New World" because of their watercraft and reputation as traders. In fact, the name Acalan is from the Nahua word *acalli* or "place of the canoes" (Scholes and Roys 1968:50; Thompson 1970:118). Acalan is situated between Tabasco, the Petén, and SW Yucatan. Cuzumel and Bacalar are on the Caribbean coast where there were important Putun trading centers, and interaction with surrounding regions was by watercraft and over land (Scholes and Roys 1968). Cortés (1963 [1485–1547]:421–422) related in his letters that an entire sector of the town consisted of merchants under the supervision of the ruler's brother, and that principal commodities included cacao,[28] pine resin, cloth, and red shell beads. He states that maize and beans were also traded and that the region was "*...very rich in food supplies and there is much honey*." When Cortez (1991 [1519–1526]) and his men later passed through Acalan in 1525, they were well received and provided with a daily supply of, "*honey, turkeys, maize, copal and a great deal of fruit*." This emphasizes the fact that the redistribution of consumables can take on a variety of forms in a variety of different contexts and that such economic activity was under the auspices of ruling lords. Ritual feasting is also a social lubricant that can facilitate alliances

[28] The Chontal Maya grew no less than four crops of cacao within the annual cycle – the principle crop was between April and July (Coe and Coe 1996:59).

between different polities or societies, or, as in the case of the ballgame, feasting can be competitive (Koontz 2008). Feasting and certain foods also mark time in the annual cycle, but whatever forms they take, food and feasting are central to a whole host of cultural situations, and particularly important to understanding dietary differences related to status and class.

Food, Feasting, and Mesoamerican Religion

The chroniclers' accounts from various regions of the Neotropics clearly emphasize that certain plants and foods were central to indigenous ritual practices and religious beliefs. The Maya carved various plants, both real and imagined on stone monuments, modeled them into figurines, painted them on pottery and murals, and drew them in their codices (Taube 1989; Berdan et al. 1992 [1541–1542]). Among the Maya and societies of lowland Veracruz, maize was of religious and ritual importance and a powerful icon, the maize deity was represented in a variety of Mesoamerican cultures (Taube 1985, 1996). Sacred indigenous texts such as the Maya *Popol Vuh* and Aztec codices convey a clear impression that maize was central to the mythological origins, ethnic identification, and very existence of the Mesoamerican people and that it had a particularly close symbolic connection to the ruling elite (Townsend 2000; Stross 2006; Sachse 2008; Morley et al. 1994; Alcorn et al. 2006).

The religious importance of maize is apparent when noting that shamans still use kernels to interpret omens, and its ancient divinity is clear by its iconographic and hieroglyphic association with primary deities and origin myths (Tedlock 1985; Sachse 2008; Freidel et al. 1993). Iconographic interpretation on Classic Maya stelae and architecture indicated that the maize god was the "First Father," and the Quiche Maya term *Qanan* or maize literally means "Our Mother" (Freidel et al. 1993:55; Stross 2006:583). The spiritual power of maize in Mesoamerican culture is inferred from its use in rituals. During Aztec rituals, maize kernels were cast, sometimes with pieces of thread. The casting of maize kernels is related to the indigenous belief that the maize kernels will "jump" towards the culpable object or protagonist causing the illness or provide clues to the question being divined (Lipp 1991; Stross 2006).

In the *Popol Vuh*, the Mayan creation story states that the gods used maize from the Mountain of Sustenance at *Paxil Cayala* as the main ingredient for the design of humankind. They go on to state this mountain was filled with, pataxte, cacao, zapotes, anonas, jocotes, honey, and most importantly, yellow and white ears of corn (Sachse 2008:140). In Maya mythological creation, Xmukane (*She who has borne children*) or "Our Mother" ground white and yellow kernel maize provided by the Mountain of Sustenance (Christenson 2003:195). Modern Maya believe that eating maize provides a means of incorporating divine/ancestral flesh into their bodies: thus, a way in which they can access ancestral speech and esoteric knowledge regarding the spiritual realm. Young children are fed maize so that they will be able

Fig. 17 This sculpture of the young Maize God, commissioned by the thirteenth ruler "18-Rabbit" (*Waxaklajuun Ub'aah K'awiil*) and one of eight that were once set on the cornice of Structure 22 at Copan. It was built in 715 A.D. to commemorate the 20th anniversary of his accession to the throne. The young Maize God represents the Mayan ideal of beauty, and features prominently in Maya art during the Classic period (200 B.C.–900 A.D.). He personifies the agricultural cycle and is associated with abundance and prosperity. In this sculpture, his headdress is a stylized ear of maize and his hair, the silk of the cob (Courtesy of the British Museum)

to speak Maya and become Maya with ancestral flesh and blood (cf. Sachse 2008:140; Christenson 2006:210).

Among the Chontal Maya, maize was venerated as a god, along with the sun, moon, rain, and the wind. The young Maya Maize Lord was in this case in the form of a young mythological male ruler (Fig. 17). The Young Maize Lord appears was a Classic Period god of Maize and he represented the Maya ideal of beauty. As Karl Taube (1985:181) points out, "*his elongated tonsured head mimics the long tasseled cob. Maize grain, at times infixed into his head, is an identifying feature of his personified nominal glyph*." Jade ornaments generally associated with the necklace worn by the young Maize Lord evoke verdant, precious qualities of the living plant (*ibid*.). The god's delicate features and Xoc Monster-*Spondylus* medallion also reflect a feminine nurturing quality associated with tending corn among some contemporary Maya. This is evident when noting that maize is termed "Our Mother" among some Mayan societies (*ibid*.). This further suggests that maize transcends the binary duality of male/female in that the maize represented a mythological lord, as well as "Our Mother," through a metaphorical reference to the fertility and fecundity of the earth. In the Bacalar region of the Yucatan, indigenous tribes rebelling against seventeenth century Spanish authority replaced hosts and wine in their mass with tortillas and maize gruel, emphasizing the importance that maize continued to have among Maya populations long after they had converted to Catholicism (Las 1971 [1527–1565]; Traboulay 1994). Of all the foods that came from the Neotropics, maize had more symbolic and spiritual importance tied to it than any other plant species, and it was critical to both feasting and ritual performance (Taube 1985, 1989; Sachse 2008).

Roles of Foodways to Feasting and Festivals

Foodways were also crucial to ritual and sacrificial offering during calendric feasting, festivals, and rites. During the dry season, the Aztecs would make offerings of tortillas and fowl to the feathered serpent *Quetzalcoatl* to bring on the coming rains and for agricultural fertility. Offerings consisted of small plates of tamales (*pisil vah*), "*as large as fat melons*" and upon these tamales were pieces of fowl and male turkeys (Durán 1971 [1588]:136; see also Coe 1973:52; Taube 1989:Fig. 7). Such offerings were made to ward off sickness (particularly respiratory illnesses) or to predict the coming rainy season. Various forms of syncretism continue to the present, and cuisines and certain plants still have a great importance to ethnic identity, ritual, and in the local economy as food staples (Christenson 2008).

Religious rituals surrounding the Festival of Toxcatl dedicated to the Aztec deity *Tezcatlipoca*, the Smoking Mirror, included bunches of ears of corn, pine bark, quail, turkey, and fish. Maidens at the Temple of Tezcatlipoca making offerings and processions to this idol were clad in blouses and skirts and covered on their faces with strings of toasted corn, and crowned their heads with maize. Youths had necklaces and garlands of toasted corn (Durán 1971 [1581]:104–105). After much celebration, dancing and playing of drums, the people returned to their homes at sunset and brought large platters filled with *tzoalli*, maize dough mixed with honey, covered with cloths decorated with skulls and crossbones (*ibid*.:107). The honeyed tamales were snatched up eagerly or carried away as relics.

The Aztec would eat a ritual food consisting of *tortillas* and *tamales* made of maize flour that was mixed with honey and beans in honor of *Xipe Totec*, the Lord of the Flayed Skin. Duran (1971 [1581]:182) states that it was forbidden to eat any other bread on the day honoring this deity suggesting certain kinds of foods were associated with specific calendric rites, deities, and ritual practices. These accounts also indicate that ritual practices involving food prohibition and fasting may have preceded the arrival of Europeans.

During the seventeenth month of the calendar called Tititl, the Aztec venerated *Camaxtli*, the God of Hunting, with offerings of sour bread (*xocotamalli*) and a bitter porridge made of purple maize (Durán 1971 [1581]:463). Hunting is an activity potentially fraught with peril involving "communication" and negotiations with supernatural animal guardians to seek out those neglecting important hunting protocol. Many such shrines included offerings of wild animal bones reflecting indigenous concepts linking bones and seeds to the regeneration of game species. Ritual offerings of bread and porridge were commonly made to civic shrines and temples honoring the Hunting God as well as domestic shrines in some houses. The celebrants also consumed bitter bread and porridge during the rituals surrounding this feast (*ibid*.). Blue maize in the form of kernels and flour were offered to the waters used to irrigate the *chinampas* (*ibid*.:368). Around Lake Atitlan, Guatemala, animal-based foods and animal-related rituals and offerings were often left or performed at sacred locations that were dedicated to hunting spirits (Christenson 2008). These examples speak of the reciprocal relationship that Native Americans have with their natural environment and reflect a belief that such offering constituted a "feeding" of the earth and sacred places (Carlsen and Prectel 1991:27; Staller 2008a:1–2; Stross, this volume).

Divine Foods and Their Associated Deities

Considering the great importance of agriculture Central Mexican/Mesoamerican peoples possessed, a large number of deities were dedicated to specific cultigens and numerous food crops were personified as deities or mythological beings.[29] The goddess *Chicomecoatl* (Serpent of the Seven Heads) and *Chalchiuhcihuatl* (Woman of Precious Stone) was Central Mexican associated symbolically with maize (Durán 1971 [1581]:Plate 23; Carrasco 1999:197–200). She was also

[29] Aztec deities may be grouped into three broad categories: Those associated with the earth and agricultural fertility, creator gods involved with the beginnings and ends of cosmological and world cycles, and those, like their patron deity Huitzilopochtli associated with the cult of war and human sacrifice (Schwartz 2000:9; Carrasco 1999:23).

associated with the harvest, all grains, and various plant species important to the state, particularly cacao. The Aztec emphasized to various chroniclers that the Maize Goddess was part of them, their flesh and livelihood, and when they planted kernels in the new growing season they would cry, as though they were sacrificing part of themselves[30] (Carrasco 1999; Schwartz 2000). The first name of this deity (*Chicomecoatl*) has reference to the catastrophic destruction brought on by frost, drought, and famine, while the second (*Chalchiuhcihuatl*) refers to her ability to bring forth life, fertility, and fecundity (Durán 1971 [1581]:222). The Aztec term "*tecuani*" refers to sting or bite, particularly with reference to frozen agricultural fields or crops destroyed by drought and insects. It was common to say that the fields were *tecuani* or eaten by frost, and anything that stings or bites was *tecuani*: thus the metaphorical significance of the first name. Seven-headed serpent may be indirect reference to the cardinal directions and a tripartite cosmos: in other words, to all plant life and to those things in the climate and environment that effect their survival, i.e., rain from the sky, dust from the wind, and the past and future events associated with such phenomena.

Sculptural depictions of the Aztec maize goddess were often made of finely carved wood, and she held carved maize cobs in her hands and had a necklace of golden ears of corn held by a blue ribbon (Durán 1971 [1581]:Plate 23). She was clothed in fine garments all red and wore a tiara of red paper. Sometimes the ears of corn in her hands were imitated in fine feather work or garnished in gold (*ibid*). The idol was housed in a chamber in the Temple of Huitzilopochtli, "*all to her greater honor and glory*" states Diego Durán (1971 [1581]:222–223). This chamber was decorated and made green with numerous strings of maize-cobs, chili peppers, squash, flowers, and offerings of amaranth seeds and seeds of various plants, which covered the floor.[31] Ritual celebrations made to the maize deity were held on the 14th of September, preceded by seven days of ritual fasting (*ibid*.:223).

During the fourth month of the Aztec calendar, special maize bread was prepared and left as a ritual offering and was only eaten during the festivals marking this month. This ritual bread was prepared in the following manner: a small quantity of ground maize kernels was mixed with toasted amaranth seeds, and then kneaded together. Honey instead of water was then mixed into the flour (Durán 1971 [1581]:422–423). This bread, called *tzocoyotl* in Nahuatl and *bollitos* or little loaves by the Spanish, was eaten only on this day (*ibid*.). These examples emphasize that certain foods, particularly when they are made from plants that were considered sacred, have specific reference to particular festivals and feasts marking the annual cycle.

[30] Davíd Carrasco (1999:200) has indicated that in Aztec botanical thought maize kernels were believed to be composed of the visible seed and the invisible "heart of maize" and once planted they were immersed into the underworld, a place called Tlalocan, a colossal receptacle enclosed in the cosmic mountain. Aztecs believed that the only way for maize kernels to become active seed was for that seed to be united with the "heart" (*ibid*.).

[31] The Yucatec Maya were also noted for providing deities offerings of food and incense while their lords were given a drink of toasted (parched) maize (Landa 1975 [1566]:101).

Many Colonial accounts point out that indigenous pictographic representations and codices emphasize the importance of food and certain plants to Mesoamerican religious rituals, calendric rites, tribute and economy, and particularly symbolic associations with the ruling class. The indigenous diet was highly diverse and complex and consisted of foods often composed of ingredients brought from some distance. This was especially true for food prepared for ceremonial feasts (Boone 2000).

In western Mexico, the Basin of Mexico, Gulf Coast, and Maya lowlands, indigenous societies depended upon aquatic and maritime resources, and a whole host of plants and fungi, both wild and altered by human selection, that were available locally or acquired through trade (Parsons 2006). These accounts and descriptions strongly emphasize the sacredness of certain plants and foods to Mesoamerican cultures and their symbolic importance to the important festivals and feasts (Taube 1985, 1993, 1996; McNeil et al. 2006; Joyce and Henderson 2007). The variability of the different kinds of food as well as the manner in which they were prepared and consumed in the context of rituals and feasting among Mesoamerican cultures is extraordinary.

Summary and Conclusions

The critical factors to plant cultivation in the Valley of Mexico involved adapting to the complex hydrology of the valley, which was highly prone to erosion and maintained by restoration techniques that consisted primarily of using organic plant and fish fertilizer and allowing fields to fallow (Parsons 2006). The other primary challenges were climatic and involved periodic early frost in the higher elevations and drought. The Aztec built elaborate terraces on the surrounding mountain slopes, which covered most of the northern and central slopes in the fifteenth century (Sahagún 1963 [1590]). Farmers maintained these terraces by living amidst their fields. Familial and/or community identity was closely tied to their agricultural fields, particularly their cornfields or *milpas* (Stross 2006:581). The Aztec developed complex drainage and irrigation systems (*chinampas*) in the valley lakes of Zumpango, Xaltocan, Chalco, Xochimilco, and Texcoco (Parsons 2006:11–15:Fig. 2.2).

Fr. Bernardino de Sahagún (1963 [1590]) states that in the Valley of Mexico maize was planted in April or early May and was highly dependent upon rainfall and temperature. Jeffrey Parsons (2006) recently observed that the *chinampas*, which means “fence of reeds” in Nahuatl, was the most complex irrigation technology in the Valley of Mexico. *Chinampas,* or as the Spaniards referred to them “floating gardens,” were cultivated year round and provided much of the food resources for the Aztec capital and the great open-air markets at Tenochtitlan, Tlatelolco, and Tetzococo (*ibid.*). Because of its location in the midst of the lake and maze of canals, many of the first Spanish explorers who described Tenochtitlan compared it to Venice (Díaz 1953 [1567–1575]:177–178).

The primary accounts of Cortés and others reaffirm the importance of wild game, aquatic resources, and algae to the Pre-Columbian diet, and the power of elites to redistribute import and trade commodities from vast distances (Sahagún 1963 [1590]; Parsons 2006).

The chroniclers describe some important and interesting points about food and feasting in Mesoamerica. They indicate that plants such as maize and cacao have a close symbolic, sometimes metaphorical and mythological, association with the ruling elite. Feasting, in its various forms and cultural contexts, appears to be for the most part a reciprocal enterprise often carried out in the context of ritual performance or engagement, which to varying degrees reifies status and hierarchical relationships among a society or culture. Feasts are tied to a point in the calendar round, and certain cuisines are associated with specific feast days.

The preparation of food is also a sacred act, like the changing of the hearth (Taube 1998). Such perceptions suggest that in Pre-Columbian Mesoamerica, the mere preparation of food was a ritual act. It invokes one of the fundamental acts of creation. Colonial narratives such as the *Popol Vuh* indicate that the act of food processing, from field to hearth, was analogous to the creation in Maya mythology and central to worldview as well as the reckoning of astronomical cycles (Tedlock 1985). Food and feasting appear to play a central role in sociocultural development at a number of different levels. They served to rationalize and sanctify the social order, and to play a central role in ethnic identity, as well as provide tribute and goods to fill huge storehouses and markets. They also serve to remind us of the passing of time. The foods and cuisine of this region of the Americas continue to play a major role in what we eat and how it is prepared. The increasing detail and array of approaches being applied to research on ancient food and feasting should keep this theme in the forefront of interest among anthropologists, art historians, ethnobotanists, and biologists for years to come.

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Development of Agriculture in Prehistoric Mesoamerica: The Linguistic Evidence

Cecil H. Brown

Introduction

This study uses linguistic data to reconstruct the prehistory of agriculture in Mesoamerica, a cultural and linguistic area of Mexico and northern Central America.[1] Evidence is assembled indicating when, where, and for whom 41 cultivated and protected plants[2] native to the New World became significant to peoples of the region in prehistoric times. The study of prehistoric agriculture has traditionally been the purview of archeologists interested in paleoethnobotany. Nevertheless, this investigation intentionally avoids reference to archeological findings and other nonlinguistic results that may or may not complement those presented here. All conclusions presented in this study are solely on the basis of linguistic data.

Specific goals of this study are (1) determination of the earliest date by which each of the 41 plants developed significance for people in Mesoamerica, (2) location of the general areas in the region where each plant initially became important to human groups, (3) determination of which of the 41 plants became important to what groups of prehistoric people, and (4) determination of when these plants became important. The comparative approach of historical linguistics is employed, with use of lexical reconstruction and glottochronology. The comparative method facilitates determination of which of the 41 plants were named by speakers of specific ancestral languages. Glottochronology determines approximately when ancestral languages were *last*

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[1] Mesoamerica is situated in southern Mexico and northern Central America and comprises both a culture area (Kirchhoff 1943) and a linguistic area (Campbell et al. 1986). In this paper, the concept of Mesoamerica is somewhat broadened to encompass some northern areas of Mexico.

[2] By referring to "protected plants," I follow Berlin et al. (1973a) who define them as those plants "which may be cultivated in small numbers or which, while not cultivated, would not be as abundant without the intervention of man" (p. 146). Cultivated/protected plants are also referred to as "managed" plants in this study.

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spoken. This study employs a new glottochronological approach that yields dates for proto-languages that are entirely objectively derived.

Background

I have previously undertaken similar investigations that use the comparative method of historical linguistics to chart the prehistory of cultivated plants in the Americas. These include studies focused respectively on maize (Brown 2006a), common bean (Brown 2006b; see Chap. 10 this volume), and squash (Brown n.d.). Each of these investigations contains information on the prehistory of these three cultigens in the New World in general, including detailed results for Mesoamerica.

Historical Linguistics: Lexical Reconstruction and Glottochronology

The comparative approach facilitates reconstruction of vocabularies of languages of the remote past not preserved in written records. The basic method is to compare lexicons of modern genetically related languages to find words that are both phonologically and semantically similar. Such similar words are considered *cognates* if they can be shown to have developed from a single word in the vocabulary of the ancestral or proto-language from which the related languages have developed (descended). For example, Yucatec and Jacaltec are two genetically related languages of Mesoamerica, both descended from Proto-Mayan, their common ancestral language spoken at the latest around 2,400 years before present (BP). These two languages have phonologically similar words for chili pepper, respectively, *ìik* and *ič*. Because the sound segments of these two words regularly correspond, these terms attest to the occurrence of a word in Proto-Mayan for chili pepper from which terms for the plant in both Yucatec and Jacaltec developed. Comparing sounds of these two words and related similar words for the plant found in other Mayan languages, it is possible to reconstruct Proto-Mayan's word for chili pepper, i.e., **iihk* (Brown and Wichmann 2004:196).

Using this approach, I determine which of 41 cultivated and protected plants were named in 30 different proto-languages of Mesoamerica spoken in the prehistoric past (see Table 1). These proto-languages are all ancestral to modern native languages of the region, and some are also ancestral to other proto-languages included among the 30. For example, Proto-Mayan is the immediate ancestor of Proto-Greater Tzeltalan, which in turn is the immediate ancestor of Proto-Tzeltalan. Appendix 1 lists and organizes the 30 Mesoamerican proto-languages according to ancestor-descendant relationship. Modern languages affiliated with proto-languages are also presented and located on a topographic map.

Table 1 The 30 Mesoamerican proto-languages (A–d), with LD date (in years before present), and indication of which of the 41 cultivated/protected plants were named in each language (X indicates named plant; bold X indicates earliest instance of a named plant)

Plant (English or Spanish common name)	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	a	b	c	d
Maize	**X**	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Maguey	**X**	X			X		X	X	X	X	X	X	X	X	X	X		X		X	X	X	X	X	X	X	X	X	X	X
Avocado	**X**	X			X		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Nopal	**X**			X	X	X	X	X	X	X	X	X	X		X	X		X		X	X	X	X	X		X		X	X	X
Squash	**X**	X			X	X		X	X	X	X	X	X		X	X	X	X		X	X	X	X	X	X	X	X	X	X	X
Chili pepper		**X**			X		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Manioc			**X**							X	X	X			X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	
Sweet potato			**X**		X		X	X	X		X	X	X		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Quintonil			**X**					X			X	X				X	X	X			X	X	X	X		X	X	X	X	X
Tobacco				**X**	X	X				X	X	X	X		X	X	X	X	X	X	X	X	X	X	X	X	X		X	
Anona					**X**					X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	
Cotton					**X**		X			X	X	X	X	X	X		X	X		X	X		X	X	X	X	X	X	X	X
White sapote					**X**			X	X		X		X			X				X	X	X							X	X
Epazote					**X**		X		X			X	X		X		X				X	X		X				X	X	X
Chayote					**X**			X	X	X		X	X		X	X				X	X	X		X	X		X	X	X	X
Mamey					**X**					X	X	X	X				X	X	X				X	X	X	X	X	X	X	
Black sapote							**X**	X	X	X		X	X				X							X		X	X	X		X
Common bean							**X**	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Cacao							**X**	X	X	X	X	X			X	X		X	X	X	X	X	X		X	X	X	X	X	X
Tomate							**X**	X	X	X	X	X	X	X	X	X	X			X	X	X	X	X	X	X		X		X
Tejocote								**X**	X			X																		X
Guava									**X**	X	X	X	X	X		X	X	X	X	X	X	X	X	X	X	X	X	X	X	
Chicozapote									**X**	X	X	X			X	X		X				X	X		X	X	X	X	X	
Papaya									**X**	X	X							X								X			X	
Pitahaya									**X**								X							X						X
Common purslane									**X**			X						X				X	X	X	X	X		X	X	

(continued)

Table 1 (continued)

Plant (English or Spanish common name)	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	a	b	c	d
Nanche									**X**						X	X		X		X	X	X	X		X	X	X	X	X	
Hog plum										**X**	X				X	X	X	X		X	X	X	X	X		X	X	X	X	
Jonote										**X**	X						X	X			X			X	X				X	
Pacaya palm										**X**	X					X		X			X	X	X	X		X	X	X	X	
Pineapple										**X**	X				X			X	X		X	X	X		X		X	X	X	
Cuajinicuil										**X**	X	X				X		X	X	X		X		X	X		X	X	X	
Coyol palm											**X**				X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	
Copal tree											**X**					X	X	X	X		X	X		X	X	X	X	X	X	
Ramon											**X**							X			X		X	X		X				
Guacimo											**X**						X	X	X					X	X	X	X		X	
Achiote											**X**				X	X		X		X	X	X	X			X			X	
Chipilin											**X**							X		X	X	X							X	
Lima bean											**X**							X				X				X			X	
Zapote amarillo													**X**		X									X		X			X	
Annual sunflower																														

Key to horizontal axis information:
A Proto-Otomanguean (7034 BP)
B Proto-Amuzgo-Mixtecan (4868 BP)
C Proto-Totonacan-Mixe-Zoquean (4387 BP)
D Proto-Uto-Aztecan (3712 BP)
E Proto- Mixtecan (3612 BP)
F Proto-Southern Uto-Aztecan (3503 BP)
G Proto-Zapotecan (3350 BP)
H Proto-Otopamean (3208 BP)
I Proto-Popolocan (2659 BP)
J Proto-Chinantecan (2455 BP)
K Proto-Mayan (2400 BP)
L Proto-Zapotec (2179 BP)

M Proto-Mixtec (1968 BP)
N Proto-Subtiaba-Tlapanec (1927 BP)
O Proto-General Aztec (1720 BP)
P Proto-Eastern Mayan (1614 BP)
Q Proto-Totonacan (1598 BP)
R Proto-Greater Tzeltalan (1565 BP)
S Proto-Core Mixe-Zoquean (1492 BP)
T Proto-Mamean (1450 BP)
U Proto-Greater Q'anjob'lan (1406 BP)
V Proto-K'ichee'an (1342 BP)
W Proto-Cholan (1223 BP)
X Proto-Totonac (1081 BP)
Y Proto-Zoque (1081 BP)
Z Proto-Yucatecan (972 BP)
a Proto-Mixe (967 BP)
b Proto-Oaxacan Mixe (848 BP)
c Proto-Tzeltalan (795 BP)
d Proto-Otomian (675 BP)

While it would be possible to do so, I have not reconstructed actual terms for the 41 plants in each of the 30 proto-languages as this is a large undertaking not pertinent to the goals of the present study. I have only determined the plants that appear to have been named in each ancestral language, given the available linguistic information. This task involved looking for cognate words for a specific plant occurring in genetically related languages. The existence of such cognates in the related languages, with appropriate distributions across the languages, constitutes evidence that their common ancestral language possessed a term for the plant.[3]

In making decisions involving word cognation, I consult earlier studies in which vocabularies of Mesoamerican languages have been subjected to comparative analysis and reconstruction. These include Kaufman (1972, 2003), Brown and Wichmann (2004), Kaufman and Norman (1984), and Berlin et al. (1973) for Mayan languages; Wichmann (1995) for Mixe-Zoquean languages; Kaufman (1990), Rensch (1976, 1989), Gudschinsky (1959), and Longacre (1957) for Otomanguean languages; and Miller (1967) and Hill (2001, 2008) for Uto-Aztecan languages. In the vast majority of cases, decisions reported here concerning the occurrence of a plant name in a proto-language agree with conclusions of these studies.[4]

Determination of a name for a specific plant in an ancestral language indicates that the plant was of considerable salience for its speakers. Berlin et al. (1973) in an important, but not widely cited study, assemble evidence that words for plants of high salience tend to be retained by offspring languages, whereas those for plants of low salience tend over time to be replaced. They present a very strong positive correlation between the lexical retention (stability) of plant names and the cultural significance of the plants they designate.

In the Berlin et al. (1973) study, plant names were collected from speakers of Tzeltal and Tzotzil, two closely related Mayan languages of Chiapas, Mexico, both of which are immediate daughter languages of Proto-Tzeltalan (see Appendix 1). Plant names in each of the two languages that refer to at least one identical species are compared for lexical similarity and possible cognation. Plants designated by these terms are grouped into four categories delimiting their cultural significance (from high to low): (1) cultivated plants, (2) protected plants, (3) wild-useful plants, and (4) wild-insignificant plants.

A total of 257 plant species have both Tzeltal and Tzotzil names (1973:161). Of these, 111 are designated by pairs of cognate terms attesting to a plant term's

[3] Lexical similarities involving words for plants can be rated with respect to how likely these are due to cognation, as opposed to chance resemblance or similarity because of borrowing. I judge lexical similarities as either (1) definitive with respect to cognation, (2) probable with respect to cognation, (3) ambiguous, or (4) because of either chance or diffusion. Only similarities pertaining to (1) and (2) are regarded as indicating cognation and, hence, the presence of a plant term in a proto-language. In addition, even when phonological similarity indicates word cognation, the underlying word in a proto-language may have designated something other than the target plant. Careful comparative analysis can usually resolve such semantic ambiguity.

[4] However, there are some differences. For example, I disagree with Kaufman's (1990) conclusion that comparative evidence indicates that a term for common bean pertained to Proto-Otomanguean (see Brown 2006a:512).

pertinence to the Proto-Tzeltalan lexicon. Paired terms for 146 species are found not to be cognate. Fourteen pairs pertaining to cultivated plants are found cognate and two are noncognate; 29 pairs pertaining to protected plants are cognate and seven are noncognate; 52 pairs pertaining wild-useful plants are cognate and 63 are noncognate; and 16 pairs pertaining to wild-insignificant plants are cognate and 74 noncognate.

The correlation between cognation and cultural significance is extremely strong and statistically significant: gamma = 0.97 (on a scale from 0.00 to 1.00, where 0.00 indicates no association whatsoever and 1.00 is a perfect correlation), $p < 0.001$. In other words, plant names of Proto-Tzeltalan strongly tend to be retained by its offspring languages when the plants designated are high in cultural importance, and strongly tend to be replaced when designated plants are low in cultural importance.

The implication of the investigation by Berlin and his associates for the present study is that plants whose names are determined to have been present in the 30 Mesoamerican proto-languages necessarily were all of substantial cultural significance for speakers of those languages. A managed plant showing "substantial cultural significance" is one whose name and use are well known to all adult members of a language community. On the other hand, the failure of a plant name to reconstruct for an ancestral language does not necessarily mean that the plant was not present in the habitat of speakers; it means only that, if it were present, it was not especially salient. For example, such a plant might be known only to a small subgroup of a language community's membership, such as a few agro-specialists. *Given these findings, the earliest dates for cultivated/protected plants documented for Mesoamerica by plant name reconstruction and glottochronology may not necessarily always correlate closely with those for the same plants attested through archeological investigation*.

Table 1 identifies those plants of the set of 41 named in each of the 30 proto-languages and presents Levenshtein distance (LD) dates for each of the ancestral languages. An LD date is the *latest* date at which a proto-language was spoken. For example, the LD date for Proto-Tzeltalan is 795 BP. This date is the hypothetical point in time just before Proto-Tzeltalan split into its two daughter languages, Tzeltal and Tzotzil.

LD dates are a new development in glottochronology (cf. Serva and Petroni 2008). Glottochronology was devised by Morris Swadesh (1951) in the mid-twentieth century as a method for determining the number of centuries since genetically related languages diverged from their common ancestor. This involves comparing the core vocabulary of two languages to determine the degree to which words in those languages are similar. Typically, core vocabulary is a list of 100 or 200 referents including common things familiar to all humans such as seed, blood, and water, and ordinary activities such as eat, sleep, and hear. Less similarity between two languages entailing words for these referents indicates greater chronological distance between the two languages, and more similarity indicates less chronological distance. Swadesh, working with the assumption that lexical replacement of core vocabulary on the average occurs at a relatively constant rate over time, developed a formula for determining the minimum number of centuries since a language divergence occurred. Applying this formula to the number of similar words in the core vocabulary list found for two languages, the number of centuries that have passed since the two split from a common ancestor can be computed.[5]

Although glottochronological dates are frequently cited in the literature dealing with language and culture prehistory, some linguists have been critical of the method from its inception. In recent years, however, increasing numbers of scholars have come to embrace glottochronology and its results (cf., Brown 2006a, b). One severe criticism of the method is that it is subjective as it involves human decisions concerning which words pertaining to core vocabulary found in two compared languages are or are not to be considered cognates. Different practitioners of glottochronology often use different criteria in deciding word cognation. In addition, different practitioners using the same criteria sometimes obtain different results simply because of the fact that human decision-making rarely if ever is totally objective.

LD dates are derived through an entirely objective procedure developed by the ASJP consortium[6] and first described in Wichmann et al. (2008). ASJP has assembled a database at present consisting of core vocabulary lists for over 2,400 languages and dialects.[7] These lists consist of words for 40-item subsets of the list of 100 basic referents proposed by Swadesh (1955). The 40 items, selected by a procedure described in Holman et al. (2008), are the most stable referents among the original 100.[8] The lists were transcribed in a phonologically simplified orthography known as ASJPcode described in Brown et al. (2008). Levenshtein distances (LDs) were calculated for all possible pairs of the 2,400+ languages[9] on the basis of the 40-item lists. An LD is defined as the minimum number of substitutions, insertions, or deletions needed to transform one word into another with which it is compared.

ASJP modifies LD in the following manner to account for confounding factors such as word length and chance phonological similarities derived from similar phoneme inventories: The raw LD is first divided by the longest string among the two compared words to obtain a normalized measure, LD_1. This is then further divided by the average LD_1 of all pairs of words not having the same meaning to obtain a further normalized measure, LD_2. Finally, the figures are converted to percentages.

The first step in calculating an LD date for a group of genetically related languages, such as Mayan, Indo-European, or Austronesian, is generation of percentages for all pairs of languages belonging to the group. Next, each family is partitioned into two objectively defined groups and the averages of the percentages for each pair of

[5] For a full description of this method, see Swadesh (1960), translated from Spanish to English by Joel Sherzer in Swadesh (1971:271–284).

[6] For information on ASJP (Automated Similarity Judgment Program), including names of consortium members, consult the project's home page: http://email.eva.mpg.de/~wichmann/ASJPHomePage.htm.

[7] These languages include most, if not all, recorded languages of Mesoamerica. Word lists for all languages in the database were extracted from hundreds of different sources. References to sources for each language are provided via a link to the ASJP home page (see above).

[8] Most stable referents are those whose names tend most strongly to remain unchanged over time.

[9] 2,881,200+ pairs.

languages whose members belong to different groups are calculated. ASJP has determined a constant rate of lexical change based on the degree of similarity between languages measured by LD percentages: 73% of LD similarity is retained over a period of 1,000 years.[10] Using this constant in a formula into which the average LD percentage for a group is entered, an LD date for the proto-language ancestral to the language group is calculated. Generation of LD dates is achieved through machine automation. This process entails no human decision-making and is therefore entirely objective.

LD dates are presented for the 30 Mesoamerican proto-languages in Table 1 (and are also given in Appendix 1). These constitute the first glottochronological dates for Mesoamerican languages that have been derived through an automated, totally objective approach.

Interpretation of LD Dates

Like all other glottochronological dates, LD dates constitute the *latest* dates at which ancestral languages were spoken. After a given LD date, the proto-language to which it pertains has ceased to exist since it has diverged into offspring languages. In other words, dialects of the ancestral language are no longer mutually intelligible and have thus become distinct languages. Theoretically, any proto-language could be substantially older than its divergence date. For example, according to an analysis by Wichmann et al. (2008), languages are spoken an average of 900 years before their divergence into daughter languages. Such considerations should be factored into interpretations of prehistoric events based on LD dates.

The Data: Languages and Plants

The data for this study come from both ethnobotanical and lexicographical sources. These sources yield names for 41 cultivated and protected plants in 68 contemporary languages and dialects (henceforth, languages) spoken by native people of Mesoamerica. The 68 languages, listed in alphabetical order, and their sources are given in Appendix 2. Classification of these languages and their location on a topographic map are presented in Appendix 1.

An exhaustive approach was used in selecting the sample of 68 languages. All Mesoamerican languages were included whose sources appear to be reasonably thorough with respect to recording names for the 41 managed plants. These include dedicated ethnobotanical studies for nine languages: Chinantec (Comaltepec), Huastec, Mixe (Totontepec), Mixtec (Alcozauca), Q'eqchi', Tzeltal (Tenejapa),

[10] Calculation of the constant is on the basis of historical, epigraphic, and archeological information calibrated with recorded events in language development.

Tzotzil (Zinacantán), Yucatec, and Zapotec (Mitla). Sources for the remaining 59 languages are dictionaries and personal communications. Many of the dictionaries include special sections in which the plants named are identified to scientific species (or to genus if not to species). Such presentations are typically found in the many dictionaries consulted for this study prepared and published by the Summer Institute of Linguistics (SIL). A large number of the dictionaries used have become available only within the last 20 years or so (mostly those produced by SIL). Therefore, two decades ago an investigation on this scale would not have been possible.

Words for plants from sources for the 68 languages figure into comparative analysis undertaken to determine the presence of names for specific plants in proto-languages. However, this analysis is not restricted to data from the 68 languages. Lexical sources for Mesoamerican languages not included among the 68, while not usually complete with respect to botanical inclusions and identifications, nevertheless provide information of some analytic use. Such data mainly consist of words for plants found in the several comparative studies of Mesoamerican languages mentioned above that were consulted for reconstructing plant inventories for ancestral languages.

The 41 plants investigated consist of species indigenous to the New World that are widely cultivated or protected by contemporary Native Americans of Mesoamerica.[11] I have attempted to be exhaustive in selecting plants to be included in this study, including all regularly managed plants known to me from personal experience in Mesoamerica and from the ethnobotanical and ethnographic literature. Plants excluded from the study are, for the most part, those of minor importance, typically only of circumscribed local interest, for which native-language names are seldom listed in dictionaries.

Native terms for the 41 plants for the most part bear a one-to-one correspondence with scientific species. Sometimes, however, they do not. For example, a single word in some native languages may designate several species of squash (*Cucurbita* spp.) as does the English word *squash*. Because of this ambiguity, names for some plants identified for ancestral languages cannot be assumed to have denoted some single specific species. All such names, with one exception, are accurately identified at least to genus. Thus, for example, the discovery that an ancestral language had a word for squash means that the language had a word that designated at least one, but conceivably more undetermined species of *Cucurbita*.

Special note should be made concerning the plant designated in this study by tomate (see Appendix 3). In Mesoamerica, the Mexican Spanish word *tomate*, depending on region, may designate either *Solanum lycopersicum* or *Physalis philadelphica*, both plants belonging to the family Solanaceae.[12] Similarly, in the vast majority of Mesoamerican languages surveyed for this study, these two species

[11] These include common purslane thought by some to be only Old World in origin, while others have proposed that it is native to both New and Old Worlds. Linguistic evidence assembled here indicates that the plant has considerable chronological depth in the New World.

[12] Most commonly, Mexican Spanish *tomate* designates *Physalis philadelphica* and *jitomate* denotes *Solanum lycopersicum*. The common English name for *S. lycopersicum* is *tomato*, and common English names for *P. philadelphica* are *tomatillo* and *husk tomato*.

are nomenclaturally related, either by both being denoted by the same term, or in some other more complex way.[13] For this reason, it is not possible to determine the exact referent of terms for tomate reconstructed for proto-languages. Thus, any term for tomate found pertinent for an ancestral language may have designated either *Solanum lycopersicum* or *Physalis philadelphica* or both.

Appendix 3 lists the 41 managed plants in alphabetical order by most well known common name (either from English or Spanish), with plant scientific identification, and, when found, other common names for the plants in Spanish (as spoken in Mesoamerica) and/or English. When plants can be scientifically identified to genus only, names are given for individual species of the genus that are ordinarily designated by native terms in the languages of Mesoamerica. Also given in Appendix 3 are the average elevation of plants in meters (when data are available), the earliest LD date found for each plant, and the proto-language with which the date is associated.

Discussion of Table 1

Table 1 presents the major empirical findings of this study. It is arranged as a matrix with common names for the 41 plants given on the vertical axis and proto-language names with LD dates on the horizontal axis. The 30 proto-languages are listed from left to right according to magnitude of their LD dates, from oldest to youngest. In each proto-language column, Xs are used to identify those plants whose names are present in proto-languages. Plant names are listed from top to bottom of the plant column according to the date associated with the earliest occurrence of their name in a proto-language (indicated by a **bold font** X), with the earliest dated plant at the top, and the latest at the bottom.

Table 1 shows that reconstructed names for maize, maguey, avocado, nopal, and squash are found for the earliest Mesoamerican proto-language, i.e., Proto-Otomanguean (7034 BP).[14] Maize and avocado can be identified to species (respectively, *Zea mays* and *Persea americana*). The other three can only be identified to genus (respectively, *Agave* spp., *Opuntia* spp., *Curcubita* spp.). Table 1 also shows that by 1968 BP names for all but one of the 41 cultivated/protected plants have

[13] For example, Totonac (Xicotepec): *paklhcha* '*Solanum lycopersicum*' and *xako'xkaa' paklhcha* '*Physalis philadelphica.*'

[14] Kaufman (1990) proposes that a word for sweet potato also pertained to Proto-Otomanguean. He points to possible cognates in two Otomanguean language groups, Tlapanec and Zapotecan. For example, Tlapanec and Chatino (Zapotecan) have very similar terms for the plant, respectively *gohon* and *kuun*. Other Zapotecan-language terms for the plant are not as similar to the Tlapanec word as is the Chatino term, e.g., Zapotec (Mixtepec) *gu* and Zapotec (Quiavini) *guhuh*. Tlapanec and Chatino are both spoken today in towns that are relatively close to one another in a highland area near to the Pacific coastal plain of southwestern Mexico. My interpretation is that the similarity of words for sweet potato in these two languages is due to diffusion of the word from Chatino to Tlapanec rather than to cognation.

been reconstructed for Mesoamerican proto-languages. A name of one of the plants, annual sunflower, has not been reconstructed for any of the 30 ancestral languages, indicating that it is probably a very recent addition to the Mesoamerican assemblage of managed plants.

Ancestral-Language Homelands

Determining locations at which plants first became significant to prehistoric Mesoamericans requires identifying where proto-languages were spoken, i.e., identifying ancestral-language homelands. Comparing plant-name inventories reconstructed for proto-languages with plant-name assemblages of modern Mesoamerican languages is one approach to homeland location. Close similarity of a plant-name inventory of an ancestral language to that of some modern language indicates that the ancestral language was probably spoken in a habitat similar to that of speakers of the modern language. This approach contributes to the location of homelands of ancestral languages, and, hence, to determining where cultivated and protected plants known to their speakers were of significance. Of special importance in this analysis is the elevation of habitat above sea level.

The average altitude for managed plants is determined through use of online information supplied by the Missouri Botanical Garden (http://www.tropicos.org). This site catalogs a massive number of plant specimens from the neotropics and many other parts of the world, and is especially comprehensive for Mesoamerica and abutting areas. These data allow calculation of the average elevation at which specimens for individual species are found. Average elevations were determined for 32 of the 41 managed plants.[15] These are reported in Table 2 where for each plant is given its common name (either in English or Spanish) along with its scientific identification. In the table, plants are rank-ordered by average altitude (in meters) from lowest to highest.

Altitude of the location at which each of the 68 modern Mesoamerican languages is spoken is determined by consulting an online site named Global Gazetteer Version 2.1 (http://www.fallingrain.com/world/index.html). This source gives elevation above sea level (in feet and meters), geographic coordinates, estimated

[15] There are a number of different reasons why average elevations for some of the 41 plants are not given. For example, in some cases so few specimens of a species were represented in the online sample that an average elevation obtained for them would not have constituted an accurate average elevation for the species. (All average elevations for plants listed are on the basis of at least 43 specimens, with the vast majority based on 100+.) Also, average elevations were not calculated for designations such as chili pepper, squash, nopal, copal tree, cuajinicuil, and tomate because these names are typically associated with more than a single species (see Appendix 3). (However, in the case of hog plum to which two species are pertinent, i.e., *Spondias purpurea* and *S. mombin*, an average elevation can be obtained as the average elevations of specimens for both species are almost identical.) An average elevation for maize (*Zea mays*) is not used as this species in Mesoamerica is cultivated at all elevations inhabited by humans, no doubt because of the many thousands of years that Mesoamericans have been involved in selection of maize varieties.

Table 2 The 32 cultivated/protected plants for which average altitudes are available, identified by common and Latin names, and rank-ordered by average altitude (given in meters, from smallest to greatest)

Common plant name	Latin plant name	Average altitude (m)
Ramon	*Brosimum alicastrum*	198
Chicozapote	*Manilkara achras*	218
Zapote amarillo	*Licania platypus*	224
Cacao	*Theobroma cacao*	339
Hog plum	*Spondias* spp.	344
Cotton	*Gossypium hirsutum*	354
Coyol palm	*Acrocomia mexicana*	354
Mamey	*Pouteria mammosa*	354
Papaya	*Carica papaya*	366
Guacimo	*Guazuma ulmifolia*	395
Common purslane	*Portulaca oleracea*	401
Achiote	*Bixa orellana*	437
Pacaya palm	*Chamaedorea tepejilote*	454
Manioc	*Manihot esculenta*	475
Pineapple	*Ananas comosus*	516
Black sapote	*Diospyros digyna*	529
Jonote	*Heliocarpus donnell-smithii*	534
Lima bean	*Phaseolus lunatus*	538
Guava	*Psidium guajava*	603
Sweet potato	*Ipomoea batatas*	685
Pitahaya	*Hylocereus undatus*	700
Nanche	*Byrsonima crassifolia*	796
Annual sunflower	*Helianthus annuus*	985
Avocado	*Persea americana*	979
Chipilin	*Crotalaria longirostrata*	1,129
Chayote	*Sechium edule*	1,137
Quintonil	*Amaranthus hybridus*	1,177
Tobacco	*Nicotiana tabacum*	1,252
White sapote	*Casimiroa edulis*	1,297
Common bean	*Phaseolus vulgaris*	1,447
Epazote	*Chenopodium ambrosioides*	1,695
Tejocote	*Crataegus pubescens*	2,094

population, and map location for most towns and villages of the world. All lexical sources for the 68 languages (see Appendix 2) indicate the major town or towns in which speakers reside. These towns were searched in Global Gazetteer Version 2.1, yielding for each language an elevation in meters. In some instances, sources give more than one town in which a language is spoken. The altitude determined for the language and used here is the average elevation of all the identified towns for a language. The 68 Mesoamerican languages range in altitude from 0 m (Huave) to 2,596 m (Trique) (see Table 3) and have an average elevation of 1,212 m.

A mean average plant altitude (MAPA) is given in Table 3 for each of the 68 Mesoamerican languages. MAPAs are calculated by summing the average altitudes

Table 3 The 68 contemporary Mesoamerican languages rank-ordered by MAPA (mean average plant altitude) from smallest to greatest, with associated altitude (in m) at which each of the languages is spoken, and with the number of the 41 cultivated/protected plants named in the languages. (See text for an explanation of color shading)

Language	MAPA	Altitude (m)	Number of plants
Nahuatl (Pajapan)	595.9	136	22
Nahuatl (Mecayapan)	610.7	37	24
Itzaj	610.8	109	31
Huave	612.1	0	25
Tzeltal (Bachajón)	617.2	1,001	25
Popoluca (Oluta)	620.8	48	32
Chol (Tila)	630.8	499	31
Chinantec (Usila)	642.6	99	28
Zoque (Francisco León)	645.6	465	25
Popoluca (Sayula)	646.8	50	31
Yucatec	650.2	38	32
Popoluca (Texistepec)	660.0	30	31
Huastec	663.1	136	32
Q'eqchi'	663.2	700	32
Zoque (Rayón)	666.5	1,599	24
Totonac (Papantla)	671.1	195	28
Totonac (Xicotepec)	673.0	999	31
Chinantec (Lealao)	675.4	627	23
Amuzgo	679.1	590	25
Chimilapa (San Miguel)	680.5	199	31
Popoluca (Soteapan)	682.1	400	29
Totonac (Zapotitlán)	689.2	977	25
Mixe (Coatlán)	691.0	2,208	33
Zapotec (Isthmus)	703.5	25	25
Chinantec (Ojitlán)	705.8	84	22
Tojolobal	708.0	1,387	28
Pipil	710.4	223	33
Nahuatl (Xalita)	710.7	588	26
Chatino	710.8	1,179	28
Chontal (Tabasco)	712.4	5	27
Chinantec (Tlatepuzco)	714.6	394	35
Tzotzil (San Andrés)	716.0	1,637	32
Zoque (Copainalá)	717.5	450	30
Tepehua	727.2	699	32
Zapotec (Zoogocho)	727.8	1,372	28
Zapotec (Yatzachi)	730.8	1,399	28
Chocho	735.6	2,200	22
Mazatec	740.4	1,475	29
Zapotec (Quiavini)	743.0	1,699	25
Tzeltal (Tenejapa)	746.9	2,092	37
Tz'utujil	750.6	1,566	32
Tzotzil (Zinacantan)	751.4	2,557	37
Mixe (Totontopec)	751.4	1,399	36

(continued)

Table 3 (continued)

Language	MAPA	Altitude (m)	Number of plants
Nahuatl (Acaxochitlán)	766.8	2,148	20
Nahuatl (Zacapoaxtla)	792.2	1,754	21
Zapotec (Mitla)	793.3	1,682	30
Ixil (Chajul)	799.2	2,007	19
Cuicatec	803.6	2,499	34
Tequistlatec	807.5	1,434	29
Kaqchikel	812.6	2,107	26
Chinantec (Comaltepec)	825.9	2,157	29
Popoloca (Atzingo)	833.6	1,562	17
Popoloca (Coyotec)	837.0	1,901	24
Ixcatec	851.2	1,844	25
Popoloca (Metzontla)	853.4	1,922	15
Mixtec (San Miguel)	860.5	2,549	20
Zapotec (Mixtepec)	861.4	2,050	28
Nahuatl (Naupan)	871.7	1,547	25
Nahuatl (Tetelcingo)	882.4	1,408	22
Phorhépecha	895.0	2,375	22
Otomi (Mexquititlan)	897.0	2,404	24
Trique	909.8	2,596	23
Mixtec (Alcozauca)	923.1	1,765	20
Zapotec (Atapec)	929.9	2,099	26
Otomi (Mezquital)	936.2	1,694	21
Tlapanec	988.4	1,374	19
Mixtec (Yosondúa)	1046.4	2,402	20
Mazahua	1071.5	2,584	17

for each of the 32 plants named in a language (see Table 2), and dividing the result by the number of the 32 plants named in the language. For example, Popoluca (Sayula) names 25 of the 32 plants. The sum of the average altitudes (in meters) of these 25 plants is 16,170, which divided by 25 yields a MAPA for Popoluca (Sayula) of 646.8. Also given in Table 3 is the altitude for each of the 68 languages. In the table, languages are rank-ordered by MAPA size, from smallest to greatest. MAPAs range in size from 595.9 (Nahuatl [Pajapan]) to 1071.5 (Mazahua).

The correlation coefficient for the association between MAPA and language altitude (see Table 3) is a robust 0.74. This statistic means that languages with larger MAPAs strongly tend to be spoken at greater altitudes than languages with smaller MAPAs. Thus, MAPAs predict with considerable accuracy the general elevation at which languages are spoken. With only one exception, Zoque (Rayón), languages with MAPAs ranging from 595.9 to 689.2 are spoken at or below 1,001 m (see yellow-shaded information in Table 3). MAPAs for these languages, then, indicate language location in "hot country" or lowland areas of Mesoamerica (lowlands are commonly regarded as extending from sea level to around 1,000 m). Conversely, all languages with MAPAs ranging from 727.8 to 1071.5 are spoken at or above 1,372 m (see blue-shaded information in Table 3), which indicates that these languages are located in "cold country" or highland areas of Mesoamerica (highlands are commonly regarded as extending upward from around 1,500 m). Languages with MAPAs showing an in-between range (691.0–727.2) are indeterminate with regard to general elevation (see information with no color shading in Table 3). Table 4 summarizes these observations.

MAPAs calculated for proto-languages of Mesoamerica indicate the general elevations at which these prehistoric languages were spoken. For example, words for 15 of the 32 plants (see Table 2) have been reconstructed for Proto-Popolocan (see Table 1). The sum of the average altitude of these 15 plants is 13,286, which divided by 15 yields 885.7, Proto-Popolocan's MAPA. This MAPA falls within the range of MAPAs for modern Mesoamerican languages (727.8–1071.5) that are spoken in highland areas (see Tables 3 and 4). Consequently, Proto-Popolocan's MAPA indicates that the ancestral language had a highland homeland.

A MAPA based on the average altitude of only a few plants is not sufficient to indicate the general elevation of a proto-language. Four of the 30 Mesoamerican proto-languages show terms for only one of the 32 plants for which average altitudes are calculated: Proto-Otomanguean (avocado), Proto-Amuzgo-Mixtecan (avocado), Proto-Uto-Aztecan (tobacco), and Proto-Southern Uto-Aztecan (tobacco). Another ancestral language, Proto-Totonacan-Mixe-Zoquean, shows terms for only three of the plants (manioc, quintonil, and sweet potato).[16] Thus, setting these proto-languages aside, MAPAs are determined for only 25 of the 30 proto-languages.

Table 5 lists the 25 Mesoamerican proto-languages for which MAPAs are determined, rank-ordered by MAPA size from highest to lowest. How these MAPAs translate into general elevation for individual ancestral languages is also indicated. Among these 25 proto-languages, 13 are determined to have been spoken in the highlands, 11 in the lowlands, and general elevation of one language, Proto-General Aztec, is indeterminate.

General elevations for five of the 30 ancestral languages are indeterminate because of MAPA inadequacy. Nevertheless, the general elevation of one of these five, Proto-Otomanguean, seems relatively apparent. Proto-Otomanguean almost certainly had a highland elevation as all of its offspring proto-languages, for which general elevations are determined, with one exception, show highland homelands: Proto-Otopamean, Proto-Otomian, Proto-Mixtecan, Proto-Zapotecan, Proto-Popolocan, Proto-Mixtec, and Proto Zapotec (only Proto-Chinantecan was a lowland language)

Table 4 Association of MAPA and general elevation of languages

MAPA range of languages	General elevation of languages
595.9–689.2	Lowland (0–c. 1,000 m)
691.0–727.2	(Indeterminate)
727.8–1071.5	Highland (c. 1,500 m and above)

[16] The MAPA for Proto-Totonacan-Mixe-Zoquean based on only three plants is 779. This MAPA, if it were accurate, would indicate a highland homeland for the ancestral language (see Table 4).

Table 5 Twenty five Mesoamerican proto-languages for which MAPAs are determined, rank-ordered by MAPA (from greatest to smallest), with associated general elevation

Proto-language	MAPA (mean average plant altitude)	General elevation
Otopamean	1076.0	Highland
Otomian	1036.0	Highland
Mixtecan	969.1	Highland
Zapotecan	890.4	Highland
Popolocan	885.7	Highland
Mixtec	879.7	Highland
Zapotec	858.7	Highland
Subtiaba-Tlapanec	845.8	Highland
Greater Q'anjob'alan	831.6	Highland
Mamean	775.2	Highland
K'ichee'an	774.9	Highland
Totonacan	763.1	Highland
Eastern Mayan	749.6	Highland
General Aztec	703.2	(Indeterminate)
Tzeltalan	685.1	Lowland
Totonac	680.5	Lowland
Oaxacan Mixean	676.6	Lowland
Core Mixe-Zoquean	672.5	Lowland
Mixe	653.0	Lowland
Zoque	637.5	Lowland
Mayan	628.0	Lowland
Chinantecan	618.8	Lowland
Cholan	599.1	Lowland
Greater Tzeltalan	597.7	Lowland
Yucatecan	561.7	Lowland

(see Table 5). In presentations that follow, Proto-Otomanguean is included among Mesoamerican ancestral languages determined to have been spoken in highland habitats.

Basic Analysis

"Basic analysis" refers to observation and description of unambiguous patterns in data, with little or no attention paid to their broader implications.

Table 6 combines information from Tables 1 and 5. It lists the 30 proto-languages, rank-ordering them by LD date from oldest to youngest. General elevation (if not indeterminate) is given for each proto-language, as is the number of plants of the sample of 41 for which terms are found. (The actual plants designated in each proto-language can be retrieved from Table 1).

Table 6 indicates that managed plants, whose names are reconstructed, have their earliest association with proto-languages spoken in highland areas of Mesoamerica. Proto-Otomanguean, a highland language, shows the oldest LD date, 7034 BP, for a proto-language for which names for plants reconstruct. Reconstructed names for managed plants do not appear in ancestral languages of the lowlands until considerably later. Proto-Chinantecan shows the oldest LD date, 2455 BP, for a lowland language for which plant names reconstruct, followed closely by Proto-Mayan, another lowland language, with an LD date of 2400 BP. Proto-Chinantecan and Proto-Mayan could have first begun to add names for these plants to their lexicons hundreds of years before these dates. Whenever the actual dates encoding commenced, names for the plants apparently began to be added to lexicons of

Table 6 The 30 Mesoamerican proto-languages, ranked ordered by LD date from oldest to youngest, given with general elevation, and number of plants of the sample of 41 for which terms are found

Proto-language	LD date	General elevation	Number of plants
Otomanguean	7034 BP	Highland	5
Amuzgo-Mixtecan	4868 BP	(Indeterminate)	4
Totonacan-Mixe-Zoquean	4387 BP	(Indeterminate)	4
Uto-Aztecan	3712 BP	(Indeterminate)	3
Mixtecan	3612 BP	Highland	13
Southern Uto-Aztecan	3503 BP	(Indeterminate)	4
Zapotecan	3350 BP	Highland	12
Otopamean	3208 BP	Highland	15
Popolocan	2659 BP	Highland	21
Chinantecan	2455 BP	Lowland	24
Mayan	2400 BP	Lowland	32
Zapotec	2179 BP	Highland	24
Mixtec	1968 BP	Highland	20
Subtiaba-Tlapanec	1927 BP	Highland	9
General Aztec	1720 BP	(Indeterminate)	23
Eastern Mayan	1614 BP	Highland	25
Totonacan	1598 BP	Highland	22
Greater Tzeltalan	1565 BP	Lowland	32
Core Mixe-Zoquean	1492 BP	Lowland	16
Mamean	1450 BP	Highland	23
Greater Q'anjob'alan	1406 BP	Highland	29
K'ichee'an	1342 BP	Highland	30
Cholan	1223 BP	Lowland	27
Totonac	1081 BP	Lowland	30
Zoque	1081 BP	Lowland	25
Yucatecan	972 BP	Lowland	31
Mixe	967 BP	Lowland	26
Oaxacan Mixe	848 BP	Lowland	28
Tzeltalan	795 BP	Lowland	34
Otomian	675 BP	Highland	18

lowland languages of Mesoamerica several millenia after such additions were first made to vocabularies of highland languages.

In Table 7, the average altitudes of plants (Table 2) are cross-tabulated against earliest LD dates attested for them in proto-languages (Table 1). Values of these two variables are given for (1) plants with average altitudes above or below 800 m, and (2) plants whose earliest LD date attestations are earlier or later than 3200 BP.

Table 7 shows a statistically significant ($p<0.01$), very strong positive correlation (0.83) between plant altitude and earliest LD date of attestation. Plants with average altitudes greater than 800 m tend to show earliest LD date attestations that are older than 3200 BP. Ten of the 32 plants have average altitudes greater than 800 m. Of these, 8 or 80.0% show LD dates earlier than 3200 BP. Conversely, plants with average altitudes less than 800 m tend to have earliest LD date attestations younger than 3200 BP. Twenty-two of the 32 plants show average altitudes of less than 800 m. Of these 22 plants, 16 (or 72.7%) show LD dates later than 3200 BP. These statistics indicate that managed plants adapted to higher elevations tended to develop substantial importance for speakers of Mesoamerican languages before plants adapted to lower elevations.

Table 6 shows that names for only a very few of the 41 plants have been reconstructed for the oldest proto-languages. The oldest language with reconstructed plant names, Proto-Otomanguean (7034 BP), had only five; the next oldest, Proto-Amuzgo-Mixtecan (4868 BP), five; the next, Proto-Totonacan-Mixe-Zoquean (4387 BP), four; and the next, Proto-Uto-Aztecan (3712 BP), three. With the passage of time, more and more plants became lexically recognized. Table 1 shows that by 4387 BP the number of different plants for which names are reconstructed for Mesoamerican languages in general increased from the original five to nine; by 3612 BP the number grew to 16; and by 3208 BP, to 21. Thus, from 7000 BP to around 3200 BP, a little more than half of the 41 plants became salient enough so that their names can now be reconstructed for Mesoamerican proto-languages.

From around 3200 BP to 2400 BP, 19 more plants developed substantial significance (as attested by plant name reconstruction). Thus, by 2400 BP, plant names can be reconstructed for a total of 39 or 95% of the 41 managed plants (see Table 1). It appears, then, that sometime between 4000 BP and 3000 BP commenced something of an explosion in the number of managed plants that became especially salient to speakers of Mesoamerican languages. This explosion is graphically apparent in Fig. 1, which shows the association of number of named cultivated/protected plants in Mesoamerican languages in general with years BP.

Table 7 Cross-tabulation of average altitudes of plants against earliest LD dates attested for them in ancestral languages of Mesoamerica

	Average plant altitude	
Earliest attested LD date of plant	Above 800 m	Below 800 m
Earlier than 3200 BP	8	6
Later than 3200 BP	2	16

Gamma = 0.83; $p<0.01$

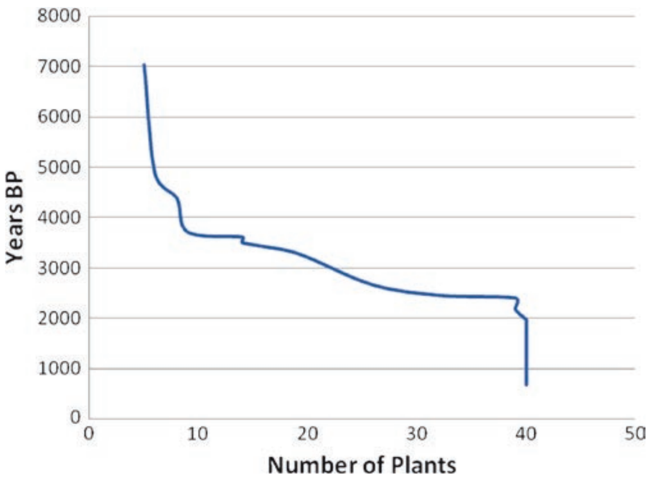


Fig. 1 Association of the number of cultivated/protected plants named in Mesoamerican proto-languages in general with years before present

In summary, linguistic evidence indicates that sometime before 7000 BP some of the 41 managed plants began to develop considerable importance for speakers of languages in highland regions of Mesoamerica. At first, only a few such plants were involved, the oldest language for which terms for the plants reconstruct, Proto-Otomanguean, showing words for only 5. From 7000 BP to 3200 BP, managed plants known to speakers of other languages of highland areas steadily increased in salience, but at a relatively slow pace, such that names can be reconstructed for only about half of the 41 plants in proto-languages spoken before 3200 BP (see Table 1). The next 800 or so years, from around 3200 BP to 2400 BP, witnessed several major developments: (1) The pace at which cultivated/protected plants increased in salience accelerated substantially, such that by the end of this relatively short period of time reconstructed names for 95% of the 41 plants are pertinent to proto-languages of the region; (2) for the first time, cultivated/protected plants became especially important to speakers of lowland languages; and (3) most of the plants for which names are reconstructed for proto-languages of this period are those with average altitudes associated with lowland areas.

Expanded Interpretation

"Expanded interpretation" refers to analysis that takes into consideration broader implications of assembled linguistic data for the prehistory of agriculture in Mesoamerica than does the basic analysis. Conclusions reached in this section should be considered somewhat more tentative than those of the preceding discussion.

The linguistic evidence for the earliest plant management in Mesoamerica is the occurrence of terms for avocado, maguey, maize, nopal, and squash in the lexical inventory of Proto-Otomanguen.[17] This ancestral language was spoken at the latest some 7,000 years ago, probably somewhere in the highland area of southwestern Mexico where many Otomanguean languages are spoken today. Linguistic evidence does not preclude the possibility that these five plants were managed by peoples of Mesoamerica at a much earlier time.

For a period of about 3,800 years, from around 7000 BP to 3200 BP, highland groups slowly, but steadily, added managed plants to their inventories of important botanical resources. By around 3200 BP, 16 cultivated/protected plants in addition to the five noted above had become familiar and important to highland peoples of Mexico, who spoke Proto-Mixtecan, Proto-Zapotecan, and Proto-Otopamean. These were anona, black sapote, cacao, chayote, chili pepper, common bean, cotton, epazote, mamey, manioc, quintonil, sweet potato, tejocote, tobacco, tomate, and white sapote.[18]

Circa 3200 BP,[19] and thereafter, major developments in Mesoamerican agriculture occurred. First, the pace at which managed plants developed substantial salience for people accelerated substantially. From the latter date to 2400 BP, groups had increased the Mesoamerican inventory of especially important managed plants to nearly twice as many as were known earlier to people of the region. These plants were achiote, chicozapote, chipilin, common purslane, copal tree, coyol palm, cuajinicuil, guacimo, guava, hog plum, jonote, lima bean, nanche, pacaya palm, papaya, pineapple, pitahaya, ramon, and zapote amarillo. The vast majority of the latter plants grow most successfully and abundantly in the lowlands where many were probably first cultivated or protected (this is indicated by the average altitudes for these plants given in Table 2).

These botanical additions reflect a second major agricultural event that occurred after circa 3200 BP, the development of plant management as a primary means of food procurement for groups of lowland Mesoamerica. Proto-Chinantecan and Proto-Mayan provide the earliest evidence for this development (see Table 6). These two ancestral languages, spoken at the latest around 2400 BP, both had lowland homelands probably located somewhere in the Gulf/Caribbean coastal plain of Mesoamerica where some of their offspring languages are spoken today.

[17] The presence of terms for these five plants in Proto-Otomanguean does not necessarily mean that they were domesticated. Terms for wild botanical species may have often been extended to their domesticated versions as these have developed. Nevertheless, the fact that names for these five plants are reconstructed for Proto-Otomanguean clearly indicates that they were of substantial significance to speakers of the language even if possibly not domesticated. (With this observation, I do not mean to suggest that maize may have evolved from wild *Zea mays*. L

[18] I do not mean to imply that all 16 of these plants were familiar to speakers of all of these ancestral languages, but only that each of the 16 plants was named in at least one Mesoamerican language by circa 3200 BP. For inventories of plants named in individual proto-languages, see Table 1.

[19] Perhaps several 100 years before 3200 BP.

Table 6 shows that 24 of the 41 plants were named in Proto-Chinantecan and 32 in Proto-Mayan.

As discussed above, Proto-Chinantecan's parent language, Proto-Otomanguean, was almost certainly spoken in a highland habitat, this suggesting that speakers of pre-Proto-Chinantecan probably moved from the highlands to the lowlands bringing with them an agrarian technology originally honed in cold country. As no Mesoamerican proto-language has been identified as ancestral to Proto-Mayan, we have no indication where their immediate ancestors might have been located. However, given linguistic indication of the beginnings of Mesoamerican agriculture in the highlands, pre-Proto-Mayan peoples, like speakers of pre-Proto-Chinantecan, might have moved from a highland area to the lowlands. It is also possible that the immediate ancestors of Proto-Mayan speakers were never situated in the highlands, and that Proto-Mayan speakers acquired at least some of their agrarian technology from highlanders through contact. This scenario would not preclude independent development of lowland agricultural resources by these people.

Whatever the details, by around 2400 BP speakers of both Proto-Chinantecan and Proto-Mayan practiced agriculture in lowland Mesoamerica, and probably had done so for hundreds of years preceding 2400 BP. The relatively large numbers of cultivated and protected plants named in these ancestral languages suggest that speakers of both languages lived in settled farming communities, perhaps the earliest such settlements found in the Gulf/Caribbean coastal plain of Mesoamerica.

Proto-Mayan's inventory of named managed plants is considerably larger than that of Proto-Chinantecan, 32 compared to 24. The next largest inventory for a proto-language older than Proto-Chinantecan (2455 BP) and Proto-Mayan (2400 BP) is that of Proto-Popolocan (2659 BP), a highland language with names for 21 of the 41 plants (see Table 6). No older proto-language shows more than 15 named plants (see Table 6). In addition, only one of the 30 proto-languages, Proto-Tzeltalan (870 BP), shows a larger inventory than that of Proto-Mayan (34 vs. 32, see Table 6). The average number of plants named in the 68 contemporary Mesoamerican languages surveyed for this study is 26.6 (Table 3), thus Proto-Mayan's inventory is clearly large even by the modern Mesoamerican standard. The large size of Proto-Mayan's assemblage of named managed plants robustly suggests that its speakers were fully engaged in a village-farming way of life, probably surpassing in size and sophistication that enjoyed by their lowland contemporaries, speakers of Proto-Chinantecan.[20]

[20] A nonconventional, but nonetheless empirically motivated proposal is that speakers of Proto-Mayan were the bearers or among the bearers of the New World's earliest civilization, Olmec. Olmec culture thrived on the Gulf coastal plain of the northern part of the Isthmus of Tehuantepec (Mexico) from 3200 to 2400 BP. The LD date for Proto-Mayan, 2400 BP, indicates that the language was spoken during a time period coinciding with the Olmec era. The large size of Proto-Mayan's plant-name inventory suggests the high degree of cultural complexity to be expected for bearers of a civilization. Furthermore, the determination here that Proto-Mayan was a lowland language, contrary to an earlier proposal (Kaufman 1976, see footnote 22) dovetails with the fact that Olmec civilization developed in a lowland environment. A similar argument might be made as well that speakers of Proto-Chinantecan were among the bearers of Olmec civilization.

Eight other lowland proto-languages emerged after around 2400 BP. Four of the latter are daughter languages of Proto-Mayan: Proto-Yucatecan (972 BP) and Proto-Greater Tzeltalan (1565 BP), and the latter language's two immediate daughter languages, Proto-Cholan (1223 BP) and Proto-Tzeltalan (795 BP). Speakers of these four languages were lowlanders (see Table 6) all of whose ancestors had probably been lowlanders since Proto-Mayan times. Modern descendants of speakers of these languages, with the notable exception of Proto-Tzeltalan, still occupy lowland areas.

Four other languages of the eight are non-Mayan: Proto-Totonac (1081 BP) and Proto-Core Mixe-Zoquean (1492 BP), and the latter language's two immediate daughter languages, Proto-Zoque (1081 BP) and Proto-Mixe (967 BP). Proto-Totonac is an immediate descendant of a highland language, Proto-Totonacan (1598 BP). Thus, speakers of pre-Proto-Totonac moved from a highland habitat to the lowlands. The three other lowland proto-languages are descended from prehistoric languages that are indeterminate with respect to general elevation of homeland. Consequently, while it is possible that ancestors of speakers of these lowland languages moved into hot country from highland locations, this migration cannot be confidently proposed at present.

Two dialects of Proto-Mayan developed into immediate daughter languages that remained in the lowlands, i.e., Proto-Greater Tzeltalan (1565 BP) and Proto-Yucatecan (972 BP). Speakers of other Proto-Mayan dialects left the lowlands and migrated to the highlands. These migrations could have occurred several 100 years before the breakup of Proto-Mayan (2400 BP). The first to move to the highlands were ancestors of speakers of Proto-Eastern Mayan (1614 BP) whose homeland almost certainly was in Highland Guatemala where all of its modern offspring languages are now spoken. (Proto-Eastern Mayan developed into Proto-K'ichee'an [1342 BP] and Proto-Mamean [1450 BP], both of which had highland homelands [see Table 6].) This migration was followed by that of ancestors of speakers of Proto-Greater Q'anjob'alan (1406 BP) who moved from the lowlands into the highlands of Chiapas (Mexico) and abutting highland areas of Guatemala. Today all speakers of Greater Q'anjob'alan languages are confined to the highlands. Finally, in relatively recent times, ancestors of speakers of modern Tzeltal and Tzotzil moved into Highland Chiapas. (Proto-Tzeltalan [795 BP], the immediate parent language of Tzeltal and Tzotzil, was spoken in the lowlands [Table 6]).[21]

By 1968 BP, names of 40 of the 41 cultivated or protected plants of the sample are reconstructed for at least one Mesoamerican ancestral language (see Table 1). One of the 41 plants, annual sunflower, is not named in any proto-language of the

[21] Another Mayan ancestral language, Proto-Huastecan, is the immediate parent of two other Mayan languages, Huastec (a lowland language of northern Veracruz, Mexico and abutting areas) and Chicomuceltec (a highland language of southeastern Chiapas, Mexico). Unfortunately, only a fragmentary lexicon exists for Chicomuceltec, a now extinct language, so that a full reconstruction of names for the 41 cultivated/protected plants is not possible for Proto-Huastecan. I have been able to calculate a MAPA (717.8) for Proto-Huastecan on the basis of partial plant-name reconstruction, but, unfortunately, it is indeterminate with respect to the language's general elevation.

region, suggesting that it became part of the general Mesoamerican inventory of managed plants only in very recent times. The plant may have even been a post-contact introduction to the region.

Conclusion

Using linguistic evidence, the development of agriculture in prehistoric Mesoamerica is investigated. This evidence indicates that avocado, maguey, maize, nopal, and squash were among the first plants to have been cultivated or protected by native Mesoamericans. This occurred, at the latest, by around 7000 BP somewhere in the highlands of Mesoamerica, probably in southwestern Mexico. From 7000 BP to 3200 BP, Mesoamericans of highland areas slowly but steadily added other managed plants to their inventories of important botanical resources. These included anona, black sapote, cacao, chayote, chili pepper, common bean, cotton, epazote, mamey, manioc, quintonil, tejocote tobacco, tomate, sweet potato, and white sapote. Beginning circa 3200 BP, the pace at which additional cultivated/protected plants developed in importance accelerated substantially. During the relatively brief period of around 800 years from circa 3200 BP to 2400 BP, the number of managed plants acquiring considerable importance for Mesoamericans nearly doubled. Also, at this time, people of lowland areas began to intensely manage useful plants. Plants gaining substantial importance at this time were, for the greatest part, those adapted to lowland habitats. These included achiote, chicozapote, chipilin, common purslane, copal tree, coyol palm, cuajinicuil, guacimo, guava, hog plum, jonote, lima bean, nanche, pacaya palm, papaya, pineapple, pitahaya, ramon, and zapote amarillo. By around 2000 BP, the modern Mesoamerican assemblage of important managed plants was all but fully established in the region, with the exception only of annual sunflower.

The first Mesoamericans of the lowlands for which linguistic evidence of plant cultivation and protection exists were speakers of Proto-Chinantecan and Proto-Mayan. These co-contemporaneous ancestral languages were spoken at the latest around 2400 BP, probably in areas of the Gulf/Caribbean coastal plain of Mesoamerica.[22] Names for large numbers of managed plants are reconstructed for these ancestral languages indicating that their speakers lived in settled agricultural communities, perhaps the earliest such communities of the coastal plain. The especially large plant inventory reconstructed for Proto-Mayan suggests that its speakers had a full village-farming way of life.

[22] The historical linguist Terrence Kaufman (1976:105), in an archeological journal, speculates that Proto-Mayan was spoken in a highland zone bordering on the lowlands. He presents very little evidence in support of this proposal, none of which is systematic. He also glottochronologically dates Proto-Mayan to 4200 BP which is 1,800 years older than the LD date for the language (2400 BP). Kaufman's dubious location of the Proto-Mayan homeland in the highlands and his much older date for the language have informed more than a generation of archeologists and others interested in the prehistory of Mesoamerica. Most archeologists who have cited these proposals have uncritically accepted them as being well-established facts, which they clearly are not.

Acknowledgments I would like to thank the ASJP Consortium for granting permission to use ASJP-produced LD dates for Mesoamerican ancestral languages. In addition, Karen Adams, Eugene Anderson, Daniel F. Austin, Brent Berlin, Pamela Brown, Lyle Campbell, Charles R. Clement, Geo Coppens d'Eeckenbrugge, Albert Davletshin, Pattie Epps, Gary Feinman, Charles Heiser, Jane Hill, Eric Holman, Eugene Hunn, Susan Kung, Andrew Leitch, Richard Manshardt, Joyce Marcus, Deborah M. Pearsall, Renata Rivera, Bruce Smith, Brian Stross, and Søren Wichmann all aided this study in important ways for which I am very grateful. This acknowledgement should not be taken as indicating agreement with conclusions drawn here of any of those thanked.

Appendix 1

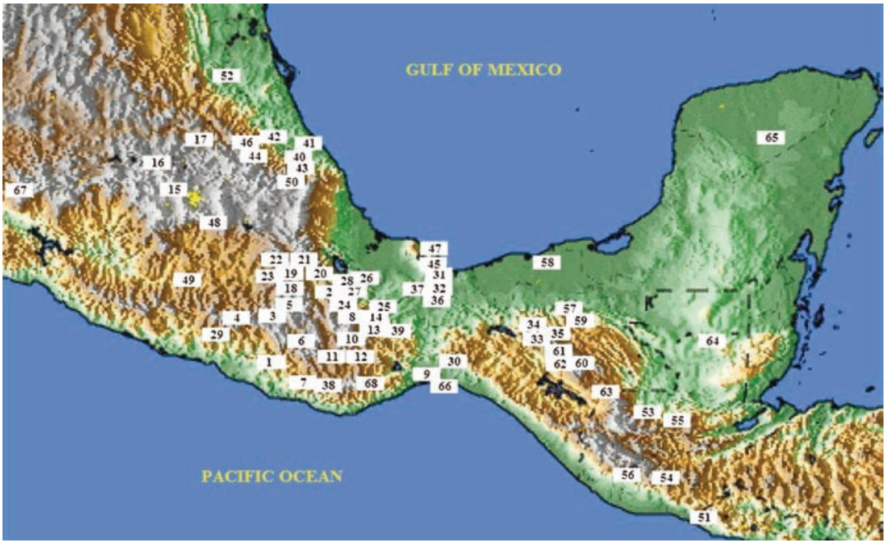
Thirty Mesoamerican proto-languages are organized according to ancestor-descendant relationship, indicated through indentation. Languages are descendants of those languages under which their names are indented. LD dates in parentheses are given for each proto-language. The 68 modern languages used in this study (see Appendix 2) are given with indication of their affiliation with proto-languages, or under "Language Isolates" when they have no such affiliation. Names for modern languages are italicized and each language is assigned an identification number (in parentheses). Sixty-eight languages are also roughly located by identification number on a topographic map of southern Mexico and northern Central America.

- Proto-Otomanguean (7034 BP):
  - Proto-Amuzgo-Mixtecan (4868 BP):
    - *Amuzgo (1)*
    - Proto-Mixtecan (3612 BP):
      - *Cuicatec (2)*
      - *Trique (3)*
- Proto-Mixtec (1968 BP):
  - *Mixtec (Alcozauca) (4)*
  - *Mixtec (San Miguel) (5)*
  - *Mixtec (Yosondúa) (6)*
  - Proto-Zapotecan (3350 BP):
    - *Chatino (7)*
    - Proto-Zapotec (2179 BP):
      - *Zapotec (Atapec) (8)*
      - *Zapotec (Isthmus) (9)*
      - *Zapotec (Mitla) (10)*
      - *Zapotec (Mixtepec) (11)*
      - *Zapotec (Quiaviní) (12)*
      - *Zapotec (Yatzachi) (13)*
      - *Zapotec (Zoogocho) (14)*
  - Proto-Otopamean (3208 BP):
    - *Mazahua (15)*
    - Proto-Otomian (675 BP):

Otomí (Mexquititlán) (16)
Otomí (Mezquital) (17)
Proto-Popolocan (2659 BP):
Chocho (18)
Ixcatec (19)
Mazatec (20)
Popoloca (Atzingo) (21)
Popoloca (Coyotepec) (22)
Popoloca (Metzontla) (23)
Proto-Chinantecan (2455 BP):
Chinantec (Comaltepec) (24)
Chinantec (Lealao) (25)
Chinantec (Ojitlán) (26)
Chinantec (Tlatepuzco) (27)
Chinantec (Usila) (28)
Proto-Subtiaba-Tlapanec (1927 BP):
Tlapanec (29)
Proto-Totonacan-Mixe-Zoquean (4387 BP):
Proto-Mixe-Zoquean (3071 BP)*:
*Tapachultec**
Proto-Core Mixe-Zoquean (1492 BP):
Proto-Zoque (1081 BP):
Chimilapa (San Miguel) (30)
Popoluca (Soteapan) (31)
Popoluca (Texistepec) (32)
Zoque (Copainalá) (33)
Zoque (Francisco Léon) (34)
Zoque (Rayón) (35)
Proto-Mixe (967 BP):
Popoluca (Oluta) (36)
Popoluca (Sayula) (37)
Proto-Oaxacan Mixean (848 BP):
Mixe (Coatlán) (38)
Mixe (Totontepec) (39)
Proto-Totonacan (1598 BP):
Tepehua (40)
Proto-Totonac (1081 BP):
Totonac (Papantla) (41)
Totonac (Xicotepec) (42)
Totonac (Zapotitlán) (43)

*Proto-Mixe-Zoquean is not included among the 30 ancestral languages for which inventories of cultivated/protected plants are reconstructed because its immediate daughter language, Tapachultec, a now extinct language, is inadequately documented. Thus, at present it is impossible to make an accurate assessment of the inventory of cultivated/protected plants pertaining to Proto-Mixe-Zoquean.

- Proto-Uto-Aztecan (3712 BP):
  - Proto-Southern Uto-Aztecan (3503 BP):
    - Proto-General Aztec (1720 BP):
      - *Nahuatl (Acaxochitlán) (44)*
      - *Nahuatl (Mecayapan) (45)*
      - *Nahuatl (Naupan) (46)*
      - *Nahuatl (Pajapan) (47)*
      - *Nahuatl (Tetelcingo) (48)*
      - *Nahuatl (Xalita) (49)*
      - *Nahuatl (Zacapoaxtla) (50)*
      - *Pipil (51)*
- Proto-Mayan (2400 BP):
  - *Huastec (52)*
  - Proto-Eastern Mayan (1614 BP):
    - Proto-Mamean (1450 BP):
      - *Ixil (Chajul) (53)*
    - Proto-K'ichee'an (1342 BP):
      - *Kaqchikel (54)*
      - *Q'eqchi' (55)*
      - *Tz'utujil (56)*
  - Proto-Greater Tzeltalan (1565 BP):
    - Proto-Cholan (1223 BP):
      - *Chol (Tila) (57)*
      - *Chontal (Tabasco) (58)*
    - Proto-Tzeltalan (795 BP):
      - *Tzeltal (Bachajón) (59)*
      - *Tzeltal (Tenejapa) (60)*
      - *Tzotzil (San Andrés) (61)*
      - *Tzotzil (Zinacantán) (62)*
  - Proto-Greater Q'anjob'alan (1406 BP):
    - *Tojolabal (63)*
  - Proto-Yucatecan (972 BP):
    - *Itzaj (64)*
    - *Yucatec (65)*
- Language isolates:
  - *Huave (66)*
  - *Phorhépecha (67)*
  - *Tequistlatec (68)*



Map 1 Mesoamerican Language Groups Topographic map of southern Mexico and northern Central America on which the 68 surveyed languages are roughly located by identification number (see above)

Appendix 2

Sources for names of the 41 cultivated/protected plants in 68 languages and dialects of Mesoamerica.

1. Amuzgo: Cloyd Stewart and Ruth D. Stewart. 2000. Diccionario Amuzgo de San Pedro Amuzgos, Oaxaca. Coyoacán, D.F.: Instituto Lingüístico de Verano.
2. Chatino: Kitty Pride and Leslie Pride. 2004. Diccionario Chatino de la Zona Alta Panixtlahuaca, Oaxaca y otros Pueblos. Tlalpan, D.F., México: Instituto Lingüístico de Verano.
3. Chimilapa (San Miguel): Heidi A. Johnson. no date. Mesoamerican Languages Documentation Project, Dictionary Query, Language: San Miguel Chimalapa Soke. http://www.albany.edu/anthro/maldp/mig.html.
4. Chinantec (Comaltepec): Gary John Martin. 1996. Comparative Ethnobotany of the Chinantec and Mixe of the Sierra Norte, Oaxaca, Mexico. Unpublished Ph.D. dissertation, University of California, Berkeley.
5. Chinantec (Lealao): Jaime Rupp and Nadine de Rupp. 1996. Diccionario Chinanteco de San Juan Lealao, Oaxaca. Tucson, Arizona: Instituto Lingüístico de Verano.
6. Chinantec (Ojitlán): Pablo Smith and Dorotea Smith. 1955. Vocabulario Chinanteco (Dialecto de Ojitlán, Oaxaca. México, D.F.: Instituto Lingüístico de Verano.
7. Chinantec (Tlatepuzco): William R. Merrifield and Alfred E. Anderson. 1999. Diccionario Chinanteco de la Diáspora del Pueblo Antiguo de San Pedro Tlatepuzco, Oaxaca. Coyoacán, D.F., México: Instituto Lingüístico de Verano.

8. Chinantec (Usila): Leonard E. Skinner and Marlene B. Skinner. 2000. Diccionario Chinanteco de San Felipe Usila, Oaxaca. Coyoacán, D.F., México: Instituto Lingüístico de Verano.
9. Chocho: Carol Mock. 1977. Chocho, Santa Catarina Ocotlán, Oaxaca. San Angel, México, D.F.: Centro de Investigación para la Intgegración Social.
10. Chol (Tila): (1) Otto Schumann G. 1973. La Lengua Chol, de Tila (Chiapas). México: Universidad Nacional Autónoma de México. (2) H. Wilbur Aulie and Evelyn W. de Aulie. 1998. Diccionario Ch'ol de Tumbalá, Chiapas, con Variaciones Dialectales de Tila y Sabanilla. Coyoacán, D.F., México: Instituto Lingüístico de Verano.
11. Chontal (Tabasco): Kathryn C. Keller and Plácido Luciano G. 1997. Diccionario Chontal Tabasco. Tucson, Arizona: Instituto Lingüístico de Verano.
12. Cuicatec: E. Richard Anderson and Hilario Concepción Roque. 1983. Diccionario Cuicateco. México, D.F.: Instituto Lingüístico de Verano.
13. Huastec: Janis B. Alcorn. 1984. Huastec Mayan Ethnobotany. Austin, Texas: University of Texas Press.
14. Huave: Glenn Albert Stairs Kreger and Emily Florence Scharfe de Stairs. 1981. Diccionario Huave de San Mateo del Mar. México, D.F.: Instituto Lingüístico de Verano.
15. Itzaj: Charles Andrew Hofling and Félix Fernando Tesucún. 1997. Itzaj Maya-Spanish-English Dictionary. Salt Lake City: The University of Utah Press.
16. Ixcatec: Ma. Teresa Fernández de Miranda. 1961. Diccionaro Ixcateco. México: Instituto Nacional de Antropologia e Historia.
17. Ixil (Chajul): Dwight David Jewet and Marcos Willis. 1996. Diccionario Ixil de Chajul-Español Español-Ixil de Chajul. Instituto Lingüístico de Verano.
18. Kaqchikel: (1) Déborah Ruyán Canú and Rafael Coyote Tum. 1991. Diccionario Cachiquel Central y Español. Guatemala, C.A.: Instituto Lingüístico de Verano. (2) Narciso Cojti Macario, Martin Chacach Cutzal, and Marcos Armando Cali. 1998. Diccionario Kaqchikel. La Antigua, Guatemala: Proyecto Lingüístico Francisco Marroquín.
19. Mazahua: Mario Colín. 1975. Vocabulario Mazahua-Español y Español-Mazahua. México: Biblioteca Enciclopédica del Estado de México.
20. Mazatec: Carole Jamieson Capen. 1996. Diccionario Mazateco de Chiquihuitlán. Tucson, Arizona: Instituto Lingüístico de Verano.
21. Mixe (Coatlán): Searle Hoogshagen Noordsy and Hilda Halloran de Hoogshagen. 1993. Diccionario Mixe de Coatlán, Oaxaca. México, D.F.: Instituto Lingüístico de Verano.
22. Mixe (Totontepec): (1) Alvin Schoenhals and Louise C. Schoenhals. 1965. Vocabulario Mixe de Totontepec.México, D.F.: Instituto Lingüístico de Verano. (2) Gary John Martin. 1996. Compartive Ethnobotany of the Chinantec and Mixe of the Sierra Norte, Oaxaca, Mexico. Unpublished Ph.D. dissertation, University of California, Berkeley.
23. Mixtec (Alcozauca): Alejandro Casas, Juan Luis Viveros, and Javier Cabellero. 1994. Etnobotánica Mixteca. México, D.F.: Instituto Nacional Indigenista.
24. Mixtec (San Miguel): Anne Dyk and Betty Stoudt. 1973. Vocabulario Mixteco de San Miguel el Grande. México, D.F.: Instituto Lingüístico de Verano.

25. Mixtec (Yosondúa): Kathryn Beaty de Farris. 2002. Diccionario Básico del Mixteco de Yosondúa, Oaxaca. Coyoacán, D.F., México: Instituto Lingüístico de Verano.
26. Nahuatl (Acaxochitlán): Gloria Ruiz de Bravo Ahuja. 1980. Náhuatl Acaxochitlán, Hidalgo. México, D.F.: Centro de Investigación Social.
27. Nahuatl (Mecayapan): (1) Joseph Carl Wolgemuth Walters, Marilyn Minter de Wolgemuth, Plácido Hernández Pérez, Esteban Pérez Ramírez, and Christopher Hurst Upton. 2000. Diccionario Náhuatl de los Municipios de Mecayapan y Tatahuicapan de Juárez, Veracruz. Coyoacán, D.F., México: Instituto Lingüístico de Verano. (2) Carl Wolgemuth. 1981. Gramatica Nahuatl de Mecayapan. México, D.F.: Instituto Lingüístico de Verano.
28. Nahuatl (Naupan): Earl Brockway, Trudy Hershey de Brockway, and Leodegario Santos Valdés. 2000. Diccionario Náhuatl del Norte del Estado de Puebla. México: Instituto Lingüístico de Verano.
29. Nahuatl (Pajapan): Antonio García de León. 1976. Pajapan: Un Dialecto Mexicano del Golfo. México: Instituto Nacional de Antropología e Historia.
30. Nahuatl (Tetelcingo): Forrest Brewer and Jean G. Brewer. 1971. Vocabulario Mexicano de Tetelcingo, Morelos. México, D.F.: Instituto Lingüístico de Verano.
31. Nahuatl (Xalita): Cleofas Ramírez de Alejandro and Karen Dakin. 1979. Vocabulario Náhuatl de Xalita, Guerrero. Centro de Investigaciones Superiores del INAH.
32. Nahuatl (Zacapoaxtla): Harold Key and Mary Ritchie de Key. 1953. Vocabulario Mejicano de la Sierra de Zacapoaxtla, Puebla. México, D.F.: Instituto Lingüístico de Verano.
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Appendix 3

Presentation of the 41 cultivated/protected plants, listing the plants in alphabetical order by most well-known common name (either from English or Spanish), with scientific identification, and, when found, other common names for the plants in Spanish (as spoken in Mesoamerica) and/or English, and, if available, average elevation in meters. When plants can only be scientifically identified to genus, names are given for individual species of the genus that are ordinarily designated by native terms in Mesoamerican languages. Also given is the earliest LD date found for each plant and the proto-language with which the date is associated.

Most well-known common name (English or Spanish)	Latin name	English common name(s)	Spanish common name(s)	Average elevation in meters (if available)	Earliest LD date (and associated proto-language)
Achiote	*Bixa orellana*	Annatto		437	2400 BP (Proto-Mayan)
Annual sunflower	*Helianthus annuus*	Common Sunflower, Sunflower	Girasol, Mirasol	985	(term not found in any proto-language)
Anona	*Annona* spp. [*cherimola, , muricata, squamosa* + others]	Cherimoya (*A. cherimola*), Guanábana (*A. muricata*), Sugar Apple (*A. squamosa*), Soursop (*A. muricata*), Sweetsop (*A. squamosa*)	Chirimoya (*A. cherimola*)		3612 BP (Proto-Mixtecan)
Avocado	*Persea americana*	Alligator Pear	Aguacate	979	7034 BP (Proto-Otomanguean)
Black sapote	*Diospyros digyna*		Zapote Negro, Zapote Prieto	529	3350 BP (Proto-Zapotecan)
Cacao	*Theobroma cacao*	Chocolate		339	3350 BP (Proto-Zapotecan)
Chayote	*Sechium edule*	Vegetable Pear, Merliton, Christophine	Guispil, Huispil	1,137	3612 BP (Proto-Mixtecan)
Chicozapote	*Manilkara achras*	Chewing Gum Tree, Marmalade Plum	Sapodilla, Nispero	218	2659 BP (Proto-Popolocan)
Chili pepper	*Capsicum* spp. [*annuum, frutescens, pubescens*]		Chile		4868 BP (Proto-Amuzgo-Mixtecan)
Chipilin	*Crotalaria longirostrata*	Longbeak Rattlebox		1,129	2400 BP (Proto-Mayan)
Common bean	*Phaseolus vulgaris*	Bean	Frijol	1,447	3350 BP (Proto-Zapotecan)
Common purslane	*Portulaca oleracea*	Purslane, Little Hogweed	Verdolaga	401	2659 BP (Proto-Popolocan)
Copal tree	*Bursera* spp. [*excelsa, graveolens, simaruba,* + others]	Gumbolimbo (*B. simaruba*)	Palo Mulato (*B. simaruba)*, Palo Santo (*B. graveolens*)		2400 BP (Proto-Mayan)
Cotton	*Gossypium hirsutum*		Algodón	354	3612 BP (Proto-Mixtecan)
Coyol palm	*Acrocomia mexicana*	Feather Palm	Coyol	354	2400 BP (Proto-Mayan)

(continued)

Most well-known common name (English or Spanish)	Latin name	English common name(s)	Spanish common name(s)	Average elevation in meters (if available)	Earliest LD date (and associated proto-language)
Cuajinicuil	*Inga* spp. [*edulis, jinicuil, spuria,* + others]	River Koko (*I. spuria*), Ice-cream Bean (*I. edulis*)	Paterno (*I. jinicuil*), Chalahuite (*I. spuria* and *edulis*)		2455 BP (Proto-Chinantecan)
Epazote	*Chenopodium ambrosioides*	Wormseed		1,695	3612 BP (Proto-Mixtecan)
Guacimo	*Guazuma ulmifolia*	Bay Cedar	Guácima, Guázima	395	2400 BP (Proto-Mayan)
Guava	*Psidium guajava*		Guayaba	603	2659 BP (Proto-Popolocan)
Hog plum	*Spondias* spp. [*mombin, purpurea*]	Red Mombin, Yellow Mombin	Ciruela, Jocote, Jobo	344	2455 BP (Proto-Chinantecan)
Jonote	*Heliocarpus donnell-smithii*		Jolocín	534	2455 BP (Proto-Chinantecan)
Lima bean	*Phaseolus lunatus*	Butter Bean	Frijol Blanco	538	2400 BP (Proto-Mayan)
Maguey	*Agave* spp. [*americana, brachystachys, chiapensis, sisalana, fourcroydes,* + others]	Century Plant (*A. americana*), Henequen (*A. fourcroydes*), Sisal (*A. sisalana*)			7034 BP (Proto-Otomanguean)
Maize	*Zea mays*	Corn, Indian Corn	Maíz		7034 BP (Proto-Otomanguean)
Mamey	*Pouteria mammosa* (syn. *P. sapota*)	Mammee Apple	Zapote Colorado	354	3612 BP (Proto-Mixtecan)
Manioc	*Manihot esculenta*	Cassava	Yuca	475	4387 BP (Proto-Totonacan-Mixe-Zoquean)
Nanche	*Byrsonima crassifolia*	Nance	Nance, Nantzin	796	2659 BP (Proto-Popolocan)
Nopal	*Opuntia* spp. [*dilleni, ficus-indica, guatemalensis, pubescens, stricta* + others]	Prickly Pear (*O. dillenii*), Indian Fig Opuntia (*O. ficus-indica*), Teen Cactus (*O. pubescens*), Erect Prickly Pear (*O. stricta*)			7034 BP (Proto-Otomanguean)

Pacaya	*Chamaedorea tepejilote*		Tepejilote, Pacaya	454	2455 BP (Proto-Chinantecan)
Papaya	*Carica papaya*			366	2659 BP (Proto-Popolocan)
Pineapple	*Ananas comosus*		Piña	516	2455 BP (Proto-Chinantecan)
Pitahaya	*Hylocereus undatus*	Red Pitaya, Dragonfruit, Strawberry Pear		700	2659 BP (Proto-Popolocan)
Quintonil	*Amaranthus hybridus*	Green Amaranth, Pigweed		1,177	4387 BP (Proto-Totonacan-Mixe-Zoquean)
Ramon	*Brosimum alicastrum*	Breadnut	Ojite, Ojoche	198	2400 BP (Proto-Mayan)
Squash	*Cucurbita* spp. [*argyrosperma, ficifolia, moschata, maxima, pepo*]	Cushaw (*C. argyrosperma*), Fig Leaf Squash (*C. ficifolia*), Musky Squash (*C. moschata*), Winter Squash (*C. maxima*), Summer Squash (*C. pepo*)	Calabaza		7034 BP (Proto-Otomanguean)
Sweet potato	*Ipomoea batatas*		Camote	685	4387 BP (Proto-Totonacan-Mixe-Zoquean)
Tejocote	*Crataegus pubescens*	Mexican Hawthorn		2,094	3208 BP (Proto-Otopamean)
Tobacco	*Nicotiana tabacum*		Tabaco	1,252	3712 BP (Proto-Uto-Aztecan)
Tomate	*Solanum lycopersicum, Physalis philadelphica*	Tomato (*S. lycopersicum*), Tomatillo, Husk Tomato (*P. philadelphica*)	Jitomate (*S. lycopersicum*), Miltomate, Tomate de Cáscara (*P. philadelphica*)		3350 BP (Proto-Zapotecan)
White sapote	*Casimiroa edulis*	Mexican Apple	Matasano, Zapote Blanco	1,297	3612 BP (Proto-Mixtecan)
Zapote amarillo	*Licania platypus*	Sansapote	Sonza	224	1968 BP (Proto-Mixtec)

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The Pastoral Niche in Pre-Hispanic Mesoamerica

Jeffrey R. Parsons

Introduction

Mesoamerica was the world's only ancient primary civilization that lacked a domestic herbivore. With domestic camelids (llamas and alpacas) in Andean South America, and sheep and goats, cattle, camels, horses, yaks, and water buffalo in the Old World, food producers in virtually all other regions where Archaic States existed were able to significantly extend their productive landscapes into drier and colder zones and over a full annual cycle – i.e., some of them became full- or part-time herders, and herder–cultivator relationships became important in the long-term development of socio-political complexity. Furthermore, protein from domesticated animal sources would have been scarce in Pre-Hispanic Mesoamerica by comparison to other parts of the ancient urbanized world. How could ancient Mesoamericans, with their seemingly much more limited capacity to generate and manipulate energy, have attained such a comparably high level of organizational complexity and population density?

Archaeologists and geographers have emphasized the role of agricultural intensification in sustaining complex Pre-Hispanic societies in the Valley of Mexico (Fig. 1), the core of Mesoamerica's largest urbanized polities after ca. 100 B.C. These discussions have focused overwhelmingly on seed-based agriculture: maize, amaranth, beans, and squash (e.g., Sauer 1941; Palerm and Wolf 1961; Sanders et al. 1979).

Because of their lack of domesticated herbivores, we might expect unusually well-developed efforts by ancient Mesoamericans to intensively exploit high-protein, non-agricultural resources that would have truly complemented, not merely supplemented, the basic agricultural staples, especially in the large expanses of *tierra fría* in central and north-central Mexico – land above ca. 1,800 m elevation, where severe winter frosts and highly seasonal rainfall limited seed-based agriculture to one growing season per year (Fig. 2). Harner (1977) and Harris (1978) "explained" this

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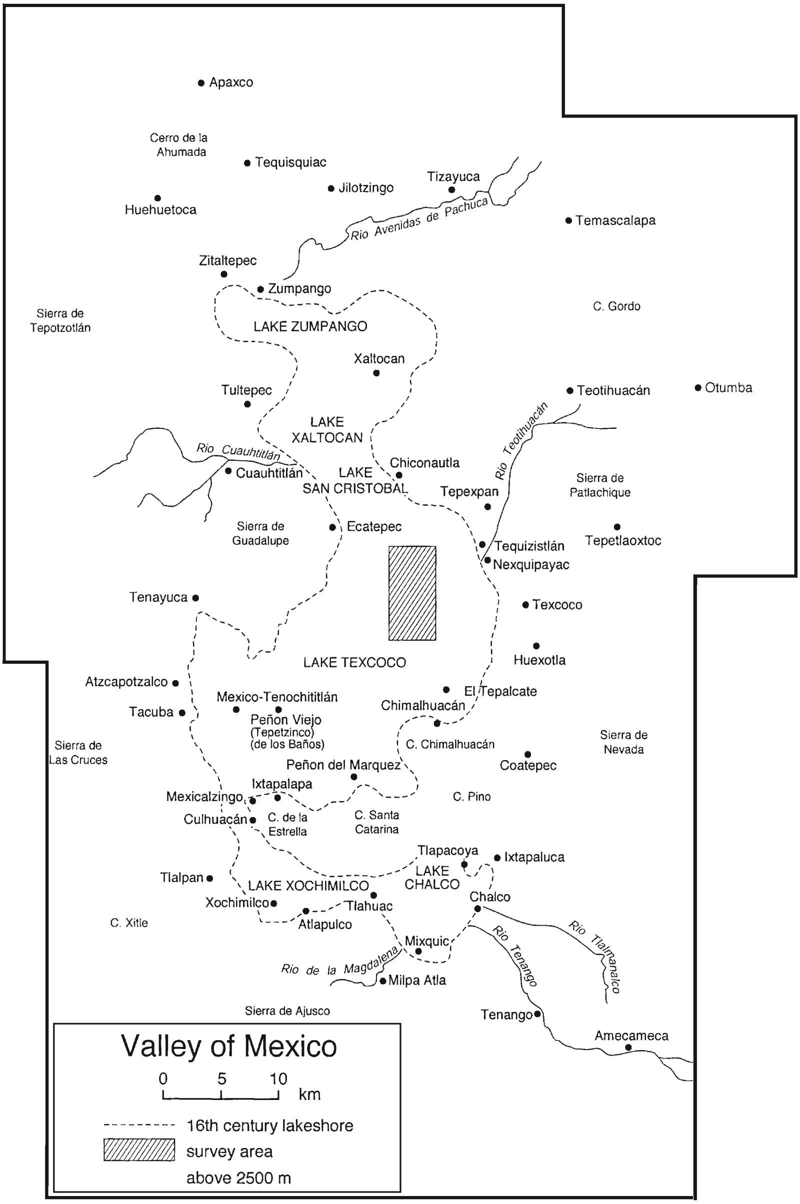

Fig. 1 The valley of Mexico

by asserting the role of human cannibalism. Following Ortiz de Montellano (1978, 1990), I also reject the role of cannibalism as a significant source of protein in Pre-Hispanic times in Mesoamerica, and I amplify and extend his efforts to propose an alternative scenario.

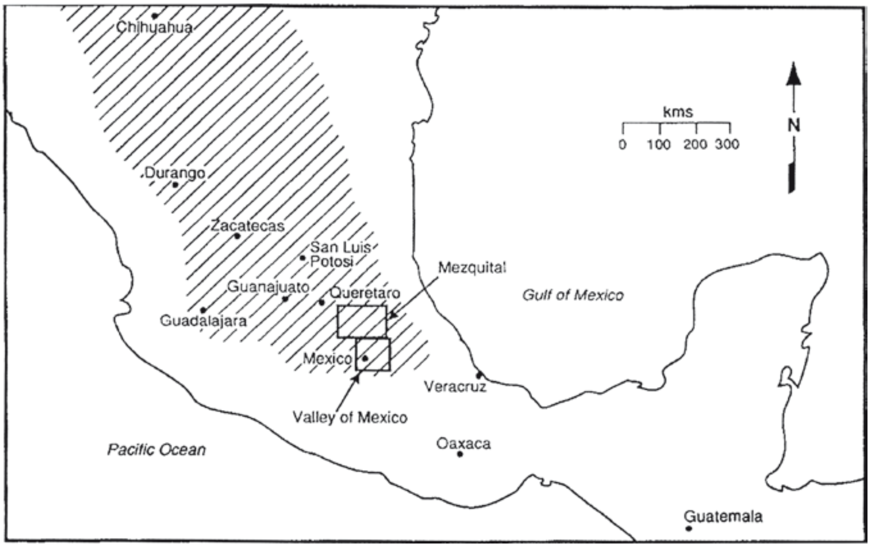

Fig. 2 Distribution of the *tierra fria* in Mexico

Here I present two interrelated hypotheses:

1. In the highlands of central Mexico, the development of complex society during the later Formative period (Table 1) was based upon the combined production of seed crops, maguey/nopal, and aquatic resources in the irrigable river valleys and marshy basins, with more specialized maguey production in the nearby drier plains and piedmonts beyond the reach of effective irrigation and high water table. These complementary resources provided a full range of food, calories, nutrition (including high-quality proteins), fiber, salt, and many other raw materials upon which high population densities and hierarchical organization depended.
2. The expansion of Mesoamerican civilization into the drier highland regions of north-central Mexico depended upon the full integration of seed-based cultivation and specialized maguey production in an environment where both large marsh-lands and dependable irrigation were lacking. Because such economic integration would have demanded the existence of a relatively centralized administration, it could not have been achieved until such a level of administrative complexity appeared in the post-Formative period. This is why we see such a limited Formative-period presence in (pre-Mesoamerican) north-central Mexico.

Essential to the development of these hypotheses are two key observations:

1. Domestic herbivores eat grass and other plants that human beings cannot consume directly. Therefore, people possessing domestic herbivores have access to a great source of energy that is not available to those lacking these domestic animals.
2. With a single exception, in no other part of the ancient world were maguey or aquatic insects and algae utilized as intensively as they were in parts of ancient

Table 1 Valley of Mexico, pre-hispanic chronology

Date	Period	Phase
1520 A.D.		
	Late Postclassic	Aztec III
1350 A.D.		
	Middle Postclassic	Aztec I-II
1150 A.D.		
	Early Postclassic	Mazapan
900 A.D.		
	Epiclassic	Coyotlatelco
650 A.D.		Metepec
		Xolalpan
	Classic	Tlamimilolpa
150 A.D.		Miccaotli
		Tzacualli
50 B.C.	Terminal Formative	Patlachique
250 B.C.		
	Late Formative	Ticoman
500 B.C.		
	Middle Formative	La Pastora
900 B.C.		El Arbolillo
	Early Formative	Bomba
1200 B.C.		Ixtapaluca

Mesoamerica. The single exception known to me is the Great Basin of the western United States, a zone occupied in antiquity by egalitarian tribal groups who lacked both agriculture and domestic herbivores, and where such resources were also intensively utilized.

Maguey as a Source of Food, Fiber, and Fuel

Writing a few decades after initial European contact, the Spanish friar Toribio Motolinia was impressed with the importance of maguey (*metl*) in the indigenous domestic economy in central Mexico:

> After the metl or maguey has matured and its stem is full-grown, they cut off its top together with five or six prickles [central leaves] where they are tender. The stem, which is above ground and from which the leaves issue, is as large as a sizable pitcher. They cut into the stem, making a cavity as large as a good-sized olla. By the time the plant is completely exhausted and the gouging is finished about two months pass, the lapse of time depending on the bulk of the plant; and each day during this time the sap is collected from that cavity into which it drops….
>
> The sap is fermented in a large earthen jar, as is done with wine… if taken with moderation, it is wholesome and very nutritious…. From this sap they also make good syrup and honey… They use this sap also to make little loaves of sugar… Good vinegar, too, is made from this sap…

> From the leaves of the maguey they obtain fiber for sewing. They also make cords, ropes and cables, girths and bridles from them; in short, whatever is otherwise made of hemp. The leaves are also used to make clothing and footwear… and mantles and capes.
> The points in which the leaves terminate are used in place of punches or awls, being very sharp and strong. Sometimes they serve as nails because they can with reasonable ease penetrate a wall or a piece of wood… they can be used in place of needle and thread by breaking off a small point together with the attached fiber.
>
> *If they do not gouge the metl or maguey to get wine, but let it mature, as many do, it yields a stalk as thick as a man's leg and two or three fathoms high; and having flowered and seeded, the stalk withers. Where wood is lacking, the maguey plant is used for erecting houses. Laths are obtained from it, while the leaves of fresh plants take the place of roof tiling. When a maguey plant has flowered, it withers to the roots, which occurs also after wine has been gathered from it. The withered leaves are used for burning, and in most regions it serves as firewood for the poor. It makes a very good fire, and the ashes are excellent for preparing lye* (Speck 1951:331–334).

Francisco Hernández, a distinguished naturalist and contemporary of Fray Motolinia, also noted that "this plant alone can easily provide everything necessary for a simple and frugal life, since the storms and climatic rigors do not damage it, and droughts do not cause it to wither. Nothing yields better (Hernández 1959:2:349; my English translation).

Maguey Flesh and Sap as Food

As noted above, the maguey plant provides a rich store of both sap and edible flesh. Throughout the highlands of southern, central and north-central Mexico today, maguey sap is acquired for human use by means of procedures which interrupt the final stage of a plant's normal 7–25-year maturation process in order to extract the sap through daily scraping and sucking operations over a period of 3–6 months. Individual plants in cultivated fields typically approach maturity continuously throughout the year. The timing of their planting and replacement is explicitly managed so as to ensure continuous productivity, when usually no more than 5–10% of a field's maguey plants are producing sap at any particular point in time (Patrick 1985; Rangel 1987; Evans 1990; Parsons and Parsons 1990).

Over its 3–6-month production period, a single plant typically yields several hundred liters of sap, and a hectare of land planted in maguey typically yields 5,000–9,000 liters of sap per year (Parsons and Parsons 1990:338). The sap may be allowed to ferment to form *pulque*, or it may be consumed in its unfermented liquid form (*aguamiel*), or it may be boiled down to form thick syrup or solid sugar. *Aguamiel* and *pulque* are quite unstable, and cannot remain unused for more than about a week (Figs. 3 and 4) As syrup or sugar, however, maguey sap is much more durable, and in these forms sap surpluses can readily be stored and redistributed over a period of months, or even longer.

Fig. 3 Castrating a mature maguey prepatory to extracting the aguamiel, Orizabita, Hidalgo, Mexico (Photograph by J. Parsons, 1983)

Fig. 4 Sucking aguamiel from castrated maguey, Orizabita, Hidalgo, Mexico (Photograph by J. Parsons 1984)

Fray Bernardino de Sahagún, another prolific sixteenth century observer, provides descriptions of the sap extraction process a few decades after initial Spanish contact:

> *… after the plants are mature he opens them up, or bores into them, or digs out the central leaves, and in this state they are scraped so that the honey from which they make pulque drips out, and they cook it or boil it first and then fill jars or skins with it, where they keep it after roots are added. The honey they sell is so thick that it seems solid, very sweet and delicious, and when it is sold it seems like water when drunk* (Sahagún 1969 [1590]: Bk. 3:140–141; my English translation).

In another passage, Sahagún described the obsidian cutting and scraping tools used for extracting the maguey sap:

> *The blade maker produces them from black stone [obsidian] using a pole supported by the feet and hands, and each time a blade is detached from the stone, and of these blades some are for shaving the head, and others for other things; some come from the surface [of the obsidian core] and others are backed, and some have two cutting edges, and others serve to scrape the interior part of the maguey so that liquid issues forth…* (Sahagún 1969: Bk.3:148).

Processes very similar to those described in the sixteenth century sources are still practiced today in some rural areas (Figs. 5 and 6).

The leaves, heart, and stalk of the maguey plant can also be cooked and eaten, as is still commonly done among more isolated modern groups in central and northern Mexico. The Tarahumara, for example, prepare cakes of baked maguey flesh, which can be stored for up to 6 months (Bye et al. 1975). Del Barco (1973)

Fig. 5 Scraping maguey leaf to extract fiber, Orizabita, Hidalgo, Mexico (Photograph by J. Parsons 1984)

Fig. 6 Spinning maguey fiber (Photograph by J. Parsons 1986)

provides a detailed eighteenth century description of the cooking process in northwestern Mexico:

> Near the living quarters they make a fire, into which they throw small stones. When the fuel has been consumed and the stones are well heated, they use long poles to spread out the fire and hot stones, and then they arrange the maguey hearts as necessary into a mound, and they cover it with the nearby hot earth; thus the heat is concentrated and held for a long time without dissipating. They leave it thus for at least 24 h, and more frequently for two nights and a day; and then they take everything out well cooked…."
>
> *When the maguey hearts are pulled out of the mound and left to cool, the woman of the household has enough food for herself and her family for three days, more or less, depending on the number of persons involved. The leaves or leaf fragments that remain fixed to the main plant are also eaten … The main body of the plant, that remaining after the leaves are cut off, is the most esteemed and solid part of the food. This is cut into slices with a knife and eaten with great pleasure since it is almost as sweet as honey preserve* (Del Barco 1973, cited in Rangel 1987:14).

Maguey sap and flesh are rich in both nutrients and calories. Ruvalcaba (1983:89) cites analyses showing that 1 L of *pulque* contains 574 calories. Davidson and Ortiz de Montellano (1983:155) report that one tablespoon of maguey sap contains (among other things) 0.08 g of protein, 5.35 g of carbohydrates, 20 calories, 0.33 mg of vitamin C, 0.02 mg of calcium, 5.03 mg of phosphorous, 12.7 mg of potassium, 30.0 μg of iron, 17.0 μg of magnesium, 9.0 μg of selenium, 6.0 μg of chromium, and 4.0 μg of zinc. In the early 1940s, Anderson et al. (1946:888) found that in the diets of their study group of rural Otomi villagers *pulque* supplied 12% of total calories, 6% of total protein, 10% of total thiamine, 24% of total riboflavin, 23% of total niacin, 48% of total vitamin C, 8% of total calcium, and 20% of total iron. Ross (1944, cited in Fish et al. 1986) found that 100 g of cooked agave flesh contains 347 calories and 4.5 g of protein.

It appears that in most *tierra fría* contexts maguey can produce approximately as many calories and essential nutrients per hectare as the standard seed crops; when the plant's flesh and sap are both consumed, maguey can potentially produce more calories than seed crops on a given unit of land (Parsons and Parsons 1990:337, 338, 345). Only on irrigated land and *chinampa* plots are seed crops significantly more productive than maguey. *Most important of all, maguey can be interplanted with seed crops in virtually all agricultural settings, and when this is done (as it commonly has been throughout the historic period in tierra fría contexts where subsistence agriculture remains the norm) the overall nutritional and energetic output on a given unit of land is potentially doubled.* [emphasis mine]

It is important to emphasize that this potential doubling of agricultural productivity in the *tierra fría* applies to *both* prime, highly fertile land as well as to more marginal terrain. Parsons and Parsons (1990) have noted, the ethnographic and historic literature is filled with clear evidence that maguey has been a key, primary component of agricultural productivity in virtually all types of agricultural land in the *tierra fría,* including both marginal terrain with dry, thin soils, and the most productive zones of deep soil and adequate humidity.

Combining maguey and seed crops would have maximized subsistence security for Pre-Hispanic agriculturalists in the *tierra fría,* which is the only part of modern Mexico where these plants flourish; annual energy productivity on most kinds of cultivated land could be doubled; agricultural productivity could be extended over a full annual cycle; agricultural productivity could be extended into nearby drier, colder, and less fertile areas which are quite marginal for seed crops; and the year-round productivity of maguey could be combined with the long-term storability of seed crops. Recent ethnographic studies (Parsons and Parsons 1990:31) also indicate that maguey sap exploitation can easily be deferred to the winter agricultural off-season (because after the initial "castration" operation, when the first stages of a plant's nascent central stalk are removed, the collection of the plant's sap can be postponed for up to 6 months, without any apparent loss in productivity), thereby reinforcing the complementarity between maguey and seed crops (see Fig. 3).

Maguey Fiber for Spinning and Weaving

In Pre-Hispanic Mesoamerica there were two *major* sources of fiber for making textiles used for clothing and other purposes: cotton and maguey (e.g., Anawalt 1980). Cotton could not be grown in the *tierra fría* at elevations above ca. 1,800 m asl, and so maguey was the only important source of textile fiber which could be locally produced in most of highland central and north-central Mexico (Fig. 6). Furthermore, according to Duran's sixteenth century account of Pre-Hispanic practices (1964:131), during the reign of Moctezuma I (ruler of Tenochtitlan ca. 1440–1469), "the common people will not be allowed to wear cotton clothing, under pain of death, but only garments of maguey fiber." Even if this assertion cannot be taken literally, it clearly suggests that the great mass of commoners were clothed in maguey-fiber garments, and that imported cotton cloth was much less widely available.

The only detailed description of the fiber-scraping process that I have been able to find in the Colonial period sources come from an unpublished account dating to the late eighteenth century. As seen in Fig. 5, this is remarkably similar to late twentieth century practice.

> *The Indians cut the leaves or pencas and place them on a flat board which they lean against a pole … and at the top of the board they fasten the surface of the leaf so that its cut edge hangs down toward the bottom of the board, and then scraping from top to bottom they remove the leaf's husk … thus they remove the fiber and pile it up … after washing the fiber with water they hang it out in the sun and overnight to dry and whiten …* (cited in Rangel 1987:7).

As far as I can determine, much of what little detailed sixteenth century information exists on spinning and processing maguey fiber (*ixtle*) comes from the writings of Bernardino de Sahagún:

> *The seller of coarse maguey fiber capes, … the dresser of maguey leaves in order to extract the fiber – the one who dresses them [is] an owner of maguey fiber who toasts [the leaves], treats them with maize dough. He dresses them, scrapes them, presses out the moisture, shakes out the water, places [the fibers] of his shoulder, treats them with maize dough* (Sahagún 1963:73).

And, in another passage,

> *… the Otomi women concerned themselves only with maguey fiber. [The green leaves] were toasted, dressed, scraped. They pressed the water [out of the fiber], treated it with maize dough, spin it, placed it over the shoulder, wove it* (Sahagún 1963:180).

Two other passages from Sahagún are informative about the several different kinds and qualities of clothing that was made from woven maguey fiber in the sixteenth century:

> *He sells capes of maguey fiber – clean ones, white, dough-treated – with dough applied, burnished with a stone, made firm …; an arm wide; [like] a small cylinder, narrow and short, long, extended; thick, very thick, exceedingly thick, like a foundation [cape]. It rings like metal. [It is] of tight weave, very tight; like a pottery rattle [in sound], a maguey fiber cape which sounds like a pottery rattle; [ornamented] with the whirlpool design, as it with*

> *eyes painted; … the maguey fiber cape of twisted weave; the one with broken cords, with husks outlined in black – in wide black lines, with the interior diagonal design; the cape with the ocelot design; the shiny maguey fiber one – shiny maguey fiber of fine grade.*
>
> *The coarse maguey fiber capes he sells are of loose weave – loose, picked with a thorn, trimmed with maguey spines; thick all over, of tight weave; carefully done ones, skillfully made coarse maguey fiber capes; [those made of] a single maguey fiber; white coarse maguey fiber capes, flowered coarse maguey fiber capes – those with flowers; small coarse maguey fiber capes; coarse maguey fiber capes of very thick weave; soft, coarse maguey fiber capes; those of wavy design; those of sparse and loose weave – very sparse and loose ones …; the coarse maguey fiber capes with nettles; … the coarse maguey fiber cape of fine quality* (Sahagún 1963:73).
>
> … many of the Otomi women [were] weavers of designs. They wove; they made the wonderful capes and designs, the skirts with designs; they wove the gauze weave, the so-called ocelot cape, the woven design skirt, the woven design shift …
>
> They wove the diagonal central motive, the turkey with mat-designed interior, the violet colored, the cape of twisted weave, the good-for-nothing, the useless weave, the glossy maguey weave; the maguey fiber cape, the one of single maguey threads, the netlike cape, the net like nopal cape, the netlike shift (Sahagún 1963:180–181).

Sahagún also notes that maguey fiber was also commonly employed for making sandals:

> *[He who] sells sandals, sells sandals of cured leather, of maguey fiber – of tight stitching, of thin stitching, of thick stitching; of tangled stitching, basted, of loose stitching: loose, straight, and long, straight, shiny, not dragging … He treats the sandals with leached ashes* (Sahagún 1963:73–74).

Recent ethnographic observations indicate strong continuities in maguey fiber processing between the sixteenth century and modern times. During the 1980s, for example, Parsons and Parsons (1990) observed a sequence of steps by means of which the flesh of the massive maguey leaf is separated from the fiber by scraping, and subsequently dried, carded, spun, and woven into cloth (see Fig. 6).

Maguey Sap, Flesh, and Fiber in Combination

Ethnographic studies show that, when properly managed, the sap, flesh, and fiber of a single maguey plant can be extracted for human use. These studies also reveal the critical importance of dried maguey stumps as fuel in areas where firewood is scarce or absent, just as in the sixteenth century. Pre-Hispanic highland populations may have been as much interested in the fuel which maguey provided as they were in the food and fiber which the plant produced: Sahagún (1969:3:145), for example, specifically mentions the sale for fuel of dried maguey stumps and leaves in mid-sixteenth century marketplaces in the Valley of Mexico.

Parsons and Parsons (1990:157) found that an average maguey leaf provides roughly 75 gm of dried fiber. An average maguey plant has 20–30 leaves, and thus provides approximately 2,000 g of dried fiber. An average modern carrying cloth (*ayate)* made of woven maguey thread measures about 1 m^2 and weighs about 200 g. Thus one maguey plant provides enough fiber for about 10 m^2 of cloth, probably enough for outfitting an average pre-Columbian person with most of the maguey-fiber textile required for clothing over a period of a few years. In addition to clothing and carrying cloths, maguey fiber would also have served to make a wide variety of nets, bags, and cords.

Ethnographic research indicates that on an average cultivated hectare of land in highland central Mexico about 30 maguey plants can be exploited each year for both sap and fiber (Parsons and Parsons 1990:336, 338). Thus, one hectare of cultivated maguey could potentially outfit approximately 30 people with the maguey cloth they need for a few (say 3) years. Or, assuming each average person requires one-third of his/her wardrobe to be replaced each year, then one hectare of cultivated maguey would provide the annual maguey cloth needs for some 90 people (once again, let us simplify our calculations by calling it an even 100). On this basis, 1,000,000 people (approximately the number of people living in the Valley of Mexico in A.D. 1500) would annually require for the clothing needs the fiber production (c. 600,000 kg) from some 10,000 ha (roughly 5% of the total arable landscape in the Valley of Mexico) of cultivated maguey. This same amount of land could *potentially, at the same time*, have produced annually about 50,000,000–90,000,000 L of *aguamiel,* roughly 6,000 metric tons of cooked maguey flesh, perhaps 8,000–10,000 metric tons of multiple cropping maize or beans, and many tons of dried maguey stumps for use as household fuel (Parsons and Parsons 1990:337–338).

When one considers these figures and remembers that maguey production (of both sap and fiber) can be deferred to the agricultural off-season, and that household spinning and weaving can also be relegated to the winter off-season period, then the complementarity of maguey and seed crop cultivation in the *tierra fría* becomes even more fully apparent, as does the greatly improved economic security the two cultivation systems provide in combination (Fig. 7).

The ethnobotany and paleo-ethnobotany of maguey are still in their infancy. However, even at this point the sub-specific variability of this plant in central Mexico is well known. Today, for example, there are at least a dozen named varieties of cultivated maguey in the eastern Mezquital (Salinas and Bernard 1983), and in the late nineteenth century there were more than two-dozen different named varieties in nearby Tlaxcala and Puebla (Blasquez and Blázquez 1897). In 1984 an elderly Otomi man told me that different varieties of maguey have different properties and characteristics: some are recognized as better sap producers, others are better for fiber, while others perform better on certain types of land with different characteristics of soil depth, humidity, organic content, proportions of stones, etc. This same man took me to one of his fields where there were 13 different-named varieties of maguey; unfortunately I lacked the time to record the full specificity of this variability, and as far as I can determine, nobody else has studied this interesting phenomenon. So, the specific qualities of these different types of maguey, and the origins of this impressive botanical diversity, remain poorly understood (see Fig. 7). However, some (or much) of it must ultimately derive from deliberate prehistoric human selection for specific qualities in an increasingly specialized and diversified maguey productive system.

Fig. 7 Multiple cropping maize and maguey, near Zumpango, Edo. de Mexico, Mexico (Photograph by J. Parsons, 1990)

Aquatic Resources: A Case Study from the Valley of Mexico

These resources include waterfowl, fish, edible insects, a variety of amphibians and reptiles, algae, reeds, and certain other aquatic plants. These products were energetically, nutritionally, and economically so important as to attract large numbers of people engaged full time in their extraction, processing, and distribution. The extensive ponds and marshes across the wide valleys and basins of the Mexican Mesa Central (Fig. 8) should be considered in much the same way as agricultural land in terms of their contribution to Pre-Hispanic subsistence.

The Aquatic Landscape in the Valley of Mexico

The Valley of Mexico is an internal-drainage basin about 7,000 km^2 in area. Lacking natural external drainage, it forms a great topographic saucer, rimmed on all sides by higher ground that surrounds a central depression. Today, after 400 years of extensive artificial drainage, this is virtually all dry land. In precolumbian times, however, rainfall on the surrounding slopes and plains drained into the lowest part of the basin to form a series of interconnected shallow lakes and marshes: from north to south, Lake Zumpango, Lake Xaltocán, Lake San Cristobal, Lake Texcoco, Lake Xochimilco, and Lake Chalco (see Fig. 1).

Lake Texcoco, at the bottom of the drainage gradient at ca. 2,238 m asl, was saline; Lakes Zumpango and Xaltocán were brackish, while Lakes Chalco and Xochimilco were freshwater. Beginning ca. 1200 A.D., the ponds and marshes of

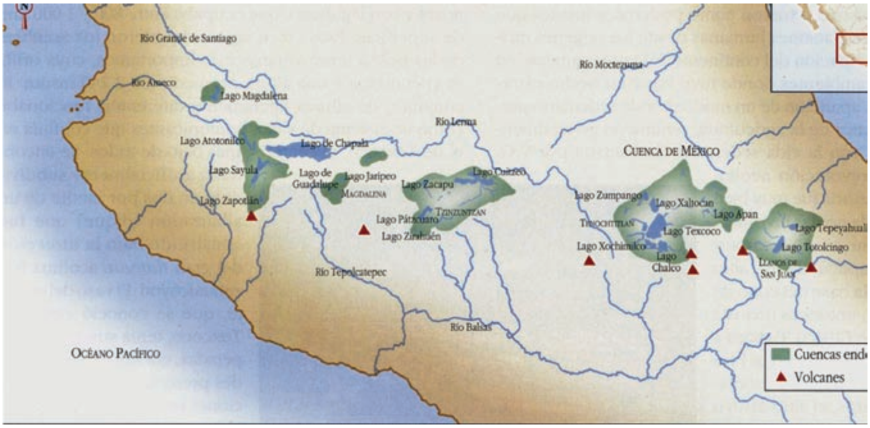

Fig. 8 The distribution of marshlands in the Mexican Mesa Central (adapted from Rojas 2004:24). There is another extensive marshland zone in the Toluca Region just west of the Cuenca de México

Lake Chalco-Xochimilco were drained and transformed into productive agricultural plots (*chinampas*) (Armillas 1971). Except around some of its peripheries (Ávila 1991), saline Lake Texcoco remained uncultivated, and there was only minor development of agriculture in the brackish northern lakes and marshes (Nichols and Frederick 1993).

The uncultivated expanse of saline ponds and marshland in the central and northern lakes – some 600 km^2 in area – attracted a high proportion of urban settlement after the thirteenth century A.D.: the Aztec/Spanish capital (Tenochtitlán/Mexico City) was situated within western Lake Texcoco, and many major Postclassic and Spanish Colonial towns were located around its shoreline (see Fig. 1).

The Historical Evidence of Saline Lake and Marsh Exploitation in the Valley of Mexico

García Sanchez (1998), Gibson (1964), Rojas (1985), Ramos-Elorduy and Pino (1989), Ortiz de Montellano (1990), and Parsons (2006) have discussed at some length the historically documented uses of aquatic resources in the Valley of Mexico from the early sixteenth through the mid-twentieth centuries. Sahagún's sixteenth century account (1963:63–65), for example, provides detailed descriptions of five types of fish, at least 38 types of waterfowl, 14 categories of "small animals that live in the water," and at least 18 categories of edible and medicinal aquatic plants. Spanish eyewitness observers of pre-conquest Tenochtitlán in 1519 (e.g., del Castillo and Bernal 1908:2:71–73) describe aquatic foods (fish, ducks, and pastes made from *algae* and insects) available in the urban marketplace.

Fig. 9 Eastern Lake Texcoco in 1550 (after Apenes 1947) (north is to the right). No. 1 shows men spearing (fish?, salamanders?, frogs?) from a canoe; No. 2 shows a man fishing (?) with a pole and line; No. 3 shows a man capturing waterfowl in large upright nets suspended from poles; No. 4 shows a man walking with a push-net over his shoulder; No. 5 shows a man pushing a net through the water (to capture insects?); No. 6 shows two men engaged in uncertain activity (building or repairing the reed barrier?)

A remarkable mid-sixteenth century map graphically illustrates a variety of fishing and bird-netting activities in Lake Texcoco, with other tasks of uncertain function (Fig. 9) (Apenes 1947; Linne 1948). Figure 9 clearly shows two major subdivisions of the "lake" separated by what appears to be a linear barrier made of interwoven reeds: (1) an inner (westward) section, with no aquatic plants, and where no waterfowl are being netted; and (2) an outer (eastward, toward higher ground on the Texcocan lakeshore plain) section, with numerous aquatic plants, and where the dominant activity is netting waterfowl (Fig. 10). This dichotomy suggests control over water depth in order to facilitate the exploitation of different kinds of aquatic resources – clearly this would have involved considerable competence in hydraulic engineering and careful management of the aquatic landscape. Other documentary sources inform us about the extensive drainage and flood-control projects undertaken by Aztec engineers throughout the region (Palerm 1973).

Most of the aquatic resources mentioned in the sixteenth century sources are animals, including very large quantities and varieties of waterfowl, mainly seasonal migratory species but also some year-round residents, plus several kinds of fish and fish eggs, several kinds of edible aquatic insects and insect eggs, and a range of amphibians, reptiles, and crustaceans. Except for migratory waterfowl, which were present in prodigious numbers only during the winter months, most of the other

Fig. 10 Netting insects in 1938, Lake Texcoco ©Museum of Ethnography, Stockholm, Sweden. (Photograph by Ola Apenes)

aquatic fauna were available year round. Only one lake plant, algae (*Spirulina*), is frequently mentioned as a sixteenth century food source, although the seeds, stalks, and roots of three or four other types of aquatic plants are also described as edible. There are also references to the use of reeds, rushes, and cane as raw materials for mats and house lot fences.

In the sixteenth century, waterfowl were hunted and trapped in a variety of ways, especially with the use of nets and snares and well-designed approach-and-follow tactics that tired the birds so that they were unable to fly away from the approaching hunters, who then simply seized, speared, clubbed, or netted them. Insects were also collected with a variety of nets (Figs. 11 and 12). The harvesting of insect eggs was facilitated through the construction of nurseries in shallow waters where the eggs were deposited on conveniently placed reed bundles pushed into the lake bottom, or on thick submerged ropes. Fish were speared, hooked, or netted. Frogs and salamanders were speared from boats or from the shore.

The Special Importance of Algae and Aquatic Insects in the Sixteenth Century

Of all the available aquatic resources, insects and algae stand out in terms of their huge volume and great nutritional value. Their special significance merits some quotations from two sixteenth century writers. Francisco Hernández noted several different varieties of aquatic insects that were harvested and consumed in the Valley of Mexico during the mid-sixteenth century:

Fig. 11 Bagging harvested insects, Lake Texcoco. (Photograph by J. Parsons 1967)

> *…The axaxayácatl is a small, lacustrine fly …is collected with nets from the lake in such great quantities that great numbers of them are cut up and mixed together to form little balls, which are sold in the markets throughout the year; the indians cook them in salty water wrapped up in maize husks, and prepared in this way they comprise a good food, abundant and agreeable …* (Hernández 1959:390; [my English translation]).

> *… a great quantity of a certain substance called ahuauhtli [*insect eggs*], with a fishy taste, is taken from the Mexican lake [Lake Texcoco]. It looks like a poppy seed, and it is the eggs of the axacayácatl … It is gathered by throwing into the lake, where the waters are most turbulent, loosely twisted cables as thick as a man's arm or thigh. The [*eggs*] shaken and swirled, adhere to these, from which the fishermen remove them and store them in large vessels. They make tortillas [from it] similar to corn ones, or the balls they call tamales … or they save it, split into portions and wrapped in corn husks, toasting or cooking it at a later time …* [English translation by Ortiz de Montellano 1990:118]

> *The mexicans refer by this term [Ocuiliztac] to certain little worms that live in Lake Texcoco, … When raw these are black, but once toasted in plates or on comales they promptly turn white. The indians eat them with salt … Every year, primarily during the rainy season, they occur in abundance and it is easy to capture them … they are not found*

Fig. 12 Preparing insect-egg nursery, 1938, Lake Texcoco. ©Museum of Ethnography, Stockholm, Sweden. (Photograph by Ola Apenes)

> *on the tables of rich people … but amongst those who do not have an abundance of better food …* (Hernández 1959:393; [my English translation]).

> *Izcahitli* is a mass of small worms that, captured with nets in Lake Texcoco and stored in large vessels, are sold in the markets … When cooked by the sellers they acquire a blackish color, an odor like fish eggs, and a consistency like compressed bread crumbs. They increase the quantity of milk in nursing mothers, for which purpose some make them into tortillas that they dry and store, although they do not preserve in a good state for very long in this manner. When these worms are half cooked, spices are added to improve their flavor … (Hernández 1959:395; my English translation)

Hernández also described the harvesting of algae (*tecuitlatl*) on Lake Texcoco in the Valley of Mexico:

> *Tecuitlatl, which resembles slime, sprouts in certain places in the Mexican basin and rises to the surface from which it is swept with nets or is removed with shovels. Once extracted and slightly sun dried, the Indians shape it into small loaves. It is again placed on fresh leaves until it is completely dry and then it keeps like cheese for only one year. It is eaten as necessary with roasted corn or with the common tortillas of the Indians. Each source spring of this slime is owned privately [emphasis added] and sometimes yields a profit of a thousand*

> *gold ducats yearly. It has a flavor like cheese … but less agreeable and with a muddy odor; when fresh it is blue or green; when old, it is the color of mud … [It is] edible only in small quantities, and this instead of salt or as a condiment for maize. The tortillas made from this material are a poor and rustic food…"* (Hernández 1959:408–409; English translation by Ortiz de Montellano 1990:104)

Fray Toribio Motolinia provided some additional details about algae utilization and the commercial redistribution of this product:

> *There breeds upon the water of the Lake of Mexico [western Lake Texcoco] a sort of very fine slime, and at a certain time of the year when it is the thickest, the Indians gather it with very fine nets until their … boats are full. On shore they make a very smooth plot 2 or 3 brazas [3.4–5.1 m] long and a little less wide on the earth or on very fine sand. They throw it down to dry until it makes a loaf 2 dedos [3.6 cm] thick. A few days later it dries to the thickness of a used ducat [coin]. The Indians cut this loaf into wide bricks and eat a lot of it and think it good. This merchandise is carried by all the merchants of the land as cheese is among us. Those of us, who share the tastes of the Indians, find it very tasty. It has a salty flavor*." (Motolinia 1967:27–328; English translation by Ortiz de Montellano 1990:104).

The Later Colonial Period and Nineteenth Century

Throughout the eighteenth and nineteenth centuries more than a million waterfowl annually made their way into the urban marketplaces (Gibson 1964:343). Their eggs probably provided an additional significant source of protein, nutrients, and calories – Sahagún (1963:26–39) noted that seven types of waterfowl raised their young in the Lake Texcoco marshes.

Other estimates hint that annual harvests of edible aquatic insect products might have amounted to thousands of metric tons (e.g., Peñafiel 1884:129–130). The huge masses of these insects that periodically washed up along the lakeshores during the nineteenth century were commonly collected for use as agricultural fertilizer (Orozco y Berra 1864:154). The potential annual harvests of fish, larval salamanders, frogs, crustaceans, mollusks, algae, and other aquatic plants are more difficult to quantify, but they were probably very substantial. Gibson (1964:339–340), for example, found that in the early seventeenth century "over a million fish were being taken annually from Lake Chalco and Xochimilco." Gibson also noted the presence of "professional Indian fishermen" at that time in many towns around the freshwater and saline lakes, and emphasized that "fishing jurisdictions were as carefully demarcated and as jealously guarded as land jurisdictions in native society."

The nineteenth and twentieth century sources reveal that the same aquatic resources continued to be used in more recent times. Similar products, similar uses, similar extractive and processing technology, and the similar importance of market exchange between lacustrine, agricultural, and craft producers have characterized the aquatic economy over four centuries. Marsh reeds and rushes continued to be noted as raw material for mats, and there are also some suggestions of use of these plants for food. Many aquatic food products were effectively dried for long-term storage, greatly facilitating the accumulation and exchange of surpluses from one year to the next.

Recent Ethnographic and Experimental Evidence

In the late 1930s and early 1940s, Scandinavian ethnographers recorded some details of traditional saltmaking, bird hunting, and insect collection along the eastern sectors of Lake Texcoco, from Nexquipayac to Chimalhuacán (see Fig. 1) (Apenes 1943; Linne 1948). Their published accounts dramatically underscore the remarkable continuity between these early twentieth century activities and their sixteenth century counterparts illustrated in Fig. 13.

In 1992, I observed traditional aquatic-insect collecting in the last remnants of the saline marshlands of Lake Texcoco at the modern village of Chimalhuacán (Parsons 2006). These observations amplify and extend some of the historic sources, and facilitate the interpretation of relevant archaeological data.

Insect Collecting. Four varieties of aquatic insects (members of the *Coraxidae* family, in both larval and adult stages) continue to be collected with a net mounted on a wooden frame fastened to a long handle and pushed by a man walking through shallow water where the insects live and breed. This activity duplicates that depicted in scenes from the 1930s recorded by Linne (1948:134), and illustrated on the mid-sixteenth century map (see Fig. 9). Occasionally, small fish are netted along with the insects. The insects and fish are ground to a paste with a *mano* and *metate*. The paste is then wrapped in maize husks and cooked in *tamale* form on a griddle (*comal*).

Insect eggs (*ahuauhtle*) are naturally deposited in great quantities throughout the year on the surfaces of aquatic vegetation. The harvested eggs are ground to a paste and then either cooked and eaten in *tamale* form, or (more commonly) mixed with other foods. The usual practice today is to encourage the insects to deposit their eggs in artificial lakebed "nurseries" – long lines of U-shaped clumps of grass inserted by hand with the aid of a wooden or iron stake into the shallow lake bottom at intervals of about 1 m. The grass surfaces provide places where large masses of insect eggs are deposited and whence they are periodically collected.

I found that up to 16 kg (dry weight) of aquatic insects can be netted in 2 or 3 hours from a ponded area approximately one hectare in area. Assuming that approximately 100 kms^2 (10,000 ha) of the original lake surface (ca. 500 km^2) might

Fig. 13 Window mural showing duck hunting on Lake Texcoco, 1938. Photograph by Ingrid Christensen, (Photo courtesy of Irmgard W. Johnson)

have been available for this type of activity, and that one hectare could produce an average of 10 kg of edible insects and 5 kg of eggs every 2 weeks, then a very rough estimate of maximum total annual insect/egg harvest would be 3,900 metric tons during precolumbian times. Peñafiel (1884:129–130) estimated that more than five times this quantity would have been potentially available. These figures are particularly impressive considering the high protein and amino acid content of these products (Tables 2 and 3).

Experimental Algae Production in Lake Texcoco. The nutritional value of algae (*Spirulina*) is outstanding. According to Furst (1978:60), for example, it is 65–70% protein by weight, "a higher percentage than any other natural food …," and it contains all eight essential amino acids. Dillon and Phad (1993:103) report that "the essential amino acids comprise 47% of the protein." Notably, the area of a

> … pond devoted to the cultivation of *Spirulina* can produce 125 times as much protein as the same amount of area devoted to corn, 70 times as much as to farmed fish, and 600 times as much as to cattle. (Furst 1978:62)

Since the 1960s there has been commercial production of *Spirulina* at a large evaporation plant (Sosa de Texcoco, abandoned in the mid 1990s) on the north side of Lake Texcoco. Here, by the 1970s a pilot program had succeeded in producing about 1 metric ton per day of dry *Spirulina* (Furst 1978), and this production was expected to rise soon thereafter to about 5 metric tons per day. By the early 1990s, annual productivity of this facility had expanded to 600 metric tons (amounting to 14 tons of protein per year per hectare) from an evaporation facility of some 800 ha (Gallejos 1993:135). The overall potential production is far higher because *Spirulina*

> … multiplies rapidly, dividing three times daily, and flourishes in waters that are too salty for irrigation or human consumption. All that is needed is the right amount of solar radiation and a high level of salinity. The Valley of Mexico … has about 240 days of sunshine per year and the water of Lake Texcoco has a pH factor between 9 and 10, which indicates a high salt content. Under these conditions, a single hectare can produce from 12,000 to 20,000 kg of dried protein [12–20 metric tons] per year from *Spirulina* (Furst 1978:63).

Under ideal conditions, the potential daily output of protein from *Spirulina* on 500 ha of Lake Texcoco would amount to 48,835 kg (nearly 50 metric tons) (Furst 1978:64).

Table 2 Protein content of some edible lacustrine insects from Lake Texcoco (adapted from Ramos-Elorduy and Pino 1989:49, 54, 55)

Insect	% Protein	% Protein digestible	% Total digestible
Corixidae: *ahuauhtle* (eggs)	56.55	89.34	61.56
Corixidae: *axayacatl* (adult)	62.80	98.02	86.95
Abedus ovatus S. (adult)	67.69	No data	No data
Ephydra hians S. (larvae)	35.81	No data	No data

Table 3 Essential amino acid content of some edible lacustrine insects (adapted from Ramos-Elorduy and Pino 1989:51–52)

Insect	Essential amino acid content (mg/16 g)[a]	FAO daily requirement (mg)
Krizousacorixa spp. and *Notonecta* spp.	43.6	–
Corisella spp.	38.9	–
Ephydra hians	50.62	–
–	–	36.0

[a]These amino acids include isoleucine, leucine, lycine, metionine + cisteine, phenylalanine + tironsine, threonine, triptophane, and valine

Pre-Hispanic Elite Control and Market Redistribution of Maguey and Aquatic Products

Canoes are often mentioned as essential for many kinds of hunting and collecting on and around the lakes in the sixteenth century. These boats were also used for transporting lakeshore residents – together with their harvested ducks, fish, reeds and reed mats, and insect products – to places where they exchanged their aquatic products for complementary agricultural and craft goods. The occasional mention of "water folk" in sixteenth century sources (e.g., Sahagún 1963:31, 33, 36, 65) suggests a significant degree of specialization in the exploitation of aquatic resources by lakeshore communities. The products of aquatic specialists would have nicely complemented those of urban artisans or full-time agriculturalists living farther inland – as references to market exchange indicate. The occasional mention of the individual ownership of fishing and algae-collection plots (Gibson 1964:339–340), Hernández 1959:408–409) is further testimony to the economic importance of aquatic resources and aquatic specialists in the sixteenth century economy. There is good reason to suspect that there was also controlled access to specific lake and marsh locales prior to European contact in the Valley of Mexico.

There is only limited documentary or archaeological evidence bearing upon the elite control and redistribution of maguey and aquatic products. As noted above, the production and use of these products are mentioned in many sixteenth century sources, and there is some indication of their role in marketplace exchange. However, we still understand little about how either set of resources was controlled or managed. Below I provide a few examples of what evidence I have found bearing upon elite controls and marketplace exchange of these materials at the time of initial Spanish contact in 1519–1521.

Maguey Products

Using the *Códice Mendocino*, Robert Barlow (1949) compiled lists of tribute acquired by the Aztec imperial authorities (Triple Alliance) in the early sixteenth century. This study showed that the only two sources of "maguey honey" were two provinces in relatively arid terrain just north of the Valley of Mexico. Each of these provinces annually contributed "400 large jars of thick maguey honey," and both also supplied large quantities of woven cloth made of maguey fiber (Barlow 1949:47, 50). Barlow reported no mention of either *pulque* or sugar, but from other sources Taylor (1987:54) found reference to three communities from the same region that annually sent a total of 62,500 L of *pulque* as tribute to the Triple Alliance.

I know of no mention of maguey products paid as tribute to the Triple Alliance from within the Valley of Mexico itself. However, it must be remembered that the tribute lists would have contained no information about products that may have reached consumers in the context of market exchange or as rent from the landed estates of nobility. The importance of maguey-fiber textiles in the tribute lists may relate to the documented significance of cloth (both maguey fiber and cotton) as a medium of market exchange and tribute payments during the late Pre-Hispanic period (Carrasco 1977:234, 237, 248; Hicks 1987:99; Brumfiel 1987:106).

Aquatic Products

Aquatic products are scarce in the sixteenth century tribute lists. Barlow (1949:42) lists only one tributary province, Quauhtitlan in the northwestern Valley of Mexico, from which significant quantities of such products derived annually, and this was exclusively in the form of 4,000 "rush mats [*petates*, or *esteras*] and seats."

As far as I can determine, there are no other mentions of aquatic products in the tribute lists studied by the authors cited above. However, Hernán Cortes and Bernal Diaz del Castillo – two Spanish soldiers who commanded and participated, respectively, in the combined Spanish–Tlaxcallan forces that conquered the Aztecs and their capital Tenochtitlan during 1519–1521 – briefly witnessed life in urban Tenochtitlan prior to the commencement of hostilities. Both left brief descriptions of aquatic products in the great marketplace at Tlatelolco:
According to Cortes,

> There is a street where all kinds of native fowl are sold, such as turkeys, partridges, quail, wild ducks, fly-catchers, widgens, turtle doves, doves, caged birds, parrots, owls, eagles, falcons, hawks and kestrels …
>
> *They sell pastries made from birds and fish. They sell much fish, fresh and salted, raw and cooked. They sell great quantities of turkey and goose eggs, as well as those of all the other types of birds I have mentioned; they sell prepared tortillas made from eggs* (Cortes 1963:72–73; [my English translation]).

Diaz del Castillo described the presence in the same marketplace of

> *… fisherwomen and others who sell some cakes made from a sort of ooze which they get out of the great lake [Texcoco], which curdles, and from which they make a bread having a flavor something like cheese* (del Castillo and Bernal 1908:73).

Although these sixteenth century sources, and others noted earlier, provide tantalizing references to the exchange of aquatic products in marketplaces throughout the Valley of Mexico and beyond in last decades of the Pre-Hispanic era, they do not give us much insight into the degree to which these resources may have been controlled and manipulated by elites. By the mid-sixteenth century, after several decades of Spanish domination, it is clear that some sections of especially productive wetlands were controlled by entrepreneurial producers and merchants who redistributed aquatic products through markets where they were brought and sold using recently introduced Spanish money. Nevertheless, the sixteenth century sources also indicate that many local communities also had direct access to wetland resources, and that individuals from these communities redistributed similar products through the same marketplaces, traveling to and fro across the lakes in heavily laden canoes. However, I know of no good information relating to how the control and redistribution of aquatic resources were managed during Pre-Hispanic times.

Conclusions

The very scarcity of documentary information relating to elite control of both maguey and aquatic resources might mean that the production and distribution of these products were controlled and managed at local levels that were not much noticed by sixteenth century writers. This is obviously a question that must remain in abeyance until more information – probably mostly archaeological – becomes available.

Model for the Northward Expansion of Mesoamerican Civilization ca. 500 B.C. to 500 A.D.

Figure 14 schematically depicts the hypothetical change in the socio-economic configuration of Central Mexico between ca. 500 B.C. (Late Formative period) and 500 A.D. (Classic period). Figure 14a illustrates the Late Formative situation in which relatively small cores of intensive production had developed in the environmentally most favored heartlands across the large basins and valleys of the Mesa Central. Although there was some contact and exchange of materials and ideas between these core areas, there was limited occupation of intervening marginal terrain (higher, drier, colder, and with thinner, less fertile soils), and little expansion of Mesoamerican civilization northward into more marginal terrain that continued to be mostly occupied by hunters and gatherers who practiced little or no agriculture, and who lacked significant access to aquatic resources. Although extensive maguey cultivation was technologically feasible in the more marginal northern regions during the Late Formative, existing socioeconomic systems were still too small and noncentralized to permit the effective integration of northern maguey specialists with intensive producers of complementary agricultural and aquatic materials to the south. Lacking

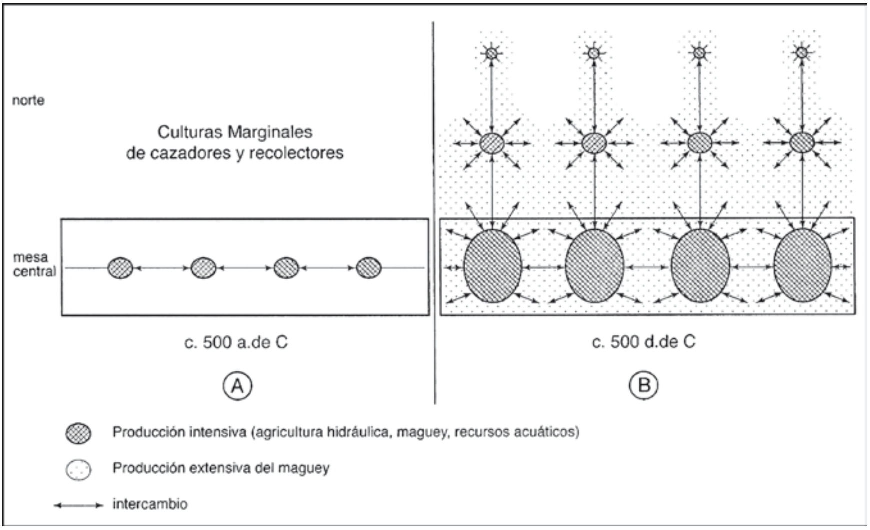

Fig. 14 Model of changing socioeconomic organization and northward expansion of Mesoamerican civilization between ca. 500 B.C. and 500 A.D

access to large quantities of these complementary products, the northern groups could not maintain a sedentary way of life or sustain high population densities, and so remained outside Mesoamerica.

By contrast, Fig. 14b shows a situation in which by ca. A.D. 500 the larger, more centralized economies of the Classic period permitted northern maguey specialists to obtain the complementary aquatic and agricultural products they required through marketplace exchanges that may have been centrally administered. This meant that more marginal northern terrain could be much more densely and extensively occupied than before. These conditions also facilitated the establishment and expansion of intensive producers in the smaller and more dispersed valleys of north-central Mexico where a degree of hydraulic agriculture and some access to aquatic resources was feasible, especially as water-control technology improved. This development, in turn, would have encouraged the expansion of maguey specialists yet farther to the north, as occurred by Epiclassic times when the Mesoamerican frontier attained its maximal northern extent.

This hypothetical model obviously must be further evaluated and revised on the basis of additional archaeological research in central and north-central Mexico

Overall Summary and Conclusions

I have tried to make the case for maguey and aquatic resources as the functional equivalent of pastoralism in ancient Mesoamerica. These resources in combination provided Pre-Hispanic peoples in the Valley of Mexico and across the broad

Table 4 Summary of products from maguey and aquatic resources in prehispanic Mesoamerica

Aquatic resources	Maguey
Edible insects	Fiber (*ixtle*)
Fish	"Meat" (baked leaves and plant bodies)
Waterfowl	Sap (aguamiel), pulque, syrup, sugar
Frogs	Construction material (leaves, stalks, trunks)
Salamanders	Fuel (dried leaves, stalks, trunks)
Turtles	
Reeds and other aquatic plants	
Algae	

Mexican *Mesa Central* with a full range of foods, nutrients, raw materials, and craft goods that complemented seed-based agriculture in much the same way as did herding of domestic herbivores in Andean South America and the Old World; only animal transport and animal traction were absent (Table 4).

The development of larger and more centralized economies during the Classic period permitted large numbers of specialists in maguey cultivation to occupy drier and colder terrain at higher and thinner-soiled elevations within the Mesa Central as well as more marginal arid lands farther to the north where Mesoamerican civilization had previously not existed (Braniff 1989; Kelley 1990). Maguey specialists in previously marginal terrain exchanged complementary products with producers in more favored core areas who focused on hydraulic agriculture and the intensive exploitation of aquatic resources. In this manner, Mesoamerican civilization expanded well to the north during Classic and Epiclassic times as full economic integration of different productive systems was achieved and overall carrying capacity substantially increased.

Notably, of all the world's ancient civilizations, as far as I can determine, only in ancient Mesoamerica were maguey and aquatic insects and algae intensively exploited. Such resources were of secondary or tertiary significance in the agropastoral societies of the Andes and the Old World. The core regions of ancient Mesoamerican civilizations, where the largest and most complex and expansive polities developed and endured, had their heartlands in the broad expanses of the large valleys and basins across the width of Mexico's central plateau where seed-based agriculture, aquatic resources, and maguey were combined for millennia. It should not be forgotten that the hypothetical scenario I have developed must be subjected to further refinement, elaboration, and testing through further archaeological and ethnohistoric research.

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The Drink Mescal: Its Origin and Ritual Uses

Mari Carmen Serra and Carlos Lazcano A.

Introduction

> Tezcatlipoca, also called Titlacauan, "…started by relating a tall story, he became a short, old man with very white hair, who went to *Quetzalcoatl*'s house and that old man entered where *Quetzalcoatl* was, and as he did so, the old man said: My lord and son, how are you? I have with me a medicine for you to drink. *Quetzalcoatl* replied: You are welcome, old man, I have been waiting for your arrival for many days.
>
> … and the old man, answering to *Quetzalcoatl*, said: My lord, look at this medicine which I bring for you. It is good and healthy, and intoxicates those who drink it. If you drink it, it will intoxicate you, it will heal you, it will soothe your heart, and it will remind you of the labors and fatigues of the work and of death, or of your departure…" (Sahagún, Fray Bernardino de 1982 [1590]:196–197).[1]
>
> Some chapters later, Sahagún (1590) mentions that *Quetzalcoatl* decides to leave Tula and that he arrives at Quauhtitlan, "…where there was a big and thick tree, and *Quetzalcoatl* went near it, and asked the pages for a mirror, and it was given to him, and he saw his face in that mirror and said: I am old! …" (*ibíd*.:202).[2] And he continued on his way (Fig. 1).

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[1]In the original Spanish text: "… comenzó primero a hacer un embuste, que se volvió como un viejo muy cano y bajo, el cual fue a casa del dicho Quetzalcóatl y entró el dicho viejo adonde estaba el dicho *Quetzalcóatl* y entrando el dicho viejo dijo: Señor hijo, cómo estáis, aquí traigo una medicina para que la bebáis. Y dijo el dicho *Quetzalcóatl*, respondiendo al viejo: en hora buena vengáis vos, viejo, que ya ha muchos días que os estoy aguardando ...y le dijo el viejo respondiendo al dicho *Quetzalcóatl*: Señor, veis aquí la medicina que os traigo; es muy buena y saludable, y se emborracha quien la bebe; si queréis beber, emborracharos ha y sanaros ha, y ablandárseos ha el corazón, y acordáseos ha de los trabajos y fatigas y de la muerte, o de vuestra ida…" (Sahagún 1982 [1590]:196–197).

[2]In the original Spanish text: "...donde estaba un árbol grande y grueso y largo, y el dicho Quetzalcóatl arrimóse a él, y pidió a los pajes un espejo, y se lo dieron, y miróse la cara en el dicho espejo y dijo. ¡ya estoy viejo!…" (*ibíd*.:202).

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Fig. 1 Tezcatlipoca showing the mirror to Quetzalcóatl (Fragment of a mural by Iker Larrauri, MNA)

This paper presents a study on the ritual use of mescal in pre-Hispanic cultures from the Formative to Epiclassic times based on archeological evidence from settlements dependent on the site of Xochitecatl-Cacaxtla, Tlaxcala, and on ethnoarcheological studies of different regions within Mesoamerica.

In the development of these societies, in particular those with complex structures, social manifestations are detected which are used to justify, maintain and prolong the predominance of one social class, which, in turn, uses them as a connection and a power strategy in their interrelations as an elite class.

Some of these manifestations are rituals, festivities, ceremonies, etc. and other kinds of specific cultural expressions, which play different roles in society, covering a wide variety of socio-cultural characteristics (Dietler 1996). One concrete class of rituals is the act of eating, which is part of the basic language of the "politico-symbolic action," where alcohol enhances the potent effects, at the same time as sharing the properties of the food. This is a social fact loaded with symbolism, which incorporates production and exchange relationships, and which links the domestic and political economies (Cohen 1974).

Dietler (1996) shows that banquets in particular include the practice of "guest politics," the conversion of economic and symbolic capital, and the reiteration and naturalization of the role distinctions contributing to the articulation of regional exchange networks, and, when appropriate, of religious systems (Dietler *ibíd.*; Hayden 1996).

The manufacture of beverages is part of the process that emerges from the elites which expands their control over the professions, at the same time as establishing symbols and creating mechanisms to manipulate surpluses.

In the same way, Arnold (2001) affirms that banquets could have been celebrated during opening ceremonies, dynastic weddings, or with the purpose of accomplishing the distribution of the bounty, which had been acquired through incursions or was the fruit of negotiations of organized expeditions.

He also shows the prominence of other types of celebrations, with deep roots in antiquity, in which alcoholic drinks were served, such as: collective banquets offered to the community or to workers as a reward for finishing collective projects or buildings; as a ritual; and, evidently, as political banquets.

Drinking isimportant not only for nutrition, but also as a part of rituals and the political economy of early societies. In Mesomerica, as we will discuss later, there are indicators of a similar process related to the celebration of feasts, hospitality practices, and evocation of deities.

Mescal in Sources and Chronicles

In this work, we discuss the use of alcoholic drinks which have been reported as being the most frequent among pre-Hispanic groups, namely Pulque and Mescal.

Maguey was one of the most important plants in pre-Hispanic Mexico, and one that caused the most astonishment among the chroniclers and explorers who adventured in the New World (Fig. 2). The sixteenth century (1944 [1535]) chronicler Gonzalo Fernández de Oviedo describes the plant:

> "...it is a very useful herb, necessary in this place, the one which is called maguey, and it is very similar to the cassava ...it grows in a trunk in the same way as the lettuce ...This maguey sprouts in its middle a stick or a smooth and straight stem, taller than a very tall man, and at the end of this offshoot, there are some very yellow flowers; it sprouts the quantity of a hand span in the highest part, which resembles a corncob…" (1944 [1526]:183).[3]

[3]In the original Spanish text: "…es una hierva muy útil y necesaria en estas partes, la que se llama maguey, y tiene mucha semejanza con la yuca… nace en un tronco a manera de lechuga ... Este maguey echa en la mitad una vara o tallo liso y derecho, más alto que un hombre bien alto, y en el fin de este vástago unas flores en el extremo amarillas y hecha una cantidad de un palmo en lo más alto, que aprésese una mazorca…" (Fernández de Oviedo 1944 [1535]:183).

Fig. 2 Maguey (La Ruta del Mezcal Project, IIA-UNAM)

In the sixteenth century, the Franciscan Toribio de Benavente, Motolinía (1528) stated that he had heard about a liquor manufactured by cooking the heart of the maguey, which was called *mescalli,* "…which the Spaniards say is healthy and very substantial…" (1979 [1528]:197).[4]

The need to guarantee the supply of maguey meant that its control was sought through cultivation, as Fray Bernardino de Sahagún (1590) states:

> "Those who sell maguey-honey have magueys, and usually sell **wine** of the earth, which they make from the maguey-honey, which they first cook or boil; to always have honey, they usually plant the shoots of the magueys…" (1975 [1590]:568).[5]

[4] In the original Spanish text: "…que los españoles dicen que es de mucha sustancia y saludable…" (Motolinía 1979 [1528]:197).

[5] In the original Spanish text: "El que vende miel tiene magueyes, y suele vender **vino** de la tierra que hace de la miel del maguey, la cual cuece primero, o la hierve, y para que nunca le falte la miel, suele plantar los hijuelos de los magueyes…" (Sahagún 1975 [1590]:568).

There are a large number of documents which talk about the products obtained from the maguey. Francisco Cervantes de Salazar (1971 [1546]) considers maguey as one of the; "…most notable, marvelous and useful of the trees which either ancient or modern people have found ...the indigenous peoples came to regard the maguey as a God ...the dry leaves or green spiky leaves (*pencas*) are used as tiles to cover houses and channels ...when dry, they make very good firewood ...When the spiky leaves are dry they swingle them in the same way as with twine, and from them they make threads to sew and knit; the spine serves as a needle, as a pin and as a nail, and ropes and very strong cords are made in the same way as fabrics ...From the maguey are made honey, sugar, vinegar, wine, honey-syrup and some other potions which it would take too long to describe." (1971 [1546]:116).[6]

Fray Toribio de Benavente, Motolinía (1528), also registers the different uses of maguey:

> "…a sweet and clean **wine** is made, which is drunk by the Spaniards and which they say is good, substantial and very healthy …This same wine was used by the indigenous peoples …to be more cruel and brutal(?) …from the same liquor they make honey-syrup and honey …They also obtain from this liquor small sugar panels ...good vinegar …From it they also obtain clothes and shoes …the spins in which the leaves' ends are used as bradawls … which are sometimes used as nails …The spiky leaves (pencas) are also used for many purposes …indigenous women store the maize they grind in pieces of it …And when there is a shortage of wood, it is used to build houses …and the spiky leaves of the green ones are used instead of tiles …the dry spiky leaves are used to make fire …There is another type of these thistles or trees which is similar, except that the color is whiter …the leaves are thinner: from this, better *wine* is obtained … *These are cooked in earth*, separating the spiky leaves and the head, and they taste as good as a candied citron which has just been marinated or which has not been cooked very well. The spiky leaves are full of threads which are impossible to swallow, but it is possible to chew and suck the juice, which is sweet (and is called *mexcalli*); if an expert cooks the heads, they have such a good appearance that many Spaniards like them as much as they like a good candied citron ...From the *metl* good paper is made: the sheets are as big as two of the ones we make, and they make a lot in Tlaxcallan." (1979 [1528]:243–246).[7]

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[6] In the original Spanish text: "El que vende miel tiene magueyes, y suele vender **vino** de la tierra que hace de la miel del maguey, la cual cuece primero, o la hierve, y para que nunca le falte la miel, suele plantar los hijuelos de los magueyes…" (Sahagún 1975 [1590]:568).

[7] In the original Spanish text: "… *hácese un vino* dúlcete, limpio, lo cual beben los españoles y dicen que es muy bueno y de mucha sustancia y saludable ...De este *vino* usaban los indios ...para ser más crueles y bestiales ...de este mismo licor hacen arrope y miel ...También sacan deste licor unos paneles pequeños de azúcar ...vinagre bueno ...Sácase también de él vestido y calzado ...las púas en que se rematan las hojas sirven de punzones ...que sirven algunas veces de clavos ...Las pencas también por sí se aprovechan para muchas cosas ...en un pedazo ponen las indias el maíz que muelen ...Y donde hay falta de madera sirve para hacer casa ...y las pencas de los verdes suplen por tejas ...las pencas secas se aprovechan para hacer lumbre ...Hay otro género de estos cardos o árboles de la misma manera, sino que el color es algo más blanquecino ...las hojas son un poco delgadas: de este digo sale mejor **vino** ...*Este cuecen en tierra*, las pencas por sí y la cabeza por sí y salen de tan buen sabor como un diacitrón no bien adobado o no muy bien hecho. Lo de las pencas está lleno de hilos que no se sufre tragarlo, sino mascar y chupar aquel zumo, que es dulce (y así lo llaman *mexcalli*); más si las cabezas están cocidas de buen maestro, tienen tan buena tajada, que muchos españoles lo quieren tanto como buen diacitrón ...Hacese del metl buen papel: el pliego es tan grande como dos pliegos del nuestro, y esto se hace mucho en Tlaxcallan" (Motolinía 1979 [1528]:243–246).

Here, it is important to point out that, that which Motolinía (1528) calls *mexcalli* is nothing but the cooked maguey that was used as food; but it must also be obtained in order to elaborate the mescal beverage.

Archeological studies related to the maguey have also determined its importance. About this, Jeffrey Parsons states:

> "The energetic value of cultivated maguey has not been fully appreciated in previous efforts to estimate the carrying capacity of prehispanic agricultural landscapes in the *tierra fría*. We estimate that, on the average, fields in maguey and seed crops could have at least doubled the caloric and nutritional output of the most categories of cultivated land that might have been planted with seed crops alone" (1990:363–364).

In a work entitled *Alcohol in Ancient Mexico*, Henry J. Bruman (2000) discussed historical documents and carried out ethnological studies related to alcoholic drinks prepared by different indigenous groups. His research covers the region from the Gila River in Arizona, United States, to the south of the Panama Isthmus. The author divides the production of alcoholic drinks in Mexico into six cultural areas: the mescal area is where the Tahue, Cora, Totorame, Otomi (Jalisco) and Nahuatl languages are spoken. For this author, the cultivation of maguey in the regions of Mexico and Central America was fundamental for the manufacture of mescal, which is known under different names such as "tequila" and "bacarona." He also reports the use of large ovens for cooking the *piñas* (heads) of the maguey in the states of Sonora, Chihuahua, Sinaloa, Durango, Nayarit, Zacatecas, San Luis Potosi, Jalisco, Colima, Michoacan, Hidalgo, Puebla, Mexico State, Mexico City, Guerrero, Oaxaca y Tlaxcala, and identifies the different species of agave used in the traditional production of mescal.

In his book *Mescalaria*, Ulises Torrentera (2000) compiles the history of mescal in the state of Oaxaca. Speaking about the origin of mescal, he assures that:

> "...these work processes might have been known before the arrival of the Spaniards. According to Manuel Payno, before the Conquest, the indigenous peoples used to elaborate a beverage with the leaves of the maguey, which was called *maguee*, which was made by removing the bark and the nerves of the maguey, to then roast it and cook it in earth ovens, but the description actually refers to *mexcal*. This is how the different mescales, which we still know today, arose: *tequila*, *sotol*, *comiteco* from Chiapas, *bacanora* from Sonora, *raicilla* and *barranca* from Nayarit and Jalisco, *tuxca* or *quitupán* from Colima, *yahuytzingu* (in the Mixteca) fermented in the past in leather cubes in the same way as *pulque*, the substantial *mexcal*, and the *tequila*." (2000:97).[8]

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[8] In the original Spanish text: "estos procesos de trabajo quizá eran conocidos antes de la llegada de los españoles, Según Manuel Payno, antes de la Conquista, los indios elaboraban una bebida con hojas de maguey, a la que llamaban *maguee*, que se elaboraba quitándole la corteza y los nervios al maguey, para luego asar y cocer en hornos hechos en la tierra", pero la descripción más bien se refiere al mexcal".

"Así nacieron los diferentes mescales que todavía conocemos: tequila, sotol, el comiteco de Chiapas, el bacanora de Sonora, la raicilla y barranca de Nayarit y Jalisco, la tuxca o quitupán de Colima, yahuytzingu (en la Mixteca) antiguamente fermentado en cubos de cuero como el pulque, el mexcal de sustancia, el Tequila." (Torrentera 2000:97).

The cooking is believed to have been done in ovens excavated in the soil, similar to those which have been found in archeological digs, not only in the settlements close to Xochitecatl-Cacaxtla, Tlaxcala, but also in other archeological sites such as in Paquime, Chihuahua, where remains of agave were even found in one of the ovens.

The cooking process is described by Mateo de Monjaraz, son of the *conquistador* Gregorio de Monjaraz and trustee of Miahuatlan, Oaxaca, in an account from 1580, where he explains that from the agave:

> "… a kind of preserve of the center is made, by putting it into a hole, with some stones on top of it, and they throw some earth on, and light a fire underneath, with which it is cooked and it becomes as sweet as a preserve, and slices are cut which are called *mixcal*, and in the same way vinegar is made, and many other things which cannot be explained."[9]

Also Andrés Pérez de Ribas (seventeenth century), in his account of Sinaloa, mentions the process to obtain the *mexcalli*:

> "... the mescal plant is also useful for them as a means of support and as a gift ...it is used to make *wine*, honey and vinegar ...but for these people it is especially useful as food. Because when it is ripe, they cut it all up with the trunk, *and this, roasted between stones in fire and placed into a hole made with earth, they cover with tree branches and over them they put earth; with a slow heat these trunks soften together with part of their spiky leaves (pencas),* and they are for them like sweet preserves, since cooked like this the plant is very sweet, and it is only this crop that they tend, plant, and take care of near their houses, and they do not do so with any other …" (1944:124, 130).[10]

But he also adds:

> "They made *wine* out of many plants and fruits of the earth, such as prickly pears, ... mezquite carobs, ...or from the mescal plant and its spiky leaves (*pencas*) ...and from other plants milled or ground and put in water, in two or three days they obtain the flavor which so impairs their judgment." (*ibíd*.:135).[11]

This last comment makes us suspect that what he talks about is not pulque, since he mentions mescal and its spiky leaves (*pencas*) and not the maguey honey-water.

[9] In the original Spanish text: "…se hace un género de conserva del centro del cual metiéndolo en un hoyo, encima unas piedras y echan tierra encima y fuego debajo con lo cual se cuece y quedan tan dulce como conserva y se cortan a tajadas que llaman mixcal, y asimismo hace vinagre y otras muchas cosas que no se pueden explicar ni dar entender." (Monjaraz).

[10] In the original Spanish text: "…sírveles también de sustento y regalo la planta de mescal…sirve para hacer *vino* de ella, miel y vinagre… pero a estas gentes principalmente de comida. Porque cuando está sazón la cortan con el tronco, y *éste asado entre piedras que abrazadas por el fuego y echadas en una hoya que hacen de tierra, las cubren con ramas de árboles y sobre ellas tierra, y a calor manso se ablandan esos troncos con parte de sus pencas,* y son para ellos como cajetas de conserva, porque así esta planta es muy dulce, y sola esa suelen beneficiar y plantar cerca de sus casas, y no tratar de beneficio de otra alguna…" (Pérez de R., Andrés 1944:124, 130).

[11] In the original Spanish text: "El *vino* lo hacían de varías plantas y frutos de la tierra, como de tunas…, algarrobillas de mezquite… o de la planta del mescal y sus pencas… y de otras plantas molidas o quebrantadas y echadas en agua, en dos o tres días se accedan y toman el gusto que tanto les arrebata el juicio" (Pérez de R., Andrés 1944:135).

What is clear is that he is describing the second phase of production of mescal, which is fermentation.

There are many documents which mention a *wine* obtained from the *mexcalli*. For instance, Gonzalo de las Casas, in his *The war of the Chichimecas* (*La Guerra de los Chichimecas*, 1944 [1580]), explains that the Guachichiles:

> "...eat the leaves and root [of the maguey] cooked in little ovens which here are called *mixcali* and it is good food and they make **wine** which they drink…"[12] (1944 [1580]).

Alcina Franch, in *Calendar and Religion among the Zapotecs* (*Calendario y religión entre los Zapotecos*), also writes about a ritual beverage called *socollule* or "cooked magey," used in a ceremony for thanking the gods in the community of Tepitongo in the Sierra de Juarez, at the end of the sixteenth century (cf. *ibíd*. p. 79).

One of the key processes for the manufacture of mescal is distillation, which has always been considered as a technical contribution, which arrived from Europe in colonial times, but some sources leave open the possibility that this process was known to pre-Hispanic peoples. In his sixteenth century description, Gonzalo Fernández de Oviedo (1944 [1535]) describes how the maguey plant:

> "...is cut from its stock, and the head or stump is cooked and made into a certain delicacy ...and juice is extracted from the leaves by sweat through fire to distill it; and those people drink that liquor, because water they never see nor have, except for that of the sea …" (1944 [1526]:63).[13]

At the start of the seventeenth century we find precise references to the distillation of agave. In the *Descripción de la Nueva Galicia* (*Description of the New Galicia*, 1621), Domingo Lázaro de Arregui records that:

> "... the mexcales are very similar to the maguey, and the roots and base of the spiky leaves are eaten roasted, and also from them, squeezing them once roasted, a must is obtained from which they get *wine* by *alquitara* (by distillation), clearer than water and stronger than liquor and of that same taste. And although many virtues are told about *mexcal*, they commonly use it to such excess, that they discredit the *wine* and even the plant." (1946 [1621]:50).[14]

The *alquitara* (slow distillation) is an ancient kind of alembic still in which the distillation process takes place. In this regard, Alexander von Humboldt (1973 [1811]) recounts the following:

[12] In the original Spanish text: "…comen las hojas y raíz cozidas en hornillos que aquí llaman mixcali y es buena comida y hacen **vino** del que beben..." (Casas, Gonzalo De las 1944 [1580]).

[13] In the original Spanish text: "…lo despencan y la cabeza o zepa la cuecen y hacen cierto manjar… y de las hojas sacan zumo por sudor de fuego a manera de destilarlo; y aquel licor beben aquellas gentes, por que agua nunca la ven ni la tienen, salvo la del mar…" (Fernández de Oviedo and Gonzalo 1944:63).

[14] In the original Spanish text: "…los mexcales son muy semejantes al maguey, y su raíz y asientos de las pencas se comen asados, y de ellas mismas, exprimiéndolas así asadas, sacan un mosto de que sacan **vino** por *alquitara* (por destilación), más claro que el agua y más fuerte que el aguardiente y de aquel gusto. Y aunque del mexcal de que se hace comunican muchas virtudes, úsalen en lo común con tanto exceso, que desacreditan el **vino** y aun la planta." (Arregui, Domingo Lázaro de 1946 [1621]:50).

"...the honey or juice of the agave has a bittersweet taste most pleasant, and ferments easily due to the sugar and mucilage it contains ...When pulque is distilled, a liquor called *mescal* or maguey liquor is obtained, which is very intoxicating. They have assured me that the plant they grow to distill the juice is essentially different from the common maguey or from pulque ..." (1973 [1811]).[15]

Mescal Ethnoarchaeology

Selection of raw materials is one of the most important factors for obtaining a good mescal (Fig. 3). The agave species, its size, weight, ripeness, and many of its organoleptic characteristics determine the quality of mescal. Mescal is produced from different varieties of agave, but another type of plant is also used: the common sotol (*Dasylirion*), once considered as belonging to the Agavaceae Family. Both families represent a group of succulent plants typical of the semi-arid zones in Mexico.

Fig. 3 Mexico map depicting the estates where mescal is produced to this day (La Ruta del Mezcal Project, IIA-UNAM)

[15] In the original Spanish text: "…la miel o jugo del agave tiene un sabor agridulce bastante grato y fermenta fácilmente a causa del azúcar y mucílago que contiene… Destilado el pulque se hace un aguardiente llamado mescal, o aguardiente de maguey que embriaga mucho. Me han asegurado que la planta que cultivan para destilar el jugo difiere esencialmente del maguey común o de pulque…" (de Humboldt 1973 [1811]).

Only some species of agave are used for producing mescal, and some are preferred over others, taking into account the size of the *piña* (central core of the agave) and its sugar content. This is why extensive growing of some varieties has been carried out in order to obtain more plants; some examples are: blue agave (*A. tequilana*), which is used to produce tequila, or *espadin* agave (*A. americana, var. Oaxacensis*), in Oaxaca. It is also common practice to harvest wild maguey or *tobalá* (*A. potatorum*) in the highlands around Oaxaca.

Only the maguey plants forming an inflorescence known as *quiote* (stem or cane) are harvested to produce mescal. Young plants are never used since they are still bitter and acid. Once the ripe agave plants are selected, the scape, commonly known as *quiote*, is removed. Then, the maguey plants are cut down, and the process to cut away the spiky leaves (*pencas*) follows. One by one, the spiky leaves are cut away from the heart, starting with the outer ones and ending with those close to the head; afterwards the maguey plant is turned over or pulled up from the ground to chop away the remainder. Finally, the *piñas* or heads are cut, to be baked in earth ovens.

One of the chemical changes that take place when the maguey is baked is hydrolysis (decomposition of molecules by reaction with water) of polysaccharides present in the plant, which are transformed into sugars.

There are different types of ovens for baking the maguey, but the one most employed for this purpose is a simple earth oven. It is a pit in the ground without any lining on its walls. These earth ovens use wood as fuel. We found one of these in the archaeological excavations carried out in Tlaxcala.

The rock oven has the same shape as the aforementioned; the only difference is its rock-covered walls. The rocks are used to trap heat and accelerate the baking process. This type was one of the most common ovens, and is similar to the ones found in the archaeological sites of Paquime, Chihuahua, La Quemada, Zacatecas, and Xochitecatl-Cacaxtla, Tlaxcala (Fig. 4).

The next step is the grinding or crushing of the maguey *piñas*. The purpose of grinding the agave is the extraction of its juices, and also:

> "…to tear off the tissues of the maguey and to expose it to a greater environmental action…" (Quiroz *op. cit.*:122).[16]

In the past, the agave grinding was done manually; now, it is done using animal or motor-driven traction. Sometimes, the maguey is washed as a part of this process: the bagasse resulting from this grinding is mixed with water and stirred constantly. The ground, cooked agave is then pitched into large vats or other kinds of containers, ready for the next step, which is fermentation. Alcoholic fermentation is the conversion of sugar into carbon dioxide gas and alcohol and this process is carried out mainly by yeast enzymes.

In this transformation we can observe some physical changes. As the temperature rises, the by-product, a gas, bubbles through the liquid and dissipates into the air. Also, the fermenting liquid will have a cloudy and brownish appearance, and

[16] In the original Spanish text: "...desgajar los tejidos del maguey y exponerlo a una mayor acción del ambiente…" (Quiroz *op. cit.*:122).

Fig. 4 Archaeological ovens (first column, from top): Nativitas, Tlaxcala (the first and second ones); Paquimé, Chihuahua; and La Quemada, Zacatecas. Present ovens (second column, from top): Durango, Chihuahua, Tamaulipas and Oaxaca (La Ruta del Mezcal Project, UNAM-IIA)

will have a lightly alcoholic flavor. Sometimes, the juice and the *bagasse* resulting from the grinding are left to ferment together; otherwise, just a bit of water is added to the fermenting juice. In some parts of the central region of Mexico, the product obtained is called *tepache*.

Other types of containers where the fermentation process takes place are: clay pots, canoes or hollow trunks, bovine livestock skins, vats or crates made of horizontally laid out wooden pieces, brick piles, or plastic containers.

Once the fermentation is over and the transformation of sugar into alcohol has taken place, alcohol will be extracted in its purest and most concentrated form.

> "Two types of products are the result of fermentation: non-volatile products, including solids, fats and mineral salts, fibers, etc.; and volatile products, including alcohols, ethers, ketone, etc. The procedure for separating them, distillation, is based on these characteristics…" (Sánchez López 1989:138).[17]

Thus, distillation is the process to be used for partially separating these two kinds of elements.

> "Distillation involves heating the musts to boiling point, and condensing the vapors released; by this means, alcohol is separated from non-volatile elements of the must." (*ibíd.*).[18] In the case of mescal, condensation is generated by the contact of the vapors with the walls of the coil or with another cold surface of the still.

The distillation takes place within an instrument called a still. In some cases, this container is exposed to direct heat; in others, such as vapor stills, there is an inner coil through which the vapor from the heating vessels travels.

The still with superimposed pots is composed of one pot that functions as liquid storage, and which is in direct contact with heat; and another pot which functions as a cap; there is a pot with water on top of the latter, which functions as a condenser (Fig. 5).

Fig. 5 Mescal production (La Ruta del Mezcal Project, IIA-UNAM)

[17] In the original Spanish text: "Como resultado de la fermentación se dan dos clases de productos: los sólidos, grasas y sales minerales, fibras, etc., no volátiles; y los alcoholes, éteres, cetona, etc., volátiles. En estas características se basa el procedimiento para separarlos, es decir, la destilación." (Sánchez López 1989:138).

[18] In the original Spanish text: "La destilación consiste en calentar los mostos hasta la ebullición y en condensar los vapores que se desprenden; por este medio se separa el alcohol de los elementos no volátiles del mosto" (ibíd).

The use of these handmade stills has been registered in Nahua communities of Guerrero, Zapotecs of Oaxaca, Huichol of Nayarit, and in mixed-race groups in Morelos, Puebla, Chihuahua, Sonora, and Nuevo Leon.

In other Mexican states like Coahuila, Tamaulipas, San Luis Potosi, Zacatecas, Sinaloa, Durango, and Jalisco, there are differences in production, given that modern tools are combined with wooden instruments. There are no records of this activity in Aguascalientes, Guanajuato, Queretaro, and Hidalgo, but a mescal based on henequen (*Agave fourcroydes,* Lem.) is produced in Yucatan, Campeche, and Quintana Roo. In Chiapas and Guatemala there is very little information about this beverage, the reason being that, since Colonial times, mescal was prohibited, as was also the case in the northern region of Mexico.

Rock-covered ovens used for cooking mescal were found in the Mexican states of Chihuahua, Sonora, Baja California, and Southern Baja California. The Paipai, an ethnic group from Baja California, exploit the maguey by cooking and using it as a food resource. They do not distill it, but they state that this is ancestral knowledge, which is part of their cultural identity. Due to its particular characteristics, we must mention that they are still used by the Huichol community of Ocotlan, in the state of Nayarit. Their utensils come from the same environment where mescal is produced, which is comprised of mountainous regions and semi-arid gullies of the western area of Nayarit. The still used by the Huicholes is made from a series of “rings” or circles that are manufactured with a tree bark filled with grass. Each “ring” is placed one on top of the other, reaching approximately 80 cm in height and 40 cm in diameter, and which then are covered with mud. A small wooden drainage board is placed inside, which collects the alcohols produced by the condensation of the already-fermented maguey; these alcohols are located in a container also made of “rings,” or in some other type of container (a pot) underneath the still. The drainage board is linked to a reed that crosses the still’s wall; this device allows the outflow of mescal already condensed, which is finally collected in a pot or gourd (Fig. 6).

Once the ferments have been distilled, the mescal alcoholic beverage is ready. However, there are many varieties of the finished product; as we already indicated, they depend on the type of agave used for making mescal, on the instruments used in each step of the process, and on the subsequent treatment.

Mescal can be classified according to its region of origin and to the species of agave used for its production, as each species provides its own characteristics to the mescal beverage. The quantity of mescal obtained depends on the volume of cooked maguey; we must point out that 30 or 40 baked *piñas* of maguey produce at least 40 or 60 L of mescal, and depending on the region, it can be sold between 20 or 30 pesos per liter.

The mescales most valued by artisans are those produced with ancient techniques, that do not involve “accelerators” in the fermentation or distillation processes, and which are made of 100% agave (basically wild agave); those which have higher alcohol levels (60° GL average); those which are made by native and mixed-race hands for local festivities; and those that do not depend on market demands nor official norms.

Fig. 6 A Huichol man producing mescal in a Huichol distiller (La Ruta del Mezcal Project, IIA-UNAM)

These mescal elaboration processes were archeologically identified in the excavations of settlements surrounding the archaeological site of Nativitas, Tlaxcala. There we found ovens that, we now know, were used to cook the maguey *piñas* or heads. Close by, we found several pots whose heat-exposed bodies were cut in half. The relation between ovens, settlements, and pot findings allows us to formulate the hypothesis that the production of mescal was one of the activities carried out by the inhabitants of this area; as we have said, this beverage requires at least 4 transformation phases: (a) cooking, (b) grinding, (c) fermentation, and (d) distillation.

Our excavations confirmed the presence of three ovens related to settlements and middens (troncoconical conformations). The ^{14}C results revealed that the aforementioned site was inhabited during the Preclassical or Terminal Formative Period (400 B.C. to 200 A.D.) (Serra and Lazcano 1998). The ovens are located outside the rooms belonging to the Formative Period; some of them are located near each other, and are also related to a midden. These ovens are similar to those found in the Zapotec communities of Oaxaca, Huichol of Nayarit, and in the mixed-race communities of Chihuahua and Durango.

As previously noted, we located irregularly-shaped middens next to the settlements; inside, we recovered a large quantity of bones, stone, and especially ceramic material; we also found a large quantity of fragments of ceramic pots, some broken in half, and some pot borders. These pots have similar characteristics to those used now for mescal distillation in the states of Oaxaca, Michoacan and Queretaro. The evidence shows that these cavities or middens were used as disposal sites for non-useful material in the mescal production process.

Food and Ritual Uses of Mescal

In some communities in Mexico, mescal plays a significant role. Mescal consumption is inseparable from the celebration of some ceremonies and festivities. The researcher Fausto Díaz affirms that:

> "…mescal is consumed mostly by the people of Oaxaca, who regard it as the traditional drink for their celebrations, be they festive or sorrowful. Among the festivities in which large quantities of mescal is consumed are villages' titular festivities, weddings, mayordomías[19] and wakes…" (1980:64–65).[20]

We know that for the Huichol community of Nayarit, mescal is consumed as part of the rain petition ceremonies, and is given to "successful" children (meaning they have survived the toddler's phase, and are entering a new social role), which means they have already turned three.

Sahagún (1982 [1590]) is one of the most prolific chroniclers, and he describes some festivities where alcoholic beverages were consumed in pre-Hispanic Mexico. Most scholars agree that the main beverage was pulque; however, other data sources reveal that perhaps mescal was also an important ritualistic alcoholic beverage.

In the "Relación de los edificios del gran templo de México" ("Account of the buildings of the great temple of Mexico"), Sahagún (1590) mentions that:

> "The fortieth and fourth building was called *Centzontotochtin iteopan*; this was a *cu* dedicated to the gods of wine; three captives were killed in honor of these gods of wine. One was called *Tepoztécatl*, other was called *Toltécatl,* and the other *Papáztac*." (Book 2, Appendix II, 1982 [1590]:161–162).[21]

And this was done every year in the feast of *Tepéilhuitl*. In the "Relación de las diferencias de ministros que servían a los dioses" ("Account of the different ministers who served the gods"), Sahagún (1590) says that:

> "…*Ome tochtzin* was like a mentor for all the singers, who were in charge of singing in the *cúes*; he had to see that everyone came to do their duties in the *cúes*. They would perform certain ceremony with the wine called *teooctli*, while doing their duties; in this ceremony

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[19] The organization of all three of the town fiestas – to celebrate patron saints – consists of a mayordomía. A mayordomía is a system where a mayordomo, or lead organizer, is either elected by the town or volunteers for the position. He then selects his mayordomía based on connections with family and friends. Everyone who agrees to be part of the mayordomía, which could be anywhere from 6 to 40 people, split the cost budgeted for the fiesta. Each person is in charge of a certain aspect of the fiesta.

[20] In the original Spanish text: "…el mescal es consumido en su mayor parte por los habitantes del Estado de Oaxaca, quienes lo reciben como la bebida tradicional para sus celebraciones, sean éstas de carácter festivo o luctuoso. Entre las festividades en las cuales se consume mayor cantidad de mescal destacan las fiestas titulares de los pueblos, las bodas, las mayordomías y los velorios" (Díaz 1980:64-65).

[21] In the original Spanish text: "El cuadragesimocuarto edificio se llamaba *Centzontotochtin iteopan*; éste era un *cu* dedicado a los dioses del vino; aquí mataban tres cautivos a honra de estos dioses del vino. A una llamaban *Tepoztécatl* y al otro *Toltécatl* y al otro *Papáztac*". (Book 2, Appendix II, 1982 [1590]:161–162)

the main officer was the *pachtécatl*: he had to take care of the glasses in which the singers drank, and of bringing them, giving them and of cleaning and of filling them with that wine called *teooctli* or *macuiloctli*; and he put two hundred and three reeds, of which only one had a hole, and when they picked them, the one who guessed which that one was would drink on his own. This was done after the singing ceremony." (Book 2, Appendix IV, 1982 [1590]:169).[22]

Sahagún (1590) mentions two other ministers:

"…*Ometochtli pantécatl* was in charge of providing the wine called *macuiloctli*, o *teooctli*, which was used in the feast of *panquetzaliztli*." (Book 2, Appendix IV, 1982:170). And "…*Ometochtli papáztac* was in charge of making the wine called *tizaoctli* ready, which was to be used in the house of the lord and in the feast of *tozoztli*, where men and women, boys and girls drank wine…" (Book 2, Appendix IV, 1982 [1590]:170).

In the chapter regarding drunkards, Sahagún (1590) says that:

"...the wine was called *centzontotochtin*, which means '400 rabbits', since it has many manifestations of drunkenness." And also that, "…they made feasts for all the wine gods, who became the wine, and set up their images in their temples. There they laid gifts for them; for them they sang and danced. And before them stood a stone basin, called *ometochtecómatl* (two rabbits) full to the brim. Into the wine dipped the drinking tubes, extending from it so that those who sampled the wine stood drinking it. But only those who could drink: the old men, the old women, the intrepid men, the warriors and the bold, would drink from that stone basin, since one day they would be captives or enemies, or when being in a battle, they could be taken prisoners by the enemies. Or maybe, they would capture others and take prisoners. So by [drinking] they went about mocking death. And the wine they drank never came to an end; the [basin] never stood empty. The wine makers, the wine making officials, continued pouring it into the [basin]…" (Book 4, Chapter V, 1982 [1590]:228).[23]

Sahagún (1590) mentions that:

"Those who arrived in the *tiánquez*, where there was a statue of the god *Izquitécatl* and also those who once again broke into the magueys, and made new wine, called *uiztli*, they brought the wine in jars and poured it in a stone basin, and this was not only done by the

[22] In the original Spanish text: "…*Ome tochtzin* era como maestro de todos los cantores que tenían a cargo de cantar en los *cúes*; tenía cuenta que todos viniesen a hacer sus oficios a los *cúes*. Hacían cierta ceremonia con el vino que llamaban *teooctli*, al tiempo que habían de hacer sus oficios; de esta ceremonia era el principal *pachtécatl*: éste tenía cuidado de los vasos en que bebían los cantores, de traerlos y darlos y recogerlos, y de henchirlos de aquel vino que llamaban *teooctli* o *macuiloctli* y ponía doscientas y tres cañas, de las cuales sola una agujereada, y cuando las tomaban el que acertaba con aquella bebía él solo, y no más; esto se hacía después del oficio de haber cantado". (Book 2, Appendix IV, 1982 [1590]:170).

[23] In the original Spanish text: "…el vino se llama *centzontotochtin*, que quiere decir '400 conejos', porque tiene muchas y diversas formas de borrachería." Y también que "…hacían fiesta a todos los dioses del vino, y poníanles una estatua en el *cu* y dábanles ofrendas, y bailaban y táñanles una tinaja hecha de piedra que se llamaba *ometochtecómatl*, llena de vino, con unas cañas con que bebían el vino los que venían a la fiesta, y aquellos eran viejos y viejas, y hombres valientes y soldados y hombres de guerra, bebían vino de aquella tinaja, por razón que algún día serían cautivos de los enemigos, o ellos, estando en lugar de la pelea, tomarían cautivos de los enemigos; y así andaban holgándose, bebiendo vino, y el vino que bebían nunca se acababa, porque los taberneros cada rato echaban vino en la tinaja". (Book 4, Chapter V, 1982 [1590]:228).

> wine making officials in the feasts, but every day since that was the tradition…" (Book 4, Chapter V, 1982 [1590]:228–229).[24]

In the fifteenth movable feast, Sahagún (1590) writes that:

> "The lords, leading men, nobles, and rich merchants, when a son or daughter was born to them ...when they baptized him, they banqueted the kinsmen and friends, so that they would be present at the baptism, and then they gave food and drink to all the guests, and also to the children of the whole suburb ...This [same] feast they also observed today in the baptism of their children, as to feasting, eating, and drinking…" (Book 2, Chapter XIX, 1982 [1590]:97).[25]

The author does not specify what kind of beverage it was. Sahagún (1590) says that in the sixteenth movable feast, for a son who was to be married, his parents:

> "...for this they held a great feast for him and for all the young men whom he had in his care; and for this they held conversation with him, after having given food and drink to him and to all those whom he had in his charge." And then, "began to prepare the necessary articles for the wedding – [those] to eat and to drink ..." (Book 2, Chapter XIX, 1982 [1590]:97).[26]

> "Sometimes they would give wine (*pulcre*) which they called *íztacoctli*, which means *white pulcre*. They continued serving the wine, perhaps watered, or honeyed, or cooked with the root, called *ayoctli*, which means *pulcre of water*; those which were stored and prepared for the drinking ceremony..." (Book 4, Chapter XXXVI, 1982 [1590]:251–252).[27]

There is no doubt that alcoholic beverages produced during pre-Hispanic times had significant regularities in complex societies. Joffe (1998) points out that these regularities have an influence on the development of complex societies; production and consumption of alcoholic beverages, particularly beer and wine, in sufficient quantity to supply the social variety and for political purposes would have been one of these regularities.

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[24] In the original Spanish text: "Los que llegaban al *tiánquez*, donde estaba la estatua del dios *Izquitécatl* y también los que nuevamente horadaban los magueyes y hacían vino nuevo, que se llamaba *uiztli*, traían vino con cántaros y echábanlo en la tinaja de piedra, y no solamente hacían esto los taberneros en la fiesta sino cada día lo hacían así, porque era tal costumbre de los taberneros". (Book 4, Chapter V, 1982 [1590]:228-229).

[25] In the original Spanish text: "Los señores y principales, nobles y mercaderes ricos ...Cuando le bautizaban convidaban a los parientes y amigos para que se hallasen presentes al bautismo, y entonces daban comida y bebida a todos los presentes, y también a los niños de todo el barrio ... Esta fiesta también la usan ahora en los bautismos de sus hijos, en cuanto al convidar y comer y beber". (Book 2, Chapter XIX, 1982 [1590]:97).

[26] In the original Spanish text: "...hacíanle un convite a él, y a todos los mancebos a su cargo; y para esto le hacían una plática, después de haberle dado de comer y beber a él y a todos los que tenía a su cargo ...". Y después, "comenzaban a aparejar las cosas necesarias para las bodas, así de comer como de beber". (Book 2, Chapter XIX, 1982 [1590]:97).

[27] In the original Spanish text: "A las veces daban *pulcre* que llaman *íztac octli*, que quiere decir *pulcre* blanco, que es lo que mana de los magueyes, y otras veces daban *pulcre* hechizo de agua y miel, cocido con la raíz, al cual llaman *ayoctli*, que quiere decir *pulcre* de agua, (¿mescal?) lo cual tenía guardado y aparejado el señor del convite de algunos días antes" (Book 4, Chapter XXXVI, 1982 [1590]:251–252).

According to Joffe (1998), in spite of the great local diversity of situations involved in the institutional development processes, it has been documented and found in the archeological record that alcohol is related to power and negotiation. For this author, in political economy, alcoholic beverages play an important role in the fields of subsistence, work and beliefs, apart from their specific role in rituals and festivities.

The production of alcoholic beverages implies competition among different authorities over the control, the variety, the level of production and the degree of distribution of mescal, even at the domestic level. Before the habit of drinking mescal became popular, it was of special interest (particularly for elite groups) to spread the idea that mescal nutrients and intoxicants were precious. Thus, the existence of beverages, as indicated by the presence of their containers, leads us to infer behaviors associated with wine and liquor distillation. An increase in social value entails a gradual stratification, which ends up in the hands of elite groups as a privilege, and even with sumptuary prerogatives, which are foreign to the rest of society.

Alcoholic beverages as a ritualistic element are now, and have been throughout history, a means to capture people's will. Even nowadays, there are western societies that include in their religious services some sort of fraternization, materialized as the sharing of food and beverages. Among the most valued are beverages extracted by fermentation. Also, in other societies with different cultural systems and types of religious influences, we find production and consumption of alcoholic beverages for ritualistic purposes. In this regard, Goody (1998) affirms that just as the access of individuals to the rituals of food and drink can be a means to deny or increase social inequality as a cohesion element among the group, alcoholic beverages in ritualistic contexts serve strategies of ideological representation. Moreover, advantage is taken of this context to introduce them in individual, personal uses, as an element that will secure a person's relative position within the structure of social relationships of production, in his or her community.

There is recorded evidence of mescal production and storage in some domestic areas of ancient societies with hierarchical structures, like Xochitecatl-Cacaxtla, in the Puebla-Tlaxcala Valley. The main square of the Pyramid of Las Flores, in Xochitecatl-Cacaxtla, Tlaxcala, public places, and the patios located in the settlements where the elite groups resided are some of them. These kinds of places were used to celebrate community festivities and worship of different deities.

Mescal was used for making offerings to the gods, to give courage in war, for initiation and petition rituals and, above all, to celebrate the most common, but fundamental life events: birth and death.

Conclusions

On the basis of the information from colonial sources and chronicles as well as ethnoarchaeological evidence, we conclude that mescal is a beverage with pre-Hispanic origins, and that it was closely involved with ritual use. Distillation appears to be the most important process for making mescal, and various sixteenth century sources show native societies performing this process. The ovens discovered in the course of our excavations clearly indicate the pre-Hispanic knowledge regarding the distillation process in the Terminal Formative Period (400 B.C. to A.D. 200). Excavations in domestic contexts at the site of Xochitecatl-Cacaxtla provide evidence of mescal production and show that such fermented intoxicants were stored. They also reveal domestic areas where ceremonies involving mescal were celebrated and involved consumption of this beverage.

Our ethnoarchaeological research indicates that actual mescal consumption is still practiced in some communities, providing independent lines of evidence that corroborate our archaeological investigations, suggesting that this tradition began to spread since pre-Hispanic times.

Research surrounding pre-Hispanic ritual beverages has for the most part focused upon the manufacture, consumption and production of pulque conveying the impression that this was the principal ritual beverage of pre-Hispanic Mesoamerica. However, the data generated in this analysis, provides confirmation that mescal is a very important pre-Hispanic beverage, that was produced to be primarily consumed by persons of elite status who organized and oversaw rituals and festivities.

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Forming Mesoamerican Taste: Cacao Consumption in Formative Period Contexts

Rosemary A. Joyce and John S. Henderson

Introduction

Until recently, most of our assumptions about cacao preparation and consumption in Mesoamerica were based on late documentary sources. In recent years, the amount of direct evidence of cacao consumption has rapidly grown. Even the earliest time periods of the Early and Middle Formative period have now provided evidence of cacao consumption, from the Gulf Coast of Mexico to the Pacific Coast of Chiapas, and as far east as Honduras. What is most remarkable about this early evidence for the use of cacao is the variety of preparations and serving practices implied by the combinations of vessels that have tested positive for chemical traces of cacao. In this paper, we discuss our own work at Puerto Escondido, Honduras, and argue that the initial use of cacao was as a fermented beverage, in comparison to other published data from Formative period sites. We emphasize the variety of ways cacao was prepared and consumed, rather than advocating a single model of area-wide cacao consumption. We suggest that we need to construct models that highlight variability over time and across space in the kinds of cacao foods prepared and served and the contexts of their preparation to fully understand the development of Mesoamerican taste over time.

Early Cacao in Mesoamerica: A Review of a Shifting Landscape

Almost simultaneously in Fall 2007, two articles appeared in peer-reviewed publications reporting on our analysis of evidence for cacao use in Honduras by as early as 1150 BC (Henderson et al. 2007; Joyce and Henderson 2007). Shortly after, we received a link to a "Project Gallery" posting on the website of the British archaeological journal *Antiquity*[1] reporting in brief on analyses of samples from sites in

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[1] (http://antiquity.ac.uk/projgall/powis/index.html)

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Mexico that were as old as and older than those from Honduras on which we reported (Powis et al. 2007). These research results are only the latest points on an exciting trajectory that has gradually extended our secure knowledge of the early history of cacao back in time, first to the Middle Formative Period (Powis et al. 2002; Seinfeld 2007), then to the later half of the Early Formative period (Henderson and Joyce 2006), and, with the recent results obtained by Powis and colleagues, to the earliest period for which ceramic evidence is available (Powis et al. 2007).

These research advances were based on the use of analytical methods to identify the presence of chemical compounds believed to be unique markers in Mesoamerica of plants in the genus *Theobroma*, which includes both the cultivated species used as foods in Mesoamerica, *Theobroma cacao*[2] and *Theobroma bicolor* (sometimes called pataxte). Most plants related to cacao are found in South America (Bletter and Daly 2006). Thus, theobromine, a compound found in cacao and related plants, is mainly absent from Mesoamerica. Traces of theobromine detected through the chromatography of samples from protected interior surfaces of complete vessels recovered from funerary contexts have been accepted as evidence of cacao in Mesoamerican archaeology since the publication of analyses of vessels from Rio Azul, which also featured glyphs for cacao foods (Hall et al. 1990; Hurst 2006).

What has fueled the most recent extension of confirmed cacao use back into the past is the application of analysis from whole vessels (which limited most of the first decade of analyses to sites where burials were excavated) to sherds, which are abundant at all the early village sites known to Mesoamerican analysts. Some analyses depend on surface residues that adhered to the interior of vessels. Others use residues that had saturated the interior of the porous clay body typical of the low-temperature-fired earthenware vessels. Regardless of the method of extracting samples, the identification of cacao rests on chromatography of the samples and comparison with standards for the complex chemical profile typical of cacao. Results typically are reported as strong or weak positives for specific compounds, or as the absence of any evidence of distinctive compounds, both theobromine and also caffeine, which are present in higher proportions in *Theobroma cacao* than in *Theobroma bicolor* and may help distinguish between use of these two species (Kufer and McNeil 2006).

These chemical analyses provide far more, however, than a simple yes/no answer to the question "Was there cacao in this vessel?" Residues absorbed into the fabric of vessels must have come from a relatively diluted liquid food, a beverage. Those recovered from surfaces could come from beverages, but might sometimes be the remains of thicker mixtures, sauces like the well-known mole, a use of cacao suggested for residues from vessels in early Classic Copán by Cameron McNeil (McNeil et al. 2006:235–236). The forms of vessels from which cacao residues have been recovered are diverse as well. Vessel shape is universally understood to be partly related to intended use, so variation in the vessel forms from which cacao residues are recovered implies variation in cacao preparation, serving, and consumption. All of this requires us to consider not just when and where cacao was

[2] The normal referent for the term cacao

cultivated and used, but in what ceramic forms. This is a point Powis and colleagues made in their discussion of contrasts between implied practices of cacao consumption by the lowland Maya from 600 BC through the Late Classic, and between the Classic Maya and the people of Central Mexican Teotihuacan and sites employing Teotihuacan-style vases (Powis et al. 2002).

The earliest history of cacao during the Formative Period, despite still-limited numbers of confirmed samples, already suggests a diversity of ways of consuming cacao, a situation most compatible with multiple independent traditions rather than a single origin and uniform tradition. To understand the implications of differences between sites, rather than simply treating them all as part of a single story of cacao origins, we need to look in some detail at the results from each of the five sites dating to the Early and Middle Formative Periods for which we now have secure evidence of cacao use. We begin with our own work at Puerto Escondido not because it is the key to understanding this broader landscape but because in grappling with how to understand our own data, we have considered a wider range of issues that we believe can help us to integrate the emerging data from across Mesoamerica without ignoring critical contextual characteristics.

Puerto Escondido: Finding Cacao in Early Formative Contexts

In 1994, we began excavations at an archaeological site in Honduras, CR-372, located at a place locally known as Puerto Escondido. At the time, we did not expect that our excavations of the surface-visible Classic period site located there would provide us the opportunity to investigate one of the few examples of early Formative period villages that are archaeologically accessible in the region. We did have a set of expectations for what life in such early villages would be like, based on our analyses of previously excavated materials from other places in Honduras, including the site of Playa de los Muertos, located within 10 km of Puerto Escondido, and at the time, the earliest known site of human occupation along the lower Ulúa River and its tributaries (Joyce 1992, 1996, 2001). These expectations included an agricultural subsistence base for villagers living in extended families, who negotiated social relations through participation in inter-village and inter-family visits on the occasion of ceremonies, many related to moments in the life course of the residents. Food sharing was, in our view, one of the critical sites for the negotiation of identification with and distinction between families and individuals.

By 1998, we were well into our excavations of the deeply buried sequence of surfaces at Puerto Escondido, which we realized dated to the early Formative period, predating Playa de los Muertos and most other early Honduran sites as well (Henderson and Joyce, 1998). Excavations oriented toward understanding the Formative period occupation in 1995, 1996, 1997, and 2000 produced sufficient material to allow us to obtain radiocarbon dates that showed the site was occupied from well before 1100 BC, with our earliest ceramics associated with a date calibrated to 1700–1510 BC. We continued laboratory recording of materials throughout 2001 and 2002. Starting in 1996, we began presenting our research at conferences, with special emphasis on understanding food consumption in relation to social relations in this early village.

Initially, our main evidence was the abundant pieces of broken ceramic vessels that are the single largest category of material recovered from Puerto Escondido. The arguments we were developing insisted on treating these ceramics as evidence of practices of food preparation and consumption first, and only secondarily as evidence for chronologies and definition of regional and long-distance connections evident in preferences of vessel decoration (Joyce 1996; Joyce and Henderson 2001, 2002, 2003). As we initially described the Formative period ceramic assemblages, they consisted of four contrasting suites of vessels (Joyce and Henderson 2001). In the Barahona phase (which we conservatively dated to ca. 1600–1400 BC based on uncalibrated radiocarbon dates and cross-site comparisons, but which should date to ca. 1700–1400 based on calibrated dates), we identified open bowls and incurved-rim bowls (*tecomates*) in small and medium sizes (Table 1). Arnold (2003:36) argues that Early Formative *tecomates* are generalized vessel forms that can be used for a variety of purposes, including storage, cooking, and serving. The lack of any evidence of exposure to fire and the relatively small sizes of the Puerto Escondido examples make them most comparable to tecomates interpreted elsewhere as serving vessels (Clark and Gosser 1995; Lesure 1998). The small bowls in the assemblage are examples of forms universally understood as serving vessels (Arnold 2003:27; Lesure 1998). The earliest ceramic assemblage from Puerto Escondido entirely lacks jar forms, which are understood to be the main storage vessels in later periods, and includes no vessels with evidence of exposure to fire. In this, the Barahona pottery is very much like that from Paso de la Amada on the Pacific Coast of Chiapas (Clark and Gosser 1995; Lesure 1998). For us, as for the archaeologists working at Paso de la Amada, the implication is that ceramics were initially developed as a medium for the creation of distinctive drinking vessels added to a storage, cooking, and serving technology that mainly depended on vessels of other materials.

At Puerto Escondido, the ceramic assemblage from the succeeding Ocotillo phase (ca. 1400–1100 BC, based both on calibrated radiocarbon dates and cross-site comparisons) differs in subtle but significant ways. Jars still are rare or absent. Open bowls and tecomates are still the most common forms, with larger diameter bowls and tecomates added to the small and medium sizes seen previously. Most notably, the Ocotillo assemblage also includes bottles with a central tall neck or spout, with rim diameters from 4 to 6 cm (Table 1). These must be among the earliest examples of bottles from Mesoamerica; authors discussing contemporary assemblages in some detail do not mention any bottle forms (Arnold 2003; Lesure 1998). This then, became for us, one of the questions about food serving at Puerto Escondido that we needed to understand: what were these bottles, many with exterior surfaces modeled in ways reminiscent of the fruits of plants, used for?

The Ocotillo phase assemblage in essence added one new form, and presumably a new practice of food serving, to the bowls and tecomates of the Barahona phase. The addition of larger tecomates and larger bowls raises the possibility that either

Table 1 Summary of vessel forms and sizes for Formative period phases

Phase	Vessel form	Rim diameters (in cm)
Barahona	Round-sided, flaring bowls	16–20 and 26–28
	Incurved rim bowl (tecomate)	5–10
Ocotillo	Flaring open bowls	12–18, 24–26, and 30–34
	Incurved rim bowl (tecomate); some with short vertical neck	6–12 and 16–20
	Bottles with central cylindrical spouts	4–6 (spout)
Chotepe	Bowls with flat bases and flaring or vertical walls	18–28
	Vertical or slightly flaring neck (1.5–5 cm tall) jars	14–18 and 24–28
	Incurved rim bowl (tecomate), some with short vertical neck	10–18 and 22–28
	Bottles with wide cylindrical necks	12–14
	Shallow plates	30–32
Playa	Bowls, rounded bases, flaring walls	16–30
	Bowls, rounded bases, vertical walls	14–20
	Vertical or flaring neck jars , tall (3.5–5 cm) neck	12–18
	Vertical or flaring neck jars, short (1–2 cm) neck	12–18
	Incurved rim bowls (tecomates), some short necks	16–24
	Bottles with flaring necks with exterior bolster and separate, narrow spout (2.5 cm diameter) on body	9–14 and 20–30
	Flaring bowl with bolstered rim	8–12 and 16–20
	Basin with bolstered rim	24 and 34
	Shallow plates	32

Forms are listed in order of relative abundance, from most common to least common, within each time period

portion size increased, or some food being served was consumed from shared vessels where previously it had been more individually consumed. Whereas the differences between these two assemblages were subtle, the differences between Ocotillo and the succeeding Chotepe phase were much more obvious, even though there is substantial evidence for continuous occupation of the same house sites (Joyce 2007) and continuous use of ceramic firing facilities (Joyce and Henderson 2003). Vessels produced during the transition from Ocotillo to Chotepe phases sometimes show mixtures of traditional and new technologies. The radiocarbon dates obtained and the stratigraphic record both supported the identification of a distinct late Ocotillo phase, from perhaps 1300 to 1050 BC (Joyce and Henderson 2007: Table 1). Nonetheless, the forms of ceramic vessels do not actually change definitely in these levels.

Chotepe phase stratigraphic levels yielded radiocarbon dates that substantially overlap with those of the late Ocotillo, calibrated to about 1200–900 BC. The conventional dates we assigned the Chotepe phase (1100–900 BC) recognize that the changes in ceramic decoration and form that allow us to define the phase are comparable to those recognized throughout Mesoamerica as typical of these two centuries: the end of the Early Formative period and the transition to the Middle Formative period. Many of the new features of ceramics at Puerto Escondido, particularly surface treatments, are among those characterized as related to the development of socially stratified Gulf Coast Olmec sites. It is therefore interesting to note that the vessel forms, while also innovative, are fundamentally rooted in the existing Ocotillo suite of shapes, with the addition for the first time of appreciable numbers of necked jars (Table 1).

Open bowls remain the most common form, with a new distinctive shape developed. These flat-bottom, flaring or cylindrical wall bowls are far more standardized in size than previously, and do not appear to have the kinds of distinctive small, medium, and large sizes that had developed previously. The newly evident jars are actually more common than tecomates, some of which might better be characterized as neckless or very short-necked jars, based on the development of a tall collar and their larger sizes. Perhaps supporting this suggestion, many of the tecomates in Chotepe phase assemblages share paste and surface treatment characteristics with jars, although there are enough smaller tecomates finished like the open bowls to caution against thinking tecomate serving vessels have entirely disappeared. In addition to the new jars, for the first time we find vessel forms with evidence for exposure to fire, shallow large diameter plates, some with substantial carbon deposits on their rounded undersides. The jars and shallow plates suggest innovations in cooking and storage, the use of a material (clay) previously not employed for these purposes, presumably replacing other materials previously used for storage of liquids (wooden vessels? gourds?) and dry foods (such as baskets or boxes). Chotepe assemblages also contain bottles, like those of Ocotillo, with central spouts or necks. The measurements of the openings of these bottles are significantly larger than the narrow spouts of the Ocotillo bottles.

Until 2002, the lack of complete vessels in our excavations at Puerto Escondido impeded our ability to identify with certainty the contents of any of the vessels whose broken fragments were so abundant, and whose use we inferred from features of shape and surface finish. At that point, we began a collaboration, still in progress, with Patrick McGovern of the Museum Applied Science Center for Archaeology, University of Pennsylvania Museum. McGovern proposed a trial extraction of samples from within the fabric of sherds to test whether identifiable residues of cacao could be recovered (Henderson et al. 2007).

In January 2002, John Henderson selected a set of excavated sherds for the first trial run, following McGovern's directions of preferring base sherds at least 5 cm by 5 cm, and requested permission for their removal to the United States for analysis from the Instituto Hondureño de Antropología e Historia. In February 2004, McGovern reported that W. Jeffrey Hurst of Hershey Foods Technical Center confirmed the presence of theobromine in two of the initial 17 sherds selected for this pilot project. One of these two samples (4DK-136) was a segment from the neck of a bottle that came from a late Ocotillo deposit (Fig. 1). Two radiocarbon samples from related strata produced calibrated dates of 1280–1010 and 1290–1020 CAL BC. Based on detailed stratigraphic analysis, the context containing this early bottle neck is considered to date to ca. 1150 BC. It was the only Ocotillo phase sherd tested by McGovern, and remains the earliest sample from Puerto Escondido with confirmed theobromine residues. Starting in March 2004, McGovern proceeded to test

Fig. 1 Ocotillo phase necked bottle similar to the earliest sherd tested for residues of cacao. Collection of the Museo de San Pedro Sula, Honduras (Drawing by courtesy of Yolanda Tovar)

four additional samples, three from bowls and one from a jar, all from Chotepe phase contexts. All four tested positive for theobromine. Testing was extended to other sherds selected in Honduras. Ultimately, we tested 13 samples and confirmed evidence of cacao in 11 cases. Eight were from bowls from Chotepe phase contexts, selected to provide an indication of whether the newly introduced bowl forms were used in serving cacao foods. One was from one of the highly decorated jars, also new at this time. A second jar sherd (4DK-31) had a weak indication of possible cacao residue that was not confirmed by additional analysis. Because the neck sherds from Chotepe bottle forms were all highly decorated, no Chotepe bottles were among the samples approved for destructive analysis by the Honduran Institute. We, nonetheless, are confident that these bottles were likely used to contain cacao as well, since every bowl made from the same paste and finished in the same way that was tested had evidence of definite or possible cacao residue.

Other Early Formative Cacao Use

In their brief description of their research posted on the *Antiquity* web site, Powis and colleagues report findings that demonstrate cacao use in both the Gulf Coast of Mexico and Pacific Coast Chiapas as early as, or earlier than, the samples analyzed to date from Puerto Escondido (Powis et al. 2007). The *Antiquity* report cites two positive samples resulting from testing of 22 vessels from the two sites of Paso de la Amada and El Manatí. According to a more extensive online report published by Powis (2007), this research took place in 2006. It involved testing of 41 samples from Cantón Corralito, and 16 from Paso de la Amada, both located on the Pacific Coast of Chiapas; 28 samples from the major Gulf Coast center, San Lorenzo; 26 samples from El Paraíso; and 6 from El Manatí, also in the Gulf Coast. Of the 117 samples studied, two tested positive for theobromine. Powis (2007) notes that other vessels tested also had indications suggestive of theobromine, with follow-up studies in process to reconfirm these findings.

One of the two confirmed samples with cacao residues, a sherd from a tecomate, was recovered at Paso de la Amada in association with Structure 4 of Mound 6. The type is assigned to the Barra Phase (1900–1700 BC) of the Early Preclassic, although the depositional context is later, and also contained sherds from the Locona Phase (1700–1500 BC). Powis and colleagues suggest that the conservative interpretation to date is the sample and, consequently, the use of cacao it represents, date to between 1900 and 1500 BC (Powis et al. 2007).

The second positive sherd was a deep, flat-bottom, cylindrical-wall bowl from El Manatí on the Gulf Coast. Recovered in test pit B4D3 in a context described as "in Strata IX and X" (Powis et al. 2007), it is part of a ritual deposit assigned to the Ojochi phase (conventionally assigned dates of 1500–1350 BC but placed by these authors at 1650–1500 BC based on calibrated radiocarbon dates). The calibrated date overlaps with the conservative interpretation of the Paso de la Amada sample proposed by Powis and colleagues. It is later than the presumed date of the Paso de la Amada vessel itself, based on the association of the vessel type with Barra phase. Both are, as Powis and colleagues note, earlier than the earliest tested sample from Puerto Escondido, with its likely 1150 BC stratigraphic/radiocarbon date in the Ocotillo phase, whose calibrated radiocarbon dates suggest a calendar year duration of 1400–1100 BC.

The Barra phase date for the Paso de la Amada sample, if correct, would be roughly contemporary with the Barahona phase defined at Puerto Escondido, with which Barra phase Paso de la Amada shares many ceramic characteristics. Because of the experimental nature of the testing we undertook with Patrick McGovern and the limited size of the Barahona ceramic sample excavated to date, we have not yet tested any sherds from this early period. Our expectation, given the evidence from these related sites and the high numbers of samples with confirmed cacao residue in our initial samples, is that continued analysis of Barahona ceramics will confirm that here as well, cacao drinks were being consumed during the period when the serving vessels we see are either open bowls or tecomates. This requires us to reconsider the model we have proposed for the adoption of cacao drinks at Puerto

Escondido itself, and the relationship of changing practices of serving cacao to changing forms of serving vessels.

Puerto Escondido: Cacao in Middle Formative Contexts

After the Chotepe phase, Puerto Escondido's ceramics began to resemble those previously known from early Middle Formative village sites in Honduras, typified by Playa de los Muertos located south and east of Puerto Escondido, on the east bank of the Ulúa river, the main stream in the valley. The Rio Blanco, on which Puerto Escondido was located at the time, joined the ancient Chamelecon River, the main tributary of the Ulua river, downstream from Playa de los Muertos. Figurines at Puerto Escondido include examples that share paste characteristics possibly indicating an actual origin at Playa de los Muertos, and certainly evidence of shared social practices between the two sites (Joyce 2004a). Yet, our stratigraphic excavations at Puerto Escondido gave us a sample of Playa-related ceramics associated with radiocarbon dates substantially older than those obtained at the Playa site itself (Kennedy 1981). Where excavators at that centrally located and more heavily alluviated site were not able to reach earlier occupation surfaces due to depth of deposition and height of water table, we were able to delineate a sequence from the Early Formative through to the beginning of the Late Formative, at which time there is a discontinuity before reoccupation in the Classic period. Our early Playa phase strata have calibrated radiocarbon dates of ca. 1000–800 BC; our late Playa phase strata have calibrated dates of ca. 400–200 BC. While our ceramics differ in slight details from those documented for the Playa site itself (Kennedy 1981), they support the existence of early, middle, and late components like those defined as the Zanjos, Sula, and Toyos ceramics complexes at Playa de los Muertos (Kennedy 1981). We suggest conventional dates of ca. 900–700, 700–400, and 400–200 BC for these three segments of the Middle Formative sequence, based on analysis of excavations at sites from across northern Honduras (Joyce 1996, 2001; Joyce et al., in press).

The differences in ceramics that we note between our early and late Playa assemblages are almost entirely in minor aspects of surface finish, including motifs that become popular. The early and late Playa assemblages continue all the general shape categories developed by the end of the Chotepe phase. One form, a deep bowl with a bolstered rim and small rim diameter, appears after the early Playa phase, perhaps only in the late Playa phase. Open bowls remain the most common form in the assemblages, with a wider variety of jars being the second most common part of the assemblage. The tecomates noted are almost all probably best considered jars with short necks or neckless jars. Less common forms that show some evidence of exposure to fire or other indications of use in food preparation include plates almost identical to those first seen in Chotepe, and deep basins that are newly introduced. In his study of the pottery of Formative sites in the Tuxtlas mountains of Gulf Coast Mexico, Arnold (2003:37) notes that jar forms increase in frequency over time, a pattern also seen in the Pacific Coast of Mexico (Clark and Gosser 1995; Lesure 1998).

But while in general the Playa assemblage suggests people were using ceramics for a similar range of storage, cooking, and serving food activities, there is one extremely distinctive new form in Playa contexts. This is a new bottle form, which we find in the early Playa phase and which continues to be made throughout the middle and late Playa phase. These bottles, extremely varied in their surface treatment, at times made in the form of human or animal effigies, uniformly have a central highly flaring neck and a separate, very narrow spout rising from the body. The spouts, which may stand-alone or be connected to the neck by a bridge, average 2.5 cm in diameter. The neck is so widely flared that it resembles a trumpet in profile, and is usually equipped with a roll of clay forming a bolster on the exterior of the lip. Many examples exist in museum collections, usually described as coming from burials at or near Playa de los Muertos, where Kennedy (1981) considered them likely forms used primarily in ritual (Fig. 2).

A sherd from one such spouted, flaring necked bottles was the second of the initial sherds identified as yielding theobromine in February 2004. The sample (8K-31) was directly associated with a radiocarbon date (400–350 and 300–220 CAL BC) in the late Playa phase. The vessel itself was a carefully finished glossy black bottle with complex grooved designs. The area in which this bottle was recovered was at the time part of a complex of stone features including a stepped platform, a central rectangular hearth, and at least two cists of a size and shape to suggest human burial facilities.

Fig. 2 Playa phase spouted bottle typical of the new flaring-neck bottle form possibly associated with frothing non-alcoholic cacao beverages. Collection of the Museo de San Pedro Sula, Honduras (Photograph by John S. Henderson)

On the grounds of formal resemblances to chocolate vessels illustrated in codices from Mexico, we have long argued that Middle Formative Honduran jars of this shape likely were used for cacao beverages requiring the familiar process of raising a froth before service (Henderson and Joyce 2006). Honduras was a major center of cacao production in the sixteenth century (Bergmann 1969; Henderson 1979). There is evidence from modeled ceramic figurines and ornaments for Classic period use of cacao in the Ulúa Valley (Henderson and Joyce 2006:141–143). While no visual representations of cacao plants are known from Formative Honduras, we expected these bottles to yield cacao residues, and nothing about them challenged our understanding of the use of cacao foods in early Honduras. In contrast, a small jar from more recent stratigraphic levels overlying the late Playa phase deposits at Puerto Escondido (4DL-100) was one of the two samples that tested negative for cacao residues. Although carefully decorated, this jar apparently was used to contain something other than the cacao whose history of use at Puerto Escondido had started before 1100 BC and gave rise to the spouted, flaring necked bottles of the Playa phase.

Cacao in Middle Formative Contexts: Persistent Variability

Bottle forms similar to those of Middle Formative Playa de los Muertos have long been known from Belize as well, interpreted as chocolate pots, a use confirmed by residue analyses of complete examples from Colha (Powis et al. 2002). The examples from Belize are later than those known from the Ulúa Valley (Powis et al. 2002:88). Analysis of samples from 14 spouted bottles confirmed theobromine in 3. The associated radiocarbon chronology placed the earliest of these samples at ca. 600 BC. The placement of these jars in a burial is primary evidence for the use of cacao drinks in mortuary ritual in Middle Formative Belize. Thus, in form and in use-context, Colha and Puerto Escondido reflect similar practices in serving cacao beverages during the Middle Formative.

More recent research on the Middle Formative Gulf Coast Olmec site of San Andres provides a counterpoint to the results from Puerto Escondido and Colha. At San Andrés, Daniel Seinfeld (2007) conducted a variety of analyses of a wide range of vessels. Seinfeld (2007:79–80) established the presence of both maize and cacao in a variety of vessels dating to ca. 700–550 BC from the refuse from what is interpreted as a feasting event. Stable carbon isotope analysis revealed differences in the use of different vessel forms for serving maize-based foods. Based on a higher level of C_4 plant signatures in "luxury-serving wares," Seinfeld (2007:79) concludes that maize foods were feast foods or beverages rather than staples of the diet. Electrospray ionization-time of flight mass spectrometry (ESI-TOF MS) helped identify likely cacao residues. Seinfeld (2007:82) notes that the use of cacao in feasting at San Andrés contrasts with the contemporary use of cacao in mortuary rituals at Colha. Rather than being present in special serving wares, the cacao signatures he identified were in plain jars. Seinfeld compares his results from San Andrés to the possible use of cacao for alcoholic beverages, which we have proposed for Puerto Escondido.

At Puerto Escondido, Middle Formative cacao residue was confirmed only in one bottle with a flaring neck and spout. We suspect that a variety of bowls as yet untested will yield evidence of cacao residues, as they are the most likely candidates for drinking cups. The fact that a small jar from the immediately preceding Chotepe phase tested positive for cacao, while a similar small jar from the succeeding phase did not, requires further consideration. Fermentation of alcoholic beverages does not require the use of ceramic vessels, and none of the jars recorded in Early or Middle Formative contexts at Puerto Escondido is very large, as would be expected of brewing jars. It is possible that the small Chotepe jar actually served primarily as a beaker for pouring out cacao drinks prepared in perishable vessels, filling some of the numerous bowls that tested positive for cacao residues and are thus likely drinking cups or plates.

Ancient Social Contexts of Cacao Foods in Mesoamerica

While Puerto Escondido and Colha share the use of similar spouted jars, not common or perhaps even absent in the Gulf Coast, there are differences between these two sites that are worth noting. The spouted bottles appear to develop earlier in Honduras than in Belize. In Honduras, they replace earlier bottle forms. And while there are reports of similar bottles in burial contexts in Honduras, the main sites of recovery are domestic middens, some undoubtedly containing the remains from feasting in household contexts. The Colha burials are described as tombs of social elites; to date, there is no evidence in Middle Formative Honduran villages such as Playa de los Muertos and Puerto Escondido for a clearly delineated elite with distinctive burial practices. Only at the unusual sites of Los Naranjos and Yarumela do we see the level of intra-community distinction we would expect in the presence of social elites, at Los Naranjos, including privileged burial of a minority of the population in a monumental platform (Joyce 2004b).

As we examined the sequence of bottles at Puerto Escondido, beginning with the Ocotillo phase, we considered a wide range of possible uses that might have inspired the people there to create the initial bottles, and might have led to the changes we saw over time, culminating in the Playa de los Muertos style bottles with flaring neck and separate spout. We considered the possibility that the earliest bottles were used for a different beverage, replaced in the Middle Formative by cacao.

Alcoholic beverages were the most obvious possibilities, as their importance in socially shared meals in early sedentary societies has been a point of convergence of most specialists in Mesoamerican and Central American early societies (Hoopes 1995; Clark and Cheethem 2002; Smalley and Blake 2003). While most attention in this literature has been given to the potential of maize plants as sources of alcohol, other sources, including palm fruits and manioc, have also been suggested. So one possibility we considered was that the earlier Formative villagers were drinking alcoholic beverages and that these were replaced by nonalcoholic, frothed cacao.

But this argument required an almost unbelievable degree of coordinated, self-conscious, intentional disciplining of the behavior of people in many small villages in a relatively short period of time. Not only would all these villagers need to give up alcoholic drinks in favor of tasty, but less intoxicating, cacao, but they would also have had to develop a completely new serving vessel technology to support the new frothed cacao. So as an alternative, we considered the possibility that the product being consumed was the same throughout this sequence – beverages made from cacao – and that the entire sequence of changes in details of bottle forms was related to a more gradual development of new emphases in the serving of cacao.

This led us to develop our proposal that at Puerto Escondido, the original impetus for cacao cultivation was the production of an alcoholic beverage (Henderson and Joyce 2006). We began by observing that cacao processing actually involves a fermentation step, during which the pulp surrounding the seeds within the pod is converted from a gluey substance that sticks to the seeds into alcohol. The alcohol in turn alters the otherwise bitter seeds, producing the characteristic chocolate smell and taste in the dehydrated seeds. The alcohol that is a byproduct of fermentation of cacao seeds had been ignored; we suggested it provided a logical rationale for early interest in cacao. We noted that in their native range in South America, cacao and its relatives were prized for the pulp within their pods, which at times was in fact fermented both in South America and in traditional communities into the twentieth century in Guatemala (Bletter and Daly 2006; McNeil 2006:345–346).

From this perspective, we argued that the bottles of Ocotillo phase Puerto Escondido were containers for a fermented cacao drink, and thus did not require any procedure through which foam would be created. Indeed, such a naturally fermented drink would form foam itself, perhaps forming an expectation for cacao beverages later reproduced in nonalcoholic cacao. We viewed the changes in bottle form in Chotepe phase as possible evidence of a change in the nature of the cacao beverage, culminating in Playa phase in the creation of bottles with tall necks that would contain a foam induced by using additives, beating the liquid, or pouring it from one vessel to another. The principal additive known to be used in cacao beverages today, of course, is the ground cacao seed itself, one of several fruit pits mentioned as being ground and added to cacao beverages. At least some of these are described as serving to help bring up and sustain froth. Other ground additions, such as chiles or certain flowers, apparently served as part of distinct recipes for different cacao beverages.

In our view, the addition of seeds, flowers, chiles, or other spices had multiple effects. The creation of different local, perhaps even familiar, recipes for cacao beverages would have been a way to create distinction in taste embodied in a practice subject to secrecy, ownership, and transmission from one person to others with whom he or she identified. The practice of serving cacao with such additives, which would need to be kept in suspension in the watery medium of either alcoholic or nonalcoholic cacao, provided a field of practice within which hosts could reinforce their generosity by public displays of the work required to produce special drinks. To the extent that the preparation of cacao beverages normally took place behind the scenes, introducing final steps of preparation that involved grinding seeds and stirring them in would have provided a field within which food preparers, perhaps normally women, could have publicly claimed their own labor rather than having it be appropriated invisibly.

Because alcoholic beverages have to be started brewing in advance of their planned serving date, and without modern techniques of pasteurization relatively rapidly pass to unpalatable stages, providing alcoholic drinks must have been a very public display of the organizational abilities of host families. A shift away from alcoholic cacao that nonetheless preserved the sensory features of the alcoholic drink – the froth, the suspended particles, and the crisp fresh taste remarked on in all descriptions of cacao beverages – might well have been an effective strategy to reduce the risk in hosting. By maintaining or even intensifying the performances of finishing drinks and serving them, hosts could have made even these nonalcoholic cacao drinks as effective media for creating social debt and marking social distinction as was possible by providing alcoholic beverages. We know from the outcome of cacao drinking patterns in later Mesoamerica that the serving of cacao foods – not just a single cacao drink – was in fact the center of an elaborate cuisine and an elaborate performance of hospitality and cultured life. We argued that these developments began with the earliest adoption of cacao beverages, long before cacao had become a prerogative of a political elite. We would now extend that argument to suggest that the early history of cacao involved many different approaches to cacao use and serving, uses that initially were independent even if many tended to converge in the tightly intertwined social networks of later Early Formative Mesoamerica.

The additional data provided by studies of Mexican Formative vessels at three sites adds considerably to the evidence for variation in early cacao use and to a consideration of the social contexts of cacao preparation and consumption. At Paso de la Amada, where the confirmed residue sample is part of an assemblage derived from household-level feasting, cacao was present in a tecomate, perhaps a beaker from which individual portions were poured into some form of cup. The one positive sample from the El Manatí, a shrine in which carefully composed deposits of wooden figures, rubber balls, and other objects were laid in a spring, was a bowl. No bottle forms have been described for the regional assemblage, and it is most likely that tecomates, like that from Paso de la Amada, were the main containers of cacao beverages waiting to be portioned for individual use. The individual use in this case most likely was not as part of a village drinking event, but perhaps an extra-village visit to a pilgrimage site, one apparently with associations to the ball game. Paso de la Amada has been reported to have the earliest identified formal ballcourt yet known in Mesoamerica, leading to the suggestion that competition in sports was one basis for social relations at this time (Hill and Clark 2001). Cacao beverages may have been served by hosts to visitors involved in such inter-site competitions, a social setting in which local cuisine and nonlocal taste would routinely have been brought into contact.

Early Cacao Studies: Moving Forward

With few exceptions, the study of early cacao residues to date has been driven by the imperative to identify where the original development of cacao beverages in Mesoamerica took place. This is understandable in light of the powerful opportunity provided by residue analyses to actually know without fear of contradiction that some product of *Theobroma cacao* or *Theobroma bicolor* was being consumed much earlier in Mesoamerica's history than we knew or could suspect. But as recent articles have enriched our knowledge of the specificities of cacao use even at a relatively early point in its history, it has become clear that early Mesoamericans (and Central Americans) were consuming cacao in more than one way, and thus we should expect there were multiple approaches to cultivation and use of cacao.

Because cacao was so tightly identified with the emergence of a Mesoamerican worldview that we once thought started with the development of more stratified societies on the Mexican Gulf Coast, and because cacao was so evidently important in the political, social, and economic negotiations of complex societies that the Spanish witnessed in the early colonial period, we have not yet adjusted to what appears to be the reality that cacao cultivation, processing, and consumption predated and was independent of the development of the first Olmec societies of the Gulf Coast. This is not to say that cacao did not become a core part of Olmec cultural practices when the stratified societies developed on the Gulf Coast, a historical moment that may be associated with the widespread adoption of a uniform terminology for cacao and perhaps with a trend towards more uniformity in cacao processing. Instead, our point is that the search for origins may have reached its peak, and the time is ripe for a more considered discussion of the richness of cacao cuisine.

We look forward to seeing more data points emerge showing where cacao was used in earliest Mesoamerica, but suggest that it will be increasingly important not to argue that any one place is, by virtue of an early associated date, the origin place of cacao production. Indeed, in our own drafts of our articles for the *American Anthropologist* and the *Proceedings of the National Academy of Sciences*, we labored hard not to say that our data represented the original use of cacao, even in the lower Ulúa valley, since at a minimum, we were and remain certain that testing of the small number of sherds from our earliest ceramic assemblage is as likely to produce evidence of cacao use as the later sherds were. It will be even more critical, moving forward, to establish the range of vessels from which cacao residues are recovered at each site, work that may, as in our case, delay publication of preliminary results with a consequent increase in interpretability. And it will be absolutely critical that we follow the urging of K. D. Vitelli (1998) and produce models that "think up," moving forward in time from the unknown to the known, rather than the reverse.

We cannot presume a stability of practices that should be demonstrated empirically, simply because in an earlier point in our disciplinary history, it was heuristically useful to have the unifying concept of a "Mesoamerican" way of doing things to provide a source of assumptions about earlier, less well-documented periods. The one thing we can securely say about the people of Mexico and Central America who lived before 1100 BC and were already actively producing cacao foods is that they did not already have the legacy of deliberate fostering of ideologies that would come with the centralizing efforts of Gulf Coast Olmecs and later societies. While these later societies were the inheritors of their predecessors, they reshaped their heritage in ways that undoubtedly affected such fundamental daily practices as meals, and that must have changed the common experience of the meal as part of the structuring of social differences we now recognize as separating nobles and other villagers, farmers and urban citizens. Taste, in other words, was made through histories of practice; we are now in a position to trace those histories at an unprecedented level of specificity, if we care to take up that challenge.

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Salt Production and Trade in Ancient Mesoamerica

Eduardo Williams

Introduction

Common salt, or sodium chloride, has always been a strategic resource of primary importance. In Pre-Hispanic Mesoamerica salt was used mainly for human consumption, as the native diet (consisting mainly of plants such as maize, beans, chili peppers, squash, and so on) had little chloride and sodium (Williams 2003). Chloride is essential for digestion and respiration, and without sodium our organism would be unable to transport nutrients or oxygen, or transmit nerve impulses. Throughout the world, once human beings began cultivating crops, they began looking for salt to add to their diet (Kurlansky 2002:6–9).

In the preindustrial world sodium chloride had several important uses apart from its role in the diet, particularly as a preservative of animal flesh, as a mordant for fixing textile dyes, as a medium of exchange, and as a principal component in the preparation of soaps and cleansing agents (Parsons 1994:280).

The flow of strategic and scarce goods (including salt) from the subject provinces to the imperial capitals in Mesoamerica (such as Tenochtitlan, the Aztec capital) was assured by the rulers through a geopolitical strategy that kept conquered communities under the obligation to pay tribute, and kept the lines of communication with the state core areas open at all times. The procurement and distribution of salt and other strategic resources (e.g., obsidian, copper, turquoise, jade, and so on) as well as the military control of the source areas and the extraction of tribute and trade were critical aspects for the economic and social life of most Mesoamerican polities. Imperial expansion toward resource-rich regions is ultimately explained by the desire to obtain precious commodities and vital resources, among which salt was always of paramount importance.

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Salt as a Strategic Resource in Mesoamerica

Salt production and trade played a fundamental role in Mesoamerican economy and culture from the earliest times. Olmec traders actively engaged in salt extraction and trade along the Gulf coast in the Formative, and by 1200 B.C. Olmec merchants from the Gulf of Mexico had penetrated highland and Pacific coastal Guatemala, Oaxaca, and central Mexico in their quest for salt and various other strategic resources such as obsidian, jade, serpentine, iron ores, basalt, cacao, marine shells, animal pelts, and exotic bird feathers (Diehl 2004:128). During this period in Oaxaca, salt making was restricted to villages near saline springs. As early as 1300 B.C. some salt making areas were visited briefly, but no houses were built. During the Middle Formative period (ca. 900–300 B.C.) the production of salt by boiling brackish spring water in pottery jars was a common activity. Salt making was probably one of Formative Mesoamerica's most widespread regional specializations (Flannery and Winter 1976:39–40).

Saltworks were so important for the survival of the people in Mesoamerica that wars were fought over their possession and control. The Maya site of Emal, the richest salt deposit in coastal Yucatán, was fortified to repel enemy incursions (Kepecs 2000). Elsewhere in Mesoamerica salt was used as a powerful political tool; Muñoz Camargo relates how the Aztecs tried to conquer the province of Tlaxcala by siege, depriving the Tlaxcaltecans of many goods such as cotton, gold, silver, green feathers, cacao and salt. This siege lasted for over seventy years, and as a result the Tlaxcaltecans supposedly became accustomed to eating without salt (Muñoz Camargo 1972 [1892]:110).

The Tarascans of west Mexico expanded their empire from their homeland in central Michoacan (Fig. 1) towards the Lake Cuitzeo basin in the east, the Sayula

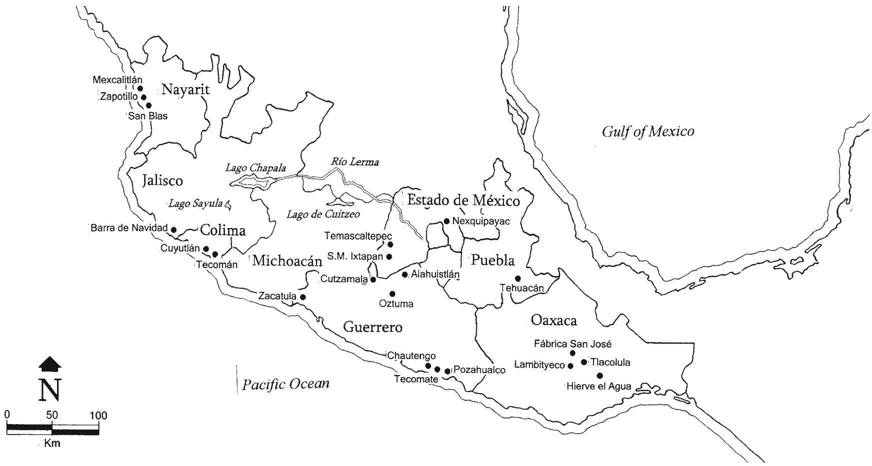

Fig. 1 Map showing major salt producing sites in central and western Mesoamerica

Lake in the west, and the Pacific coast of Michoacán and Colima to secure many strategic resources such as salt, obsidian, copper, gold and silver, which were lacking in the empire's heartland (Pollard 1993; Williams 2003, 2004a:Fig. 46).

The Many Uses of Salt in Ancient Mesoamerica

Salt had a strategic role in Mesoamerican economy and culture because of its many uses, for instance in nutrition, food preservation and the textile industry, among many others (cf. Williams 2003). What follows is a brief discussion of several aspects of salt production and use, using examples from archaeology, ethnohistory, and ethnography.

Nutrition

In the modern world, most people fulfill their dietary salt requirements from animal protein, such as cattle, pork, and their derivatives, for example milk and fat. There were no major animal domesticates in Mesoamerica before the arrival of the Spaniards, so the salt needs of the indigenous population had to be fulfilled by adding sodium chloride to the food. In the Maya area, for example, dietary salt needs were considerable because the tropical climate and hard work caused abundant salt loss through sweat. People who live in these conditions usually require a minimum of 8–10 g of salt a day (Andrews 1980:57–58). The need for a few grams of salt a day may not seem like a big problem. However, let's imagine a city of some 50,000 people in the tropics, most of them farmers or construction workers. It would take at least 400 kg of salt a day, or 146 tons a year, to sustain the society. Most communities consume more than the minimum, for dietary as well as other purposes. Therefore, when the supply is interrupted it can have serious consequences. In this case salt becomes a key factor of economic life (Andrews 1980:36).

Food Preservation

Because ancient Mesoamericans lacked modern preservation techniques, salt as a preservative must have been very important for trade in fish and other foodstuffs over long distances, as well as for storing food for long periods of time. We don't know when this practice originated, but its antiquity is well established in the Old World. In Egypt, for instance, remains of food found in a tomb dating from before 2000 B.C. included salted fish and a wooden container holding table salt (Kurlansky 2002:38).

Since Phoenician times (from ca. 1250 B.C.) the standard practice for preserving fish was to gut it, dry it, and pack it in layers with salt (Kurlansky 2002:131).

Salt preservation was an important component of the food industry in ancient Mesoamerica. In describing the Aztec marketplace in the capital city of Tenochtitlan, for example, Hernán Cortés says that "they sell much fish, fresh and salted, raw and cooked" (Cortés 1983 [1520]:63). Among the fish products found in the Aztec markets there were *tamales* made of tiny fish called *mextlapique* or *cuitlapetlatl*. The tamales, known as *michpiotli* or *michpiltamalli*, were flavored with dry chili, *epazote* (an aromatic and slightly bitter plant, *Chenopodium ambrosioides*) and diced *nopal* (*Opuntia* spp.). They were wrapped in maize leaves and were roasted on the *comal* (pottery griddle). Fish tamales are still sold in several markets in Mexico City (Castelló 1987:48, 138), and are still produced in several towns around Lake Cuitzeo, Michoacán. The fish used for making tamales here is called *charal* (*Chirostoma jordani; C. bartoni*) (Williams 2009). These fish are put in a tub with brine before being introduced into a great oven where they are cooked for several hours. Soaking in brine is an important part of the process, since the tamales are taken to far-away places such as Toluca, Mexico City and Puebla, and no other preservatives are used.

In several towns around Lake Cuitzeo, fishermen still trade fish for salt, which is used for salting a species of fish known as *carpa* before being roasted in ovens (Williams 2008). According to a source known as *Miscelánea Estadística*, in the nineteenth century fish from nearby Lake Chapala were sun-dried, salted, packed in rolled-up reed mats, and were taken to neighboring towns and as far away as Zacatecas, San Luis Potosí, Toluca, and Mexico City (Estadística 1873:33).

In colonial times salt was an important trade commodity in Colima, since it was used as food, as condiment, and for preserving fish (Reyes 2000:175). Although the people of Colima preferred fish from rivers, marine species and those from coastal lagoons were much sought after in Guadalajara, Sayula (Jalisco), and Valladolid (present-day Morelia, Michoacán). This brisk trade in fish relied on salting as a means of preservation (Azpeitia 2006:221). Salt was used as preservative in other parts of Mesoamerica as well. According to Andrews (1983:10);

> Fishing was a major industry of the Pre-Hispanic Maya, and coastal dwellers traded fish to neighboring sites in the interior in exchange for agricultural goods. To preserve the fish, they either roasted, sun-dried, or salted it… Salting was observed in the sixteenth century on the north coast of Yucatán and on the pacific coast of Guatemala… Even in this century in southwest Guatemala… salted fish was available in highland markets… during Lent. As a preservative, salt may also have been used in the tanning industry.

Bishop Diego de Landa wrote one of the best-known descriptions of Maya life and customs in the sixteenth century. He had this to say about the importance of salt and its role in food preservation among the Maya:

> They make great fisheries from which they eat and sell fish throughout the land. They often salt it and roast it and sun-dry it without salt, and they know which one of these processes is suitable for each kind of fish… roasted [fish] keeps for several days, and they take it to sell to twenty and thirty leagues, and for eating they cook it and it is tasty and healthy… They kill some very big fishes which look like mantas and they preserve their pieces in salt (Landa 1982 [1560]:121).

Textile Production

Salt was very important to the ancient technology surrounding the dyeing of textiles. There may have been a direct functional link between salt makers and cloth dyers in Mesoamerica; saline solutions have been commonly used as mordants by traditional cloth dyers in several parts of the world to fix dyed colors in textiles (Parsons 2001:241). In fact, salt's important role in the Mesoamerican economy can be indirectly gauged by the huge amount of dyed textiles that circulated through commerce and tribute. Among the Aztecs, for example, cotton cloth had many uses, such as making clothing for men and women. Cloth was also used for beddings, bags, awnings, decorative hangings, battle armor, adornment for statues of the gods and shrouds for the dead. Cotton textiles served as items of exchange, as well as forms of currency in the markets; they were exchanged as gifts among the nobility, and formed the dominant item of tribute payment at all levels (Smith 1998:91).

Imperial tribute received by the Aztec state every year included 128,000 mantles or capes, 19,200 garments and 665 warrior costumes. Most of these items were woven with dyed cotton thread, and the amount of salt used in the dyeing process must have been very high indeed, and to this we should add the 4000 "salt loaves" paid to the Aztecs by several tributary provinces every year (Smith 1998: Table 7.2).

Salt Sources and Production Techniques in Mesoamerica

Mesoamerican salt sources can be broken down into three types: saline inland lakes, highland springs, and coastal estuaries (Kepecs 2003:126). The methods used to extract salt in Pre-Hispanic times consisted of boiling brine (known as *sal cocida*); leaching brine through salt-laden earths; and solar evaporation (known as *sal solar*). These processes were often combined (Kepecs 2003:127). Salt itself is usually not preserved in the archaeological record; the archaeological markers or material remains linked to salt making with native techniques consist of: (1) pottery vessels (which were used and discarded in great quantities at salt production sites); (2) shallow solar evaporation ponds made of sand and lime; (3) canals for taking the water from the springs to the production sites; and (4) mounds of leached, discarded earth (Williams 1999, 2002). What follows is a brief discussion of Pre-Hispanic salt making in several areas of Mesoamerica. This discussion is based on archaeological, ethnohistorical, and ethnographic data (see e.g., Williams 2003).

The Basin of Mexico

Parsons (1994, 2001) studied salt making at San Cristóbal Nexquipayac, a small village on the northeastern shore of Lake Texcoco, central Mexico. According to Parsons, saltmaking at Nexquipayac involves six basic sequential steps:

(1) collecting the soils whose salts are to be leached; (2) mixing the soils in the correct manner; (3) filtering the water through the soil mixture in order to leach out the salts and concentrate them in a brine solution. A conical pit excavated in the workshop to a depth of 40–50 and 90–100 cm in diameter was used for this; (4) boiling the brine to obtain crystalline salt; (5) drying the crystalline salt; and (6) selling the dried salt (Parsons 1994, 2001).

The Sayula Basin, Jalisco

The initial process used to extract salts in the Sayula basin must have been the leaching of saline sediments. The leaching process consisted of "washing" and filtering saline earth with fresh water; the result was a salt-laden liquid or brine. This stage of production required various types of installations. The producers built a filter sustained by a wooden fork, composed of a rectangular base of sticks on which sedge, fodder, and sand were placed. The resulting brine was collected in a circular pan (Valdez et al. 1996:179; Liot 2000).

Following the extraction process, it was necessary to reduce the collected brine through natural or induced evaporation to achieve the final product – salt. Although salt production carried out until recently in the Sayula basin relied on solar evaporation, the historical texts always refer to fire reduction in ceramic vessels (Valdez et al. 1996:179).

Cuyutlán, Colima

In Pre-Hispanic times the most common salt making technique in coastal Colima was by boiling the brine. When seawater or water from saline wells was not used, it was necessary to first obtain water with a high saline content, or brine, through several processes of leaching and washing of saline soils; later the resulting brine was boiled to evaporate the water. Both processes, filtering and evaporation, were carried out using clay pots. This method was effective, but not too practical when attempting to produce large volumes of salt. As demand increased, new technologies were developed. Toward the end of the sixteenth century filters were first introduced in Colima. These consisted of wooden platforms with woven branches or sticks supporting several layers of filtering substances. A similar device is still used in Cuyutlán, Colima (Reyes 1995:152, 154).

Lake Cuitzeo Basin, Michoacán

There are several thermal springs in the eastern end of the Lake Cuitzeo, whose water, which has a high mineral content, is used for the production of salt. Each

Fig. 2 Salt producer in Simirao (Lake Cuitzeo Basin, Michoacán) standing in front of his canoas, or wooden troughs, used in the solar evaporation of the brine. Note the sack of crystallized salt on the canoa, and the little mounds of prepared soil (used for leaching) all around the finca, or salt-producing unit

salt-producing unit (known as *finca*) consists of two or more *estiladeras,* wooden structures that are used as filters to separate the salt from the earth by leaching. In every *finca* there are several *canoas*, i.e., wooden troughs, manufactured like dugout canoes (Fig. 2), where the brine that has been filtered in the *estiladera* is evaporated by the sun. Each *finca* has an area of some 50 m^2 where salt-bearing soils are extracted and mixed. There is also a network of canals that bring water from the springs to the *fincas*, with a depth of ca. 50–80 cm, and several meters in length (Williams 1999, 2004b).

The tools used by the saltmakers are quite simple: shovels, hoes, and picks to excavate the soil, wheelbarrows to take it to the *estiladera*, and buckets to take the water to the *canoas*. The tools used in the past, however, were quite different: a type of sack made of jute fiber was used to carry the earth, and clay vessels were used to carry the water within the *finca*.

The saltmaking process can be divided into four stages: (1) soils are extracted, mixed and prepared; (2) brine is obtained by leaching the earth in the *estiladera*; (3) brine is evaporated by the sun in the *canoas* and salt is collected; (4) the finished product is packed and sold.

Although the tools and permanent fixtures used nowadays for making salt in the study area are not the same as those that were employed during the early colonial era, much less in Pre-Hispanic times, the basic process for salt making still used in this area is in many ways similar to the one described in the sixteenth-century *Relaciones Geográficas* (Acuña 1987 [ca. 1570–1580]). Both ancient and modern salt making requires extracting the soil, mixing two or more types of earth, adding water, leaching and evaporation (Williams 1999).

Coastal Michoacán

The salt making season in the coastal area of Michoacán and Colima occurs in the driest part of the year (roughly from early April to mid-June). During the rainy season the fresh water drastically reduces the level of salinity in the estuary and in the soil around it, and the greater cloud cover reduces the sunlight necessary for the evaporation of brine (Williams 2002, 2003, 2004c).

Salt making in this area involves leaching the soils from the beach. This salty earth is leached with salty water from the estuary, thus producing concentrated brine that is later evaporated by the sun to obtain the final product, crystallized salt. The leaching process is carried out in the *tapeixtle.* This wooden structure consists of a flat platform made of branches supported by tree trunks. The resulting brine is taken with buckets to the *eras*, or evaporation pans made of beach sand with lime. *Eras* measure on average 6×3 m (Fig. 3), and each *plan* (or salt making unit) has around 18 *eras*, although not all of them are in use at the same time.

Fig. 3 Salt producer working in La Placita (on the Michoacán coast). He is using a basket to collect the crystallized salt from the *eras*, the shallow evaporation pools in the background

Each *era* is filled up with 20 buckets of brine (one bucket holds 20 l); subsequently two or three buckets a day are put into the *era*, and after five days it is possible to collect the first batch of salt. Thereafter salt is collected every other day, on average 25–30 kg every time. Each *plan* produces 7 tons of salt on average during the season, if the weather conditions are good.

In order to carry out the leaching process, some 70 basketfuls of *salitre* (salty earth) and 80 buckets of salty water are put into the *tapeixtle* (this will produce enough brine to fill some 15 *eras*). The *salitre* is carried on horseback, but in the old days the *salineros* would carry the baskets of *salitre* on their heads; they had to make as many as 70 trips between the estuary and the *tapeixtle*, a taxing task in the unforgiving heat of the day.

After the leaching process the exhausted soil is taken out of the *tapeixtle* and heaped on top of the *terrero*, where it accumulates until it is withdrawn by shovel and spread out on the ground. After a few days it becomes once again rich in salt and can be recycled and used anew.

Coastal Guerrero

The process known as *tapeite* in coastal Guerrero and still used in sites such as Tecomate, Chautengo, and Pozahualco (see Fig. 1), consists of leaching salt from soils where saltwater marshes dry up during the dry season. The salt makers carefully break up the thin upper crust of earth and carry it to their saltworks, where they deposit it in a large filter known as *tapeite*, which is constructed on a raised base of wooden or cane slats covered with palm or tough grass; adobe sides create a rectangular basin lined with coarse sand and a second layer of fine, sifted sand. Brackish groundwater is drawn from a shallow well dug next to the *tapeite* and poured over the saline earth. After seeping through the filter, the water is channeled into a plaster-lined holding tank. The concentrated brine is poured into the solar drying pans, where it evaporates to leave white granular salt crystals (Good 1995:2).

The Maya Area

Salt was a regional necessity everywhere in Mesoamerica, yet the white salt of Yucatán was also a bulk luxury, traded far beyond the regional level. Flowing from international trading centers to regional markets in foreign territories, it augmented regional supplies as a product of superior quality (Kepecs 2003:129). Pre-Hispanic Maya obtained salt from several sources, the most abundant ones being the coastal saltworks. The primary source of salt in Pre-Hispanic Mesoamerica was coastal Yucatán, where salt was obtained through solar evaporation. Archaeological evidence shows that Yucatecan saltworks were active from the Late Formative period (ca. 300 B.C. – A.D. 300). In colonial times salt production in Yucatán was approximately 20,000 tons per year, enough to satiate the needs of several thousand people, or the whole of the Maya Lowlands through history (Andrews 1997:40). Salt was scarce in the southern Maya lowlands of Guatemala and Belize. It was imported in bulk from the north coast of Yucatán, although recent fieldwork has documented closer sources of salt than those of the north coast (McKillop 2002).

A method of salt making that is still found in a few sites near the coast of Chiapas is the one known as *tapesco*. This technique involves leaching marsh soil with estuary water which is then evaporated in small solar pans. The *tapesco* salt-making operation takes place mainly during the dry season (from January to May or June). The soil to be leached is raked up and placed on raised wooden structures known as *tapescos*, the bottom part of which consists of a three-layered filter made of thin sticks covered with grass and reeds, which in turn are covered by a thin layer of sand. Salt water is drawn from small shallow wells and poured over the soil in the *tapesco*, thus leaching the soil. After passing through the filter the water collects in a mud-lined pan beneath the *tapesco*. The brine is then placed in a series of small shallow solar evaporation pans, where evaporation takes place anywhere from four to six days, depending on available sunlight (Andrews 1983:62–63).

Veracruz

During the Early Formative period (ca. 1200–900 B.C.) in El Salado, Veracruz, solar evaporation in pottery trays was the primary method of salt production. This technique was supplemented in some areas by salt making involving boiling brine. During the late Classic period (ca. AD 600–900) brine reduction involved a two-step process whereby salt content in the brine was first increased by boiling in pots; this brine was later reduced to loaves by boiling over fire in shallow ceramic basins (Santley 2004).

Salt production at El Salado during the Late Classic period increased and became more intensive than in the Early Formative. This activity was carried out at the household level by small groups of families, and was probably destined to stay that way because increasing the number of producers would not greatly increase the efficiency of manufacture with Pre-Hispanic techniques (Santley 2004:219).

Salt Trade, Tribute, and Transportation

Mesoamerica's great ecological and geographical diversity made exchange between regions a necessity since early times, since no single area produced all the resources indispensable for subsistence. Particularly striking were the differences between the cold highlands and the humid and hot lowlands and coasts (Blanton et al. 1981; Sanders and Price 1968).

The imposition of tribute through war, together with trade, functioned as mechanisms for the exchange of people, information and goods between several regions, in conditions of dynamic and ill-defined frontiers between different social systems (Blanton et al. 1981:60). Both archaeological and ethnohistorical data show that during the Postclassic period (ca. AD 900–1521) the Mesoamerican economy was more highly commercialized than during earlier times, with distribution systems based on market exchange (Smith and Berdan 2003:7). Regional markets played a very important role within the Mesoamerican economy. In these markets one could find exotic commodities as well as other more mundane goods. Regional markets had a more dominant position within the hierarchy than the ordinary markets found in the cabeceras (head towns), and some of them were so prominent that they became famous for selling one product in particular (Hassig 1985).

Long-distance exchange of goods, including salt, was one of the most important economic activities for Mesoamerican states. Ethnohistorical sources on the Aztecs show how during the late Postclassic this commercial activity contributed to Tenochtitlan's prosperity. The market in this city contained a variety of exotic merchandise from all corners of Mesoamerica, while the *pochteca*, or long-distance merchants, traded within and outside the Aztec imperial territory. This activity was closely linked to imperialism, and sumptuary goods played a fundamental sociopolitical role in Aztec society. The exchange of sumptuary goods between elites in the late Postclassic period had an integrative role, contributing to interregional communication, social stratification and politics (Smith 1990:153–163).

However, not all trade was sanctioned by the state. Among the Tarascans of Michoacán, for instance, there was a high level of exchange between villages in the highlands and lowlands, particularly the Tierra Caliente (the Tepalcatepec River's flood plain; see Williams 2004a:Fig. 46). It is not clear how or where this trade took place, but there is no mention of state intervention in this kind of informal exchange (Beltrán 1982:165).

Tribute flowed from diverse producers throughout the Tarascan kingdom toward the collection centers, to finally arrive in Tzintzuntzan, the state capital. Certain goods were then commercialized through the market or redistributed in many directions, for example obsidian tools, fine ceramics and metal artifacts (copper, bronze, gold and silver) (Beltrán 1982:161–162). But taxes – paid to the state in either goods or services – were more important for the economy, since they constituted to a great extent the support of the state. The tax system was completely under the control of the royal dynasty, which depended on an extensive bureaucracy to manage taxation and the punctual fulfillment of obligations. Besides salt, which was one of the most important items of trade and tribute for the Tarascan empire, the goods that more often appear on tax records from Michoacán in the sixteenth century include the following: maize, cotton cloth and garments, slaves, victims for sacrifice, domestic services, metal objects, weapons, tropical fruits, cacao, unprocessed cotton, gourds, animal skins, tropical bird feathers, beans, chili, rabbits, turkeys, honey, maguey liquor, and ceramic vessels (Pollard 2003).

Transport technology in ancient Mesoamerica was quite rudimentary because of the lack of beasts of burden and wheeled vehicles. Terrestrial transportation costs were rather high, since everything had to be moved on the back of human carriers. These porters, known as *tlamemes* in central Mexico, carried from one point to another all sorts of merchandise. We don't know exactly how heavy the usual loads were, but Bernal Diaz del Castillo stated in the sixteenth century that each *tlameme* carried a load of two *arrobas* (around 23 kg) before being relieved (Hassig 1985:28–32). At least during the Formative and Classic periods, the most efficient load was 20–30 kg for a distance of 36 km (Drennan 1984a).

In Michoacán Indian porters carried on their backs between 20 and 30 copper ingots, with a total weight of 32–72 kg, for a distance of 21–43 km (Pollard 1987:748–750). These figures, however, have to be considered with caution, since there is a great deal of variation in the loads registered in colonial documents, and the distances could also vary according to terrain (mountains, canyons, jungle, forest, desert, and so on), to weather conditions, and to other factors that might hinder the circulation of carriers (Hassig 1985:33).

Ethnographic data recorded by Carl Lumholtz in Michoacán during the early twentieth century show that *huacaleros*, as porters were known, would travel regularly on foot from the Sierra Tarasca of Michoacán to Mexico City, Guadalajara, Acapulco, Colima, and Tepic. The average distance traversed in one day would be 48–64 km with a load of 63 kg. This example gives us valuable information about the carrying capacity and distance probably traveled by Pre-Hispanic *tlamemes* transporting salt and other commodities. The figures are greater than those suggested by many archaeologists (e.g. Drennan 1984a, b), and it is also important to point out that *huacaleros* did not have to carry their own food, but rather would survive during their trips taking advantage of wild foods and of the hospitality of the inhabitants in each locality through which they passed (Kelley 2000:137).

Few customs remain today that hark back to Pre-Hispanic or colonial salt exchange and transportation; those still extant furnish us with an invaluable analogy for the reconstruction of the Pre-Hispanic past. For example, salt is still being used as a medium of exchange in the Costa Chica of Guerrero, where it can be used to obtain a broad range of goods, either of local origin or imported from other areas: *agua fresca* (a sweet drink prepared with fresh fruit, sugar and water), cooked food, maize, fruit, clothes, cosmetics, gold jewelry, bicycles, tape recorders, and electric fans, among many other items (Quiroz Malca 1998:347).

In the coastal area of Michoacán the *salineros*, or salt makers, could use until recent years the salt they produced to pay for everything, including pistols. In exchange for salt they could obtain many products such as maize, beans, *piloncillo* (unrefined brown sugar), soap, cheese, chick peas, potatoes, mangos, bananas, *mamey*, prunes, onions, sugar, and firewood, among many others. One measure of beans or prunes, for instance, would be equivalent to one of salt (Williams 2002, 2003, 2004c).

In Colima, Guerrero and Michoacán muleteers carried salt over vast distances until they were replaced by the railroad some 50 years ago. In Guerrero, for example, until 1939 Nahuas from the Balsas Valley marketed salt from the Costa Chica as itinerant sellers. For generations they had combined salt trading in the dry season with agriculture during the rainy season (from June to October). The Nahuas formed caravans of 20–25 burros or mules driven by 10–12 men to obtain salt. The trek from the Balsas Valley to the coast was about 150 km through mountainous terrain, requiring several days of travel. Coastal informants spoke of the constant arrival and departure of mule trains consisting of hundreds of pack animals from different highland towns (Good 1995:8–10).

All the means of transportation available in the colonial period (mule trains, carts, and ships) required many parallel activities or industries to provide the goods and services necessary in each case, such as road maintenance, construction and administration of inns, supply of pasture, fabrication of harnesses and ropes, construction of carts, ferries, boats, and so on (Reyes 1998:150).

Muleteers had an exceptional economic and social impact in Colima. Salt trading and transportation by mule trains became one of the activities of greatest importance within the region's economy. The supply of many indispensable products depended on the muleteers who arrived at or departed from Colima, taking salt to the centers of distribution and consumption. Because of their sheer numbers, both muleteers and their animals became the foremost consumers of goods and services, and the foremost contributors of *alcabalas,* or sales taxes (Reyes 1998:151).

During the sixteenth century the *encomenderos* and *corregidores* relied almost exclusively on *tlamemes* for the transportation of salt; this practice remained until the beginning of the seventeenth century. Carriers took salt to several places, some of them quite distant from the coast of Colima, such as Mexico City. Eventually the Viceroy of New Spain tried to forbid the use of *tlamemes,* but what really ended this inhuman practice was the scarcity of Indians due to famine and epidemics, as well as the increasing necessity to move greater volumes of salt and to move it more quickly (Reyes 1998:152).

Conclusions

Salt was a strategic resource and key commodity throughout the ancient world. In Mesoamerica salt production and trade were closely supervised by the state. Andrews (1983), for example, has suggested that the Pre-Hispanic states in the southern Maya lowlands had to import many tons of salt each year from the northern Yucatecan coast, to provide their great populations with the indispensable resource. This fact had important consequences for the economic and political organization of the Maya, as stated by Andrews:

> Access to important natural resources and control of their long-distance trade was a major factor in state formation processes in the ancient world. This was clearly the case among the Pre-Hispanic Maya. Many ancient trade networks had one or two key resources whose exchange was the major stimulus for the growth and spread of trade… among the ancient Maya it was… salt and to a lesser degree cotton, obsidian and jade (Andrews 1983:134–135).

West Mexico also saw similar processes whereby salt exchange, together with many other strategic or rare resources (such as obsidian, copper and turquoise), contributed to the development and growth of complex societies. In the Classic period the Teuchitlán tradition of central Jalisco had, apart from huge obsidian workshops, other evidences for specialization. The high-quality salt found in abundance in the Atoyac-Sayula valley of Jalisco seems to have been another strategic resource that was being exploited on a massive scale, to judge by the great number of evaporation "pits," mounds of leached soil, and potsherds from broken saltmaking vessels. The levels of production indicate that salt was probably being exported for consumption beyond the local area. The "monopolies" involved in the procurement of high-quality obsidian and salt could have promoted the economic development of the local polities (Weigand 1996:199).

Lastly, to understand the importance of salt for the political economy of the Tarascan empire, one has to consider that the Lake Pátzcuaro basin, where the state capital was located, lacks natural sources of salt, obsidian, flint, and lime, which were essential for the survival and reproduction of the people during the Protohistoric period (Pollard 1993:113). The Tarascan rulers had to import salt and many other strategic resources from the far corners of the empire. The main areas of salt procurement were the Lake Cuitzeo basin, the Lake Sayula basin, and lastly the coastal area of Michoacán (Williams 2003). The mechanisms for the exchange of these resources were regional markets, long-distance trade, and tribute paid by the diverse peoples conquered by the Tarascans.

The flow of strategic and scarce goods from the subject provinces to the imperial core was assured by the king, or *cazonci*, through a geopolitical strategy that kept conquered communities under the obligation to pay tribute, and the lines of communication with the capital open at all times. This strategy explains how the Tarascan state became one of the most powerful empires during the late Postclassic, rivaling even the Aztecs. The procurement of salt and other strategic resources, as well as their distribution, the military control over source areas and the extraction of tributes, were critical aspects for the economic and social life of the Tarascans and other Mesoamerican polities. The Tarascan state's expansion toward resource-rich regions far from the capital is ultimately explained by the desire to obtain precious commodities and vital resources, among which salt was always of paramount importance. In this the Tarascans were behaving not unlike many states and empires throughout the ancient world.

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The Dirt on Food: Ancient Feasts and Markets Among the Lowland Maya

Bruce H. Dahlin, Daniel Bair, Tim Beach, Matthew Moriarty, and Richard Terry

Introduction

Let us begin by laying facts aside, as they do not affect the question.
Jean Jacques Rousseau, *Discourse on the Origin of Inequality*

Tyranny of the Bread and Circus Paradigm Also Known as the Political Economy

Archaeologists have long tended to conflate political evolutionary stages with Polanyi's (1957) modes of exchange: bands and tribes with reciprocity, chiefdoms and early states with redistribution, and more developed states with market exchange. According to this scheme, the Classic lowland Maya (Fig. 1) are relegated to chiefdoms or an early state level of political organization with redistribution as the primary, or at least the most ostensible, mode of exchange: control of all or most labor, production, and the dominant mode(s) of exchange were concentrated in a highly centralized authority figure – a paramount chief or king and/or a polyarchy of elite kin groups – who traded exotic goods among themselves. Elites traded with each other while extracting other goods, most importantly agricultural output, from the majority population through taxes and tribute to maintain themselves and a civic/religious infrastructure they symbolized. Those at the top of the hierarchy then redistributed some of these goods down the social ladder in payment for fealty, loyal service, and the like, often at communal rituals and feasts. These Neoevolutionary concepts – bands, tribes, chiefdoms, and states, and the various forms of reciprocity, redistribution, and market exchange – are heuristic devices, or broadly conceptualized and loosely correlated classificatory forms of social and

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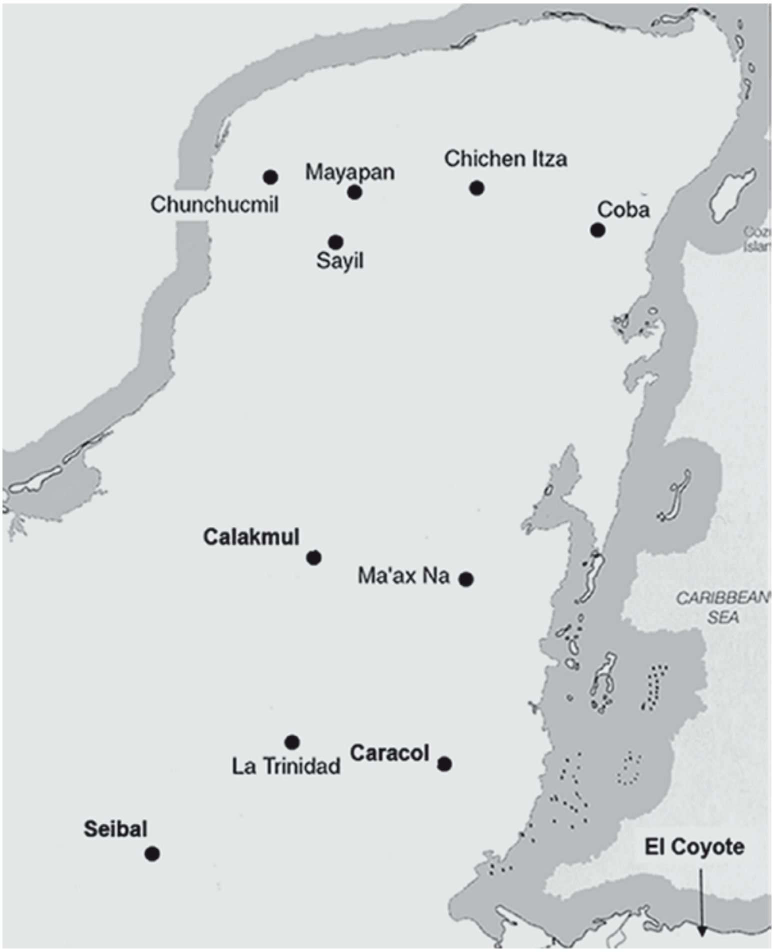

Fig. 1 Map of the Maya Lowlands

economic organization, designed to facilitate cross-cultural comparisons and to fill in holes where hard data are lacking. Obviously, they have been highly useful in constructing models. Therefore, the pocket critique of their application to the Maya that follows is not intended to challenge their utility, nor to rewrite Neoevolutionary theory, but rather to emphasize that these concepts have historically tended to narrow our perceptions and made it difficult to identify market exchange as an important facet of Classic Maya economies (see e.g., Yoffee 1977; West 2002; Sharer and Golden 2004; Rice 2008).

With few exceptions, the focus in Maya studies has steadfastly remained on the production and distribution of material symbols of power (Wells 2006); indeed, the term "political economy" has often been used as a euphemism for redistribution throughout a highly centralized hierarchy of chiefly power. Following Smith (1991:34), we take the term “political economy” to mean “polity-centered, decision-making activities of governing personnel that center around the management of resources deemed germane to the polity’s macrosystemic welfare …” (also see Scarborough and Clark 2007). In general, the economy is in the service of power holders and allows little to no agency on the part of the majority population. Support for this top-down model is substantial in the Maya area, starting with the early and enduring attention paid to the grandeur of their art and architecture, which were made by majority labor to celebrate the elite at the center of the Maya universe. It is reinforced by an overrepresentation of durable prestige goods – among the archaeologically most visible kinds of artifacts, found predominantly in elite contexts and in their iconography and epigraphy, which overwhelmingly depict the apparel and accoutrements of the elite class. On the other hand, the majority of utilitarian artifacts that were made and used by the majority population were almost certainly made of organic materials. However, the notoriously poor preservation inherent in the humid subtropics permits only rare representation in the archaeological record (Cavanagh et al. 1988) except for wetland habitats. These “phantom artifacts” may account for as much as 90% of a household’s artifact inventory (Dahlin 2007). Therefore, if these items, most notably foodstuffs, entered an exchange economy, they would not be represented in artifact inventories.

The top-down approach, along with poor preservation of organic materials, has seriously “underconceptualized” any other mode of exchange. For example, in the 1960s (e.g., Haviland 1969), it became apparent that large urban populations such as Tikal were simply too large to have been sustained by long fallow swidden. Almost immediately, exclusive attention was shifted to increasing regional carrying capacities through agricultural intensification (e.g., Turner 1974; Bronson 1966; Puleston 1968; Siemens and Puleston 1982; see also Flannery 1982; Pohl 1985; Turner and Harrison 1983; Harrison and Turner 1978; Fedick 1996). Hardly a thought was given to the possibility that critical segments of these urban populations were supplied through critical food supplements circulated through modes of exchange other than redistribution. This neglect was often supported by the well-known difficulties of the prevailing tumpline mode of transportation (Drennan 1984a, 1984b) and the assumption that a high degree of environmental homogeneity (Sanders 1977) all but precluded the need for intraregional trade in foodstuffs and other basic necessities. More recent data have soundly refuted the latter two assumptions (e.g., Beach et al. 2006; Dunning et al. 1998; Gomez-Pompa et al. 2003; Fedick 1996; Sluyter 1993). Although there is no dearth of ideas, conclusive evidence for intensive agricultural production at or near some of the largest Classic Maya sites has not been forthcoming – Caracol being the only exception (see Chase and Chase 1998).

Market exchange has nevertheless rarely been hypothesized as a viable strategy for providing those urban populations still apparently in wont, in deference to the prevailing redistribution model implicit in the political economy of chiefdoms and early states, which the Maya are supposed to exemplify. It was with primarily textual evidence, which documented the emergence of more complex secondary states that developed after the Classic Maya Period (see Kepecs 2003; Kepecs et al.

1994; Masson 2002; McAnany 1993; Sabloff and Rathje 1975, 1980), that market exchange became an acceptable economic alternative.

We define "market exchange" or "market economy" (terms we use interchangeably) as an exchange system in which goods and services are routinely bartered and/or bought and sold, and two of the factors of production (labor and capital) were freely transacted; our choice of the term "freely" should be taken in relative terms, as there are indications of highly administered trade. We also caution at the outset that we are not questioning the importance of redistribution in ancient Maya economic systems, but rather we argue that there were at least two trophic levels to the economic systems that helped sustain Maya populations.

We will first very briefly summarize the existing lines of evidence for market exchange during earlier periods. Traditionally, each of them have provided only oblique views and, taken together, amount to weak inference. We will then introduce a relatively new line of evidence which we feel is more convincing – geochemical prospecting for food exchanges on plaza surfaces. We will then report on the application of that line of evidence at two sites (Dahlin et al. 2007). We will then evaluate our results in light of the single most challenging alternative explanation for geochemical patterning in public, private (household), and parochial spaces – feasting.

Promise and Problems of Ancient Maya Market Exchange: It's the Economy, Stupid

Plattner characterizes contemporary agrarian peasant marketplaces thus:

> … periodic marketplaces are the commercial life of agrarian or peasant societies. The markets usually meet once every few days; crowds come from the countryside to sell their farm products and buy manufactured goods and foodstuffs form 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 (1989:171)

Hutson (2000) cites ethnohistoric documents to the effect that similar activities took place in Aztec marketplaces. How accurate a description of ancient Maya marketplaces these are remains to be seen, but the analogies certainly stir the imagination about the importance of such socioeconomic arenas in ancient Maya lifeways, and we feel, rightly so.

Exchange systems, by which we mean the almost infinite variety of reciprocity, redistribution, and market exchange, are at the very bedrock foundation of ancient Mesoamerican society. Nevertheless, it is difficult all too often to tease apart the prevailing modes of exchange by which different kinds of goods circulated in more complex ancient societies, as all of them operated in ranked and stratified societies. The thorniest, and the most controversial – because of its implications for the organization of Maya society (see Prattis 1982; Plattner 1989) – is market exchange.

Let's start with the Late Postclassic and Early Colonial Period in Yucatan and work our way backwards. The Early Colonial literature of Yucatan is replete with references to market exchange. Consider, for example, some of Bishop Landa's statements in his *Relación* of ca. 1566, that "the occupation to which [the Maya] had the greatest inclination was trade" (Tozzer 1941:94; also see Oviedo y Valdes(1535/1851) and Ximénez (1929–1931)), and that they traded in such low-value articles as salt, fish, cloth and clothing (*mantas*), copal, wax, honey, and flint knives in addition to swords and slaves for cacao, stone beads, feathers, bells, and other objects of metal. Tozzer (1941:94–97, footnotes 415–429) also cites Peter Martyr or Pietro Martyr d' Anghera(1912 [1516]), who asserted that the canoes seen by Columbus on his first voyage held such household items as utensils, pottery, and wooden objects, while other chroniclers spoke of hemp, clay idols, pelts, fruits, and vegetables, and even maize (Freidel 2008). More than half of these items are highly perishable. Maya vocabulary, moreover, includes the term *k'iwik* (or *kiuik*), which can be translated as "market," "fair," "where one buys or sells," or simply "plaza" and *ah k'iwik yah* for "those who traded in the marketplace" (Barrera Vasquez 1980:405; Wurtzburg 1991:94–97; King and Shaw 2007:6). In addition to terms for professional, probably elite, merchants, such as *pplom* for "professional merchants," *ah p'olom* for "merchant who bought and sold," *ah' pplom yoc* for "traveling merchants," the Maya lexicon includes *ah k'aay* for "peddler", *ah chokom konol* for "small-time trader mainly in trinkets and little items such as needles and pins", *ah lilits konol* for "merchants in spicy condiments and vegetables", and *ah lotay konol* for "a bulk merchant or wholesaler" (see Roys 1939:31; Tozzer 1941:94, fn. 415). King and Shaw point out that "the types of products generally associated with *konol* phrases suggest that they designated mainly petty merchants and/or "shopkeepers," people who catered to local and regional demands and did not travel far. They may not have been full-time traders, but part-time or occasional merchants" (2007:6). Landa even mentions that they "gave credit, lent and paid courteously and without usury" by early Colonial times (Tozzer 1941:96), and that their economies even included many different kinds of service providers in addition to merchants (Tozzer 1941:95–97).

Thus, there can be, and is, widespread acceptance of vigorous market exchange in the Colonial Period and we have already alluded to the fact that many would extend that back to the emergence of secondary states starting in the Terminal Classic Period. But, can we push it back to the Classic period or even earlier? And, can we overcome the exclusivity of the bread and circus paradigm?

First, let's take the recent discovery of 18 mural scenes at the North Plaza at Calakmul (Carrasco Vargas and Colon Gonzalez 2005; Boucher and Quiñones 2007). One scene (NE2c) depicts a man carrying a deep vessel with both arms and is glyphically identified as "*persona del maiz*" (please note, all glyphic translations are from Martin, cited in Boucher and Quiñones 2007). SE1c depicts a woman ladling out a liquid from a large *olla* to a person in front of her; to her left is a glyph identifying her as a "*persona del atole*." SE1d shows two men, one smoking tobacco, and SE2c shows two men, one apparently taking snuff; both scenes have glyphs identified as a "*persona de tabaco*." SEd2 shows a man transporting a mixed cargo on a tumpline. SE2b depicts a man tasting something in front of a woman glyphically identified as a "*persona de los tamales*." A similar scene is depicted in NE1c, but the woman is next to a hearth. SE2d shows a woman with a basket of polychrome pots glyphically identified as "*La persona de los vasos [delgados].*" NE1b shows a man kneeling in front of a basket and extending a ladle to a woman with a container; he is glyphically identified as a "*persona de la sal*." SO1c depicts two men and a woman with baskets containing what Boucher and Quiñónez (2007:47) describe as "*lo que se podria identificar como punzones para autosacrifico*," or sharp instruments for autosacrifice. Admittedly, these scenes could be interpreted as depicting either marketplace activities or preparations for a feast (Carrasco Vargas and Colon Gonzalez 2005; Boucher and Quiñones 2007). However, the North Plaza where these murals were found has all of the physical earmarks of a marketplace (Folan et al. 2001; May Hau et al. 1990). It has a warren of linear structures with double-sided rooms facing walkways on either side. There are also sizable paved open spaces along the northern edge and immediately to the south of the plaza; both of these spaces are devoid of structures and might have supported less formal vending areas or activities that are almost invariably found in traditional marketplaces.

Second, David Stuart (PC 2008) recently translated a glyph on a Late Classic cylinder vessel, probably manufactured at the Late Classic site in the Naranjo area that he reads as *aj k'iwik*, and translates as "he of the market/plaza" (Fig. 2).

Third, there are numerous ways of inferring market exchange indirectly from archaeological evidence, including geographical models of spatial relations at the regional scale such as applications of central place theory (Cook and Diskin 1976; Hirth 1978; Smith 1976a, b), statistical analyses of the distribution of artifact assemblages among households at almost all rungs on the social ladder (e.g., Hirth 1998; Hutson et al. 2008a), the distribution of presumably specialized settlements

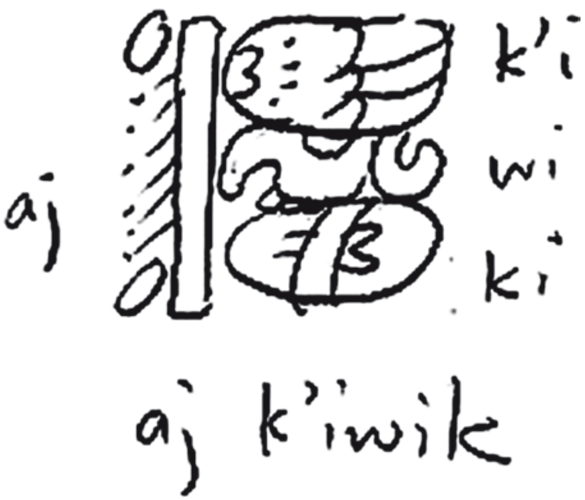

Fig. 2 The *aj k'iwik* glyph, "he of the market/plaza" (Courtesy of David Stuart)

across diverse environments (e.g., Lewis 2003; Kunen and Hughbanks 2003), and evidence for the production of specialized crafts (e.g., Costin 1991; Brumfiel 1980; Chase and Chase 1994, 2004; Hester and Shafer 1984; King and Potter 1994; Potter and King 1995; Hutson et al. 2008a; Folan et al. 2001; Chase and Chase 2004; Robin 2003; Kovacevich 2006; Moholy-Nagy 1997; Cobos Palma 1994; Chase et al. 1990; Guderjan 2007; Fry 1980; Rice 1987; Rands and Bishop 1980; Masson 2002; West 2002). However, from the studies just cited, and the controversy they have generated, it is clear that each of these lines of evidence is a blunt instrument, as they may have alternative interpretations. Moreover, even when several lines of evidence converge, they may still amount to weak inference for lack of clean or unambiguous results of hypothesis testing (Wurtzburg 1991:170, 246–248). The issue is further clouded by the fact that probably the overwhelming majority of artifacts made, exchanged, and consumed by the Maya are archaeologically invisible, thus severely constraining the data base. Therefore, it is at least possible that Maya society was intensely commercialized, and we wouldn't have a clue!

Archaeological Signatures of Ancient Maya Marketplaces

We have taken a different tact. It is based on the axiom that market exchange can occur in the absence of marketplaces, but marketplaces cannot occur without market exchange, whether defined as barter or monetized. Therefore, identification of marketplaces promises to single out market exchange as a discrete mode of exchange. In fact, marketplaces evolved after market exchange had already become an important and well-entrenched institution of exchange, as they imply a high level of economic complexity. They render market exchange more efficient and flexible simply by making goods, services, and market information more accessible by concentrating them all in one place. This is particularly true given typically large populations inhabiting ecologically diverse regions such as the Maya lowlands.

Positive identification of marketplaces has almost everywhere been impeded by the counterintuitive fact that ancient markets leave few unquestionable archaeological traces (Hirth 1998, 2000; Foias 2002). Artifacts are often displaced by the often-observed practice of regularly sweeping them up. Most items that are bought and sold in markets are the very same objects found in domestic contexts and most of them tend to be highly perishable, especially in tropical and subtropical regions. Therefore, searching for the remains of food and telltale in situ artifacts does not seem like a promising beginning. Moreover, market structures often tend to be ephemeral (e.g., temporary market stalls, posts for awnings, and tables) and leave little if any indelible traces, although some marketplaces, like Tikal, Calakmul, and Pueblito, have arcades that closely resemble modern markets (e.g., Coe 1967; Jones 1996; Becker 2003; LaPorte and Chocón 2007).

Marketplaces are nevertheless increasingly being at least tentatively identified on the basis of architectural evidence. This is reflected in Table 1. Criteria for allocating a marketplace function to a plaza surface tend to include the following: (1) Relatively large plaza without overt signs of mass ceremonialism (Tourtellot 1988) (although in many cases these spaces might have served multiple functions that might overwhelm evidence for the operation of a market in their midst); (2) Paucity of monumental architecture, as well as burials and caches in contexts that might otherwise be expected to produce them in excavations; (3) Strategic location with easy access via streets and/or causeways (see Folan et al. 1983; Wurtzburg 1991; Chase and Chase 2001; Dahlin et al. 2007); (4) Low, linear platforms or structures at the edges of a plaza, or formal masonry architectural arrangements that resemble modern arcades, sometimes in plaza centers (Coe 1967; Jones 1996, 2003; see Becker 2003, Plaza Plan 9); (5) Rows of low foundations for stalls (however, market activities do not always necessitate structures, while posts for awnings and tables were probably constructed of ephemeral organic materials (Ruppert 1952; Laporte and Chocón 2007; Gormsen 1978; Wurtzburg 1991; Hirth 2000; Dahlin et al. 2007); (6) No contemporaneous domestic structures; (7) Proximity to amenities normally associated with marketplaces, (e.g., wells, reservoirs, ballcourt, small public shrine, and/or sweat baths); (8) Few in situ artifacts (a. most were probably biodegradable, b. others were swept up into off-plaza middens (Hirth 1998; Durston 1976; Foias 2002; Tadros et al. 1990); and (9) Evidence for the finishing process for some goods (e.g., lithics, see Shaw et al. 2007) (Table 1).

If these plazas do turn out to be marketplaces, then it is axiomatic that market exchange was well entrenched at these sites. To be sure, there is nothing to preclude reciprocal exchanges and redistribution in this same venue, as well as other noneconomic activities (indeed, marketplaces are universally used for a variety of purposes). And, herein lies an apparent problem: can we distinguish between marketplace activities and these other activities in these and similar venues? We maintain that

Table 1 Lowland Maya Sites Where Marketplaces Have Been Tentatively Identified Based On Contextual Evidence.

Site	Plaza surface	Area (ha)	References
Calakmul	North Plaza	6.0	May Hau et al. (1990)
Caracol	Sacbe termini, Cochito & Parajo	0.3	Chase and Chase (2001)
Chichen Itza	El Mercado	2.5	Ruppert (1952)
Chunchucmil	Marketplace	1.5	Dahlin et al. (2007)
La Milpa	Plaza B	1.2	Tourtellot et al. (2003)
Maax Na	West Plaza	3.2	King and Shaw (2007)
Mayapan	Open Area near Gate D	3.3	Bair et al. 2009
Palenque	Grupo Ach'	0.8	Edwin L. Barnhardt (2008, Personal Communication)
Piedras Negras	South Group	0.3	Houston et al. (2000)
Pueblito	Plaza E	1.8	LaPorte et al. 2007
Sayil	El Mirador Group	0.7	Wurtzburg (1991)
Seibal	North Group	2.2	Tourtellot 1988
Tikal	East Plaza	2.6	Jones (1996)
Trinidad	Plaza V	0.8	Moriarty (2004b)
Xunantunich	Lost Plaza	0.3	Keller (2007)

the single most significant challenge involves distinguishing exchanges of food in ceremonial activities, otherwise known as feasting, from exchanges of food in marketplaces. This is because the exchange of food, whether in feasting or marketing, was probably critical to sustaining large urban populations, especially when, as is commonly believed, a significant segment of it, starting with the elites, are nonfood producers. It would behoove us, then, to develop means of distinguishing between these food-related activities and the kinds of venues in which they were performed.

It is generally agreed that feasting was used as a very common tool for forming social alliances, fulfilling reciprocal obligations, creating social debt, collecting tribute, etc. (Hayden 2001:38). Moreover, redistribution activities are very often accompanied by feasting (Appadurai 1986:21). Feasts would have entailed large quantities of food and drink prepared and served, the entire process from beginning to end probably requiring perhaps several weeks to months (Jennings et al. 2005). Following the criteria reiterated many times in the Dietler and Hayden (2001) volume on archaeological and ethnographic perspectives on feasting, we define feasts as recurrent, ritualized communal exchange and consumption of food and/or drink in specially constructed spaces. Such specially constructed spaces would typically include the following: extraordinary amounts (relative to ordinary domestic or marketplace contexts) of such artifacts as large food-preparation and serving vessels and prestige items used in rituals (perhaps even ritual disposal such as termination rituals and burials), food-preparation facilities (e.g., kitchens, hearths, roasting pits, etc.), and large special food-disposal features (also see Table 2.1 in Hayden 2001:40). On the other hand, there are no sufficient conditions that positively identify a surface upon which feasting recurred, which is to say that there may be some evidence for it, but none is conclusive as there could be competing interpretations of the same data. This is why we turned to geochemical evidence.

The Dirt on Food

We began our inquiry by acknowledging that positive identification of marketplaces has almost everywhere been impeded by the counterintuitive fact that ancient markets leave few identifiable archaeological traces (Hirth 1998, 2000; Foias 2002) because artifacts were regularly swept up and most items and associated features tend to be highly perishable or ephemeral (although, as we have said, some marketplaces have arcades that closely resemble those in modern markets). We instead began to analyze soils on plaza surfaces for geochemical traces of food and other mineral residues, based on the pioneering research of Barba, Manzanilla, and their colleagues, who have demonstrated in a series of articles, that earthen and stucco floors in domestic compounds at Cobá and at Teotihuacán trapped chemical compounds derived from specific activities repeatedly performed in a given locale (Barba et al. 1987; Barba and Manzanilla 1987; Manzanilla 1987, 1996; Manzanilla and Barba 1990; Ortiz and Barba 1993).

Thus far, soil phosphorus (P) concentrations have been the most informative. As food and other organic materials are processed, consumed, and disposed, the P constituents released from the organic matter become readily fixed or adsorbed on the surface of soil particles where they remain for centuries (Barba and Ortiz 1992; Parnell 2001; Parnell et al. 2001, 2002a, 2002b). Modern-day activities that are also associated with high soil P concentrations include gardening, waste disposal, and sweeping that pushes organic material to the peripheries of more concentrated activity areas. Thus, extraordinarily high P concentrations in soils and on floors can be associated with prehistoric food preparation, consumption, storage, and disposal (Barba and Ortiz 1992; Fernandez et al. 2005). Combined with other lines of evidence, other analyses have helped identify areas for sleeping quarters, and spaces for ritual and funerary activities (see also Barba et al. 1995; Pierrebourg 1999). Soil P analysis has also been used at Piedras Negras as a prospection tool to locate middens (Terry et al. 2000; Wells et al. 2000). Similarly, Parnell et al. (2001) reported a significant positive correlation between sherd density in test pits and surface soil P concentrations. At Cerén, El Salvador Parnell et al. (2002b) found the highest P concentrations (>50 mg/kg) in middens, while the lowest P concentrations were discovered in the samples from pathways (about 5 mg/kg), where constant foot traffic and sweeping prevented P accumulation. Thus, well-used pathways and heavily used activity areas tend to be low in extractable P (as well as trace elements, and sometimes exchangeable cations).

Methods for analysis of other activity-diagnostic chemicals are providing other clues to ancient space-use patterns. Particular interest in metal analysis has grown within the last decade, focusing on copper (Cu), iron (Fe), mercury (Hg), manganese (Mn), lead (Pb), and zinc (Zn) (Bintliff et al. 1990; Entwistle et al. 1998; Lewis et al. 1993). Metals are readily adsorbed or precipitated on the mineral surfaces of calcareous soils and stuccos commonly found at Maya archaeological sites. Many of the metallic ions remain stable in soils for long periods in the form of adsorbed and precipitated ions on clay surfaces, and as insoluble oxides, sulfates, or carbonates (Lindsay 1979; see also Wells et al. 2000). Many of the pigments used by the Prehispanic Maya contained metallic bases, such as hematite and cinnabar (Goffer 1980:167–173; see also Vázquez Negrete and Velázquez (1996a, 1996b); thus, elevated values of trace metals in soils may help to identify areas where pigments were processed or applied and where craft workshops were located. Trace metal extraction and inductively coupled plasma mass spectrometry (ICP/MS) or atomic emission spectroscopy (AES) analyses of soil and floor samples at Cancuén, Piedras Negras, and Aguateca, Guatemala, provided evidence of workshop and painting activities (Cook et al. 2006; Parnell et al. 2002b; Terry et al. 2004; Wells et al. 2000). Cook et al. (2006) studied a whole suite of elements, including rare-earth elements, but these and other elements and organic contributions to soils require further exploration. For example, meat and blood are high in Fe and lipids, beans are high in Mn, and other plants are high in Zn, and the contributions made by insects and other organisms in the detritus chain are totally unknown. But none of these suites of elements and compounds exists in a vacuum, and we need to design sampling strategies that consider and minimize the natural processes of enrichment such as differences in parent materials and variations in the soil profile by geomorphic agents.

The above studies of chemical residues in the soils and stucco floors suggest that geochemical data can distinguish patterns of heavy-use areas such as food preparation, consumption, and disposal from relatively low-use areas as well as high-traffic areas that were deliberately kept clean. Geochemical analysis has been used mostly in household contexts, however, and that can tell us very little about how those goods that left residues in the soils were obtained, whether made by self-sufficient households or through reciprocity, market exchange or redistribution. Therefore, if some of these items entered domestic and corporate groups from external sources via some sort of exchange mechanism, the most likely place to identify them would not be inside these contexts but in external environments in which goods of all kinds were routinely accumulated for the purposes of exchange, i.e., Maya marketplaces and arenas for redistribution. Bearing that in mind, we applied geochemical prospecting to loci within sites that might have served as marketplaces or venues for feasting and other ritual activities. Although we have analyzed soils for several elements (e.g., zinc, iron, mercury, copper, manganese, etc.), we will only present the phosphorus data here.

Several methods of phosphorus extraction and total element digestion have been used in geochemical studies of ancient activity areas. Dilute acid extraction procedures remove a portion of the phosphorus adsorbed on the surfaces of soil particles (e.g., Mehlich 1978; Terry et al. 2000; Middleton and Price 1996). The concentrations of phosphorus extracted vary greatly with the type and strength of the acid. In each extraction procedure, the portion of phosphorus analyzed is affected by soil acidity or alkalinity, organic matter percentage, clay content and type, and other physical and chemical properties of the soil. For these reasons, the magnitude of extracted P concentration differs with the procedure and with soil type and geographic origin. Terry et al (2000) subjected soils of household middens, patios, and pathways from Piedras Negras, Guatemala, to three different extraction procedures and one digestion procedure. While all four procedures identified high soil phosphorus levels in household middens and low phosphorus concentrations in patio and pathway soils, the Mehlich II dilute acid extraction provided the greatest percentage difference in concentration between background samples and midden samples.

Geochemical Investigations in a Modern Maya Marketplace

We studied one of the few remaining unpaved modern Maya markets in Antigua in highland Guatemala to determine whether geochemical prospecting could help in identifying surfaces where ancient Maya marketplace activities occurred. We mapped market stalls and different use areas (Fig. 3) and conducted interviews with vendors, customers, and others (Dahlin et al. 2007) and derived five more or less discrete use areas: (1) food preparation (for soccer events) and dry goods (on market days), (2) vegetable and fruit sales, (3) food service (small eateries for market

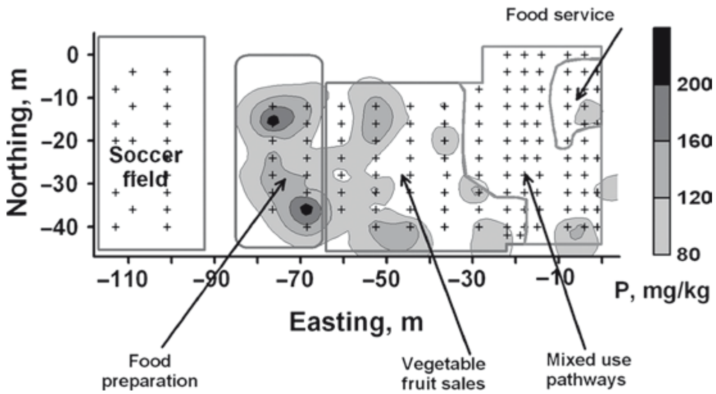

Fig. 3 Marketplace in Antigua

patrons), (4) pathways and mixed use (vegetables and dry goods), and (5) soccer field. This layout is not dissimilar from the formal arrangement of stalls vending featherwork, pottery or food, etc. that Feldman (1978) detailed in the Aztec market at Tlatelolco. Samples with the highest levels of Mehlich II extractable P were in the food preparation area, with an average of 137.4 mg/kg, or four times that on the pathways and mixed-use areas and almost 6.5 times that on the soccer field. Average P values in the vegetable and fruit sales area were 77.5 mg/kg, or nearly four times that on the pathways and mixed-use areas and 3.6 times that on the soccer field. These elevated soil P concentrations resulted from spills, discarded goods, fruit and vegetables and frequent incorporation of these materials into the soil matrix. Average P values in the food service area were 55.6 mg/kg, or 2.4 times that on the pathways and mixed-use areas and 2.6 times that on the soccer field. Elevated P concentrations in the food service area likely resulted from spilled beverages and small food crumbs. These high P values associated with food preparation, consumption, and exchange activities – from 2.4 to 6.5 times that of nonfood areas – support our hypothesis that elevated levels of P may be recognized and therefore possibly associated with ancient food preparation, consumption, and disposal. Moreover, these high concentrations appear as rough bands paralleling the rows of stalls; the walkways between the stalls, while still being elevated, have lesser amounts of P, suggesting that pathways between rows of market stalls would also be observable. Because we can think of no other food-related activity that would produce such a pattern in public places, we hypothesized that this regular alternating high/low P patterning would constitute a geochemical signature of ancient marketplaces.

Geochemical Investigations at Chunchucmil and La Trinidad

Two archaeological sites that had a high potential for having marketplaces were selected to develop the application of this technique. Chunchucmil and Trinidad functioned as rare specimens of Classic Maya specialized trade centers (Dahlin and

Ardren 2002; Dahlin 2005; Moriarty 2007). This characterization is consistent with a wealth of contextual, spatial configuration, and distributional evidence (see Hirth 1998). Studies were made of several plaza soils at each site to see which, if any of the resultant geochemical patterns on them, might replicate those found at the Antigua marketplace.

Chunchucmil: During the Early Classic Period (ca. AD 400–600), Chunchucmil (Fig. 4) was inhabited by a large urban population of 34,000–42,500 (Bond-Freeman and Mansell 2006; Magnoni 2008a; Hutson et al. 2008b). It is situated in one of the Maya lowland's most marginal agricultural landscapes and clearly would have required bulk imports of food supplements (Vlcek et al. 1978; Beach 1998; Dahlin et al. 2005; Sweetwood et al. N.D.). In all likelihood, some subsistence goods came from the Puuc, 30 km to the east, and some were probably transported from its likely port facility at Punta Canbalam on the Gulf Coast Maritime Trade Route via canals through the intervening wetlands (Dahlin et al. 1998). Long-distance trade drove the economy, and its primary export was salt from the nearby Celestún Salinas (Andrews 1983). Other income was generated by servicing long-distance traders and facilitating intraregional trade (Dahlin and Ardren 2002). Recent excavations of residential units, which provided evidence for craft specialization (Hutson 2004; Hutson et al. 2008a), and high levels of consumption of imported goods (e.g., obsidian and jade) evenly distributed in households of all social ranks (Dahlin in press; Dahlin and Ardren 2002; Mazeau 2001; Mazeau and Forde 2003) support this interpretation.

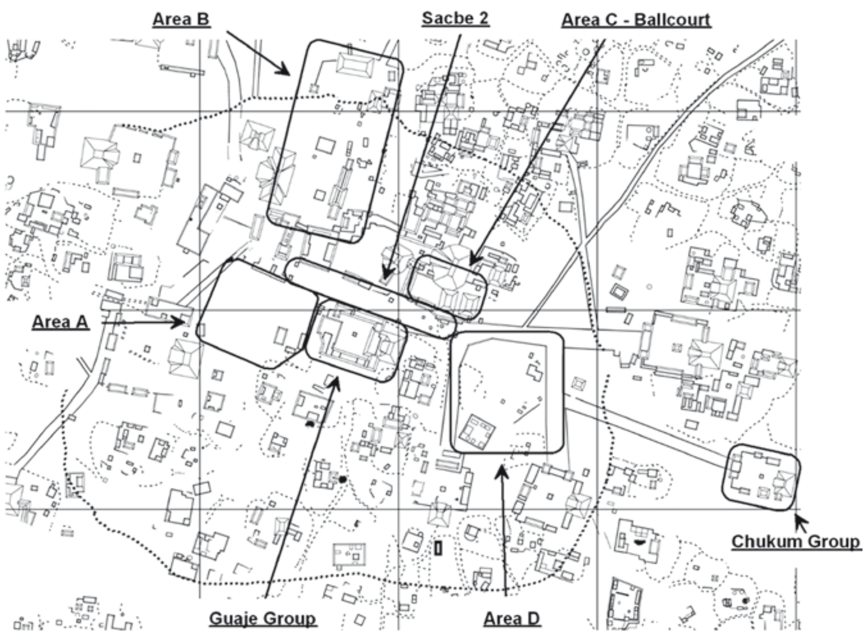

Fig. 4 Map of Central Chunchucmil with tested areas

We chemically analyzed soil samples from various parts of the site (e.g., kitchen areas and middens in houselots, streets, rural farmland, etc.) to develop background values for different kinds of surfaces and to define probable activity areas. Mehlich II extractable P values in the suite of background samples in rural areas subject to farming and ranching today were ca. 4.9 mg/kg (Dahlin et al. 2007; Sweetwood 2008). P values in an undisturbed area of Sacbe 2 (Fig. 5) had enriched (*boxluum*) soils (average P was 15.6 mg/kg) over a surface paved with *chich* and *sascab* (small stones and gravel respectively) not unlike that found in two paved public plazas (Areas B and D, see below); the central portion of Sacbe 2 was disturbed by Late/Terminal Classic squatter settlements. P values in *solares* (houselots) were ca. 3.7–6.0 mg/kg, while those in household middens, kitchens, and food preparation areas were ca. 60–150 mg/kg (Magnoni 2008b; Hutson et al. 2007). These and other P values can be found in Table 2.

Area A (see Fig. 4) is irregularly shaped (ca. 0.48 ha) and has mildly broken terrain, very thin soils, large bedrock exposures, and a large quarry; the surface was not paved nor apparently leveled. It is entered by Sacbe 2 and bounded on the west by another (unnamed) sacbe. It includes four or five small structures of unknown date. No large structures or architectural groups face onto it. It is transected by a historic *albarrada* (dry-laid stone wall) separating the *ejido* (communal) lands of Chunchucmil and Kochol pueblos (probably built in the late nineteenth or twentieth century) and the remnants of a farm road that is only visible on aerial photos. We suspect that some buildings on its fringes have been further disturbed by quarrying stone to build the nearby modern Chunchucmil/Kochol road to the south and/or the Chunchucmil hacienda a couple of kilometers to the west. A suite of soil samples was collected from Area A but have not been analyzed yet, and we did not find it worthwhile test excavating here, given the several kinds of disturbances, the thin soils, and few artifacts on the surface (all highly weathered and without diagnostics traits). There are several such unimproved "vacant" areas in Chunchucmil's site center.

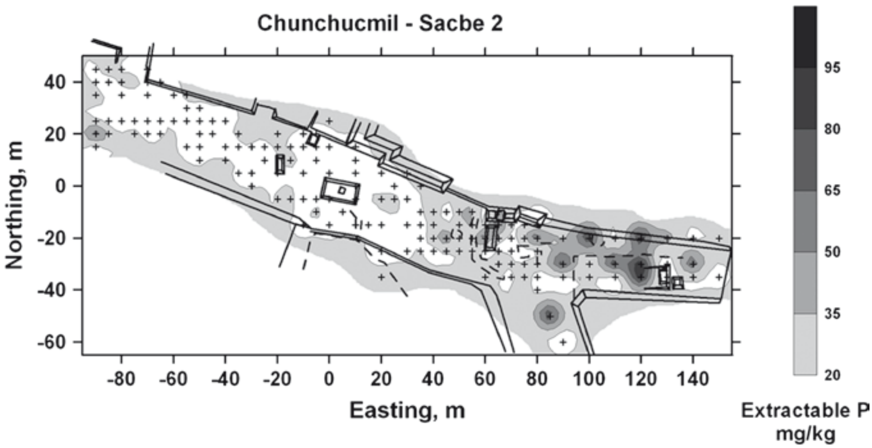

Fig. 5 Isopleths of P values on Sacbe 2

Table 2 Architectural and extractable phosphorus data at Chunchucmil

Location	Area (ha)	Small structures	P range (mg/kg)	P average (mg/kg)	Location highest P	P patterning
Controls soils		No	3.7–6.0	4.9		
Kitchens/food prep						
Kitchens/food prep middens					Rear	
Sacbe 2 eastern end	0.7	Yes	6.7–96.5	22.4	Behind str.	Edges and near str.
Sacbe 2 western end	0.4	No	6.7–57.9	15.6	Off edge	Along edges
Area B	3.6	Yes	4.0–45.5	8.7	Str. corners	Plaza edges
Area C & Ballcourt	0.08	No	7.0–162.9	20.2	Plaza corner	One corner
Area D (market)	1.5	Yes	7.7–272	56.6	Central plaza	Rectangular
Lool Group	0.41	Yes	6.7–150.7	20.5	South edge of patio	
Guaje Group	0.17	Yes	2.9–24.1	11.3	Corners	At patio edges
Chukum Group	0.28	Yes	4.0–47.1	15.8	Corners	At patio edges

Dahlin (2005) tentatively interpreted these rather mundane-looking open areas as "commons" for neighborhood or barrio gatherings. However, a glance at Figure 6 shows that they are all adjacent to elite quadrangle groups, which we will describe below, but it could hardly be otherwise given the dense packing in the site center. It is possible that they were venues for some ceremonialism for the benefit of a larger congregation somehow associated with the quadrangle groups, but, as we will see, they were of a very different nature and much less inclusive than that performed within the restricted spaces of the quadrangle groups (Fig. 6). Some ritual activities no doubt occurred in these "commons," but regrettably we are not in a position to say what they involved, other than to say that the general appearance of their thin, partial soil covers relative to other areas suggests that they were never encriched by food.

Areas B and D could roughly be described as another class of public spaces in the site center. They are centrally located, but have prepared surfaces of *chich* and *sascab*, and are associated with intrasite *sacbeob* (formal paved road) and/or *callejuelas* (streets). However, they are otherwise separated from adjacent private residences by *albarradas* and/or the backs or sides of buildings. Area B (Fig. 7), a large (ca. 3.6 ha), irregularly shaped area immediately to the west of the Chakah Group, has a 50 m long by 10–12 m high acropolis-like structure and a scattering of smaller structures of unknown date in the center. Like Area A, Area B lacks conspicuously

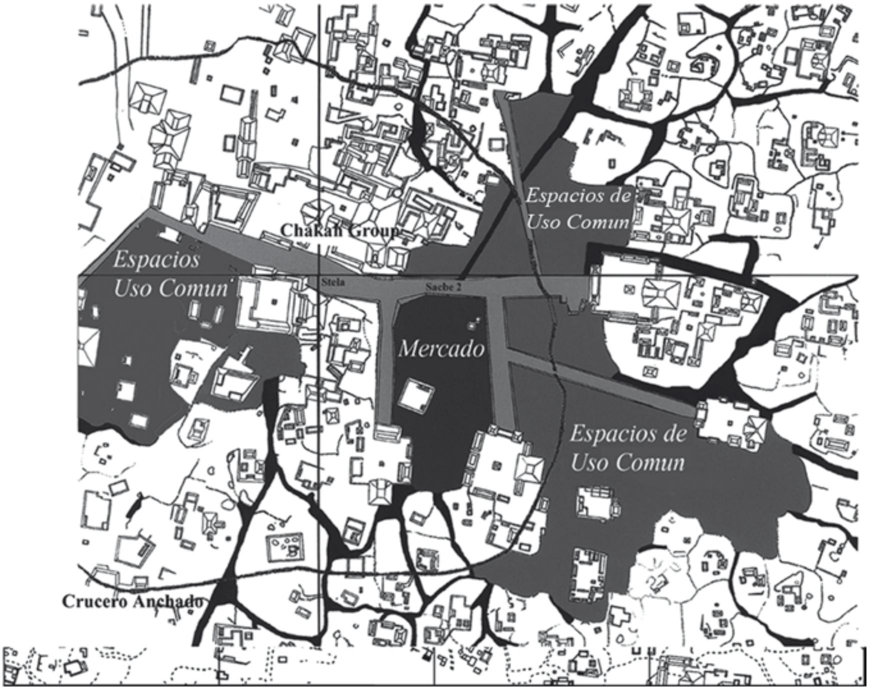

Fig. 6 Map of Central Chunchucmil showing "Commons" areas

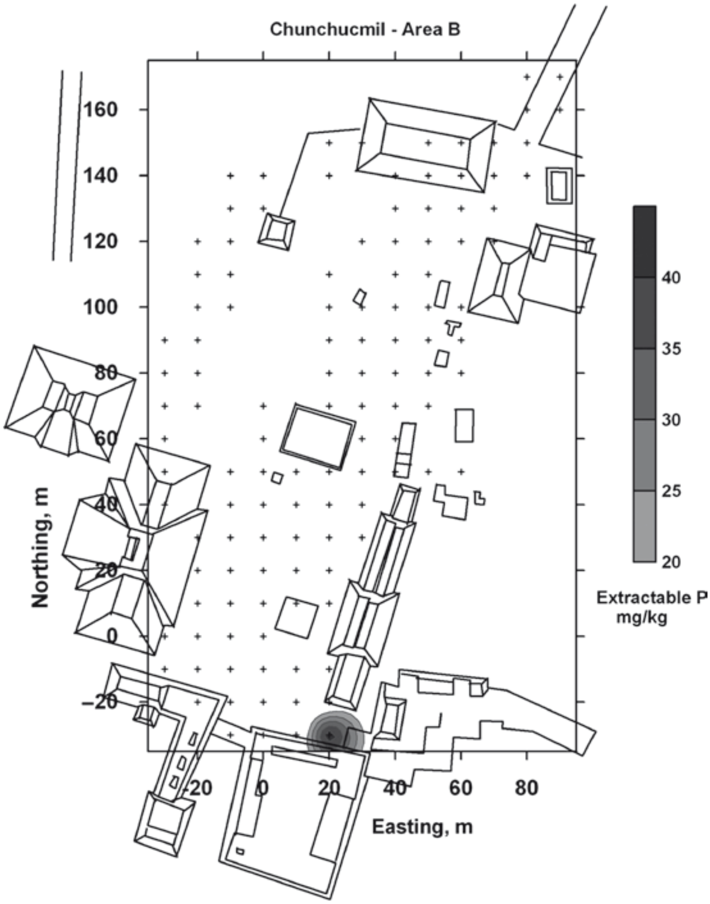

Fig. 7 Isopleths of P values in area B

large buildings facing into it. It, too, shows some signs of disturbance by the same modern farm road and *albarrada* separating two *planteles* (cultivated field or pasture). The presence of the acropolis-like structure in its center makes it the only candidate for public space that might have hosted community-wide ceremonialism, but the disturbances make this attribution somewhat uncertain.

Average extractable P values in Area B were near-background, ca. 8.7 mg/kg, and ranged up to 15 mg/kg except for one small area of higher P values (up to 45.5 mg/kg) behind a large platform belonging to the Chakah Group; in fact, several metates were found on this platform and may have been the main (or one of) the kitchens providing food to the residents of the Chakah Group. Excavations were not performed here, either, so it is not known if the midden contained large food-preparation and serving vessels and prestige items used in rituals, but, given its context, we would not be surprised if it did. However, the most likely explanation of this P enrichment tucked away in a corner of the plaza is that it resulted from its use as one of Chakah's trash dumps rather than as food preparation, consumption, or exchange activities that occurred on the plaza itself. Thus, the extremely low P values in Area B suggest that the activities that occurred here did not involve a significant amount of food, whether feasting or marketing.

Area D (Fig. 8) is a 1.5-ha artificially leveled plaza with a public well, a rare small reservoir and a freestanding 4-m-high shrine – all of which are rare at Chunchucmil – and a Late/Terminal Classic residential platform superimposed on the western edge of the plaza; this platform is one of 20 such platforms occupied by a small remnant population after the site had collapsed (ca. 700 AD, see Magnoni 2008b). Ceremonial or other architecture around the plaza perimeter is absent, but a unique network of streets and six *sacbeob* provided public access. Several 2 × 2 m excavation units showed the plaza itself consists of a thin (ca. 20–50 cm) prepared surface dating (ceramically) to the Late Preclassic Period. Several rows of rock alignments and low rock piles were found peaking above ground surface, and others were found in two large superficial excavations totaling ca. 385 m^2. These deeper test excavations showed that they were not parts of retaining walls peaking above the plaza floor; such retaining walls holding plaza fill are often found elsewhere. Instead, they were placed directly onto the plaza's floor and were quite obviously the foundations for small ephemeral structures. The roughly parallel rows are aligned with one of the *sacbeob* (Sacbe 3) that enters the plaza after crossing Sacbe 5 on the east. The small sizes of these structure foundations (~3–5 m on a side) and their orderly arrangement preclude their being a haphazard

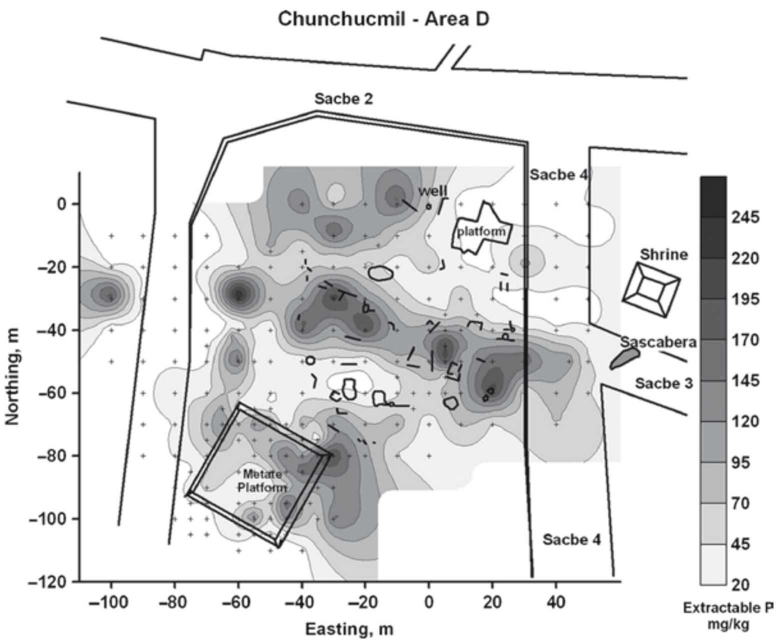

Fig. 8 Isopleths of P values in area D, or the marketplace

collection of domestic houses built over time. Based on their density in our two superficial excavations, we estimate that the plaza could have held as many as 590 such structures.

Moreover, the surficial excavations produced few artifacts, all of them highly weathered and dating to the Late Preclassic or Early Classic periods except for some Late Classic sherds on top of and around the base of the later platform. No large food-preparation and serving vessels and prestige items used in rituals were recovered. The only noteworthy artifacts were two clusters of heavily worn obsidian blade fragments; according to project lithicist Daniel Mazeau (PC 2008), they appear to be the result of third-stage reduction of cutting implements, or the end processing of some kind of good requiring a sharp implement.

Average extractable P levels in Area D are the highest recorded, averaging 56.6 mg/kg (Table 2). However, they ranged from 7.7 mg/kg, which was slightly higher than the background values for the rest of the site, to as much as 272 mg/kg, or more than 35 times greater than the lowest values within the plaza and 55.5 times that of the background soils (Dahlin 2003; Jensen et al. 2003; Dahlin et al. 2007). The linear isopleth patterns of P concentrations conform with the lines of small rock alignments, and therefore look very much like those in the modern marketplace in Antigua (see Fig. 3). In fact, this isopleth is currently intersected by the modern farm road, suggesting this alignment of elevated P concentrations was probably longer.

We sampled a number of plazas and patios in a number of residential groups, only two of which will be reported here. The Guaje and Chukum groups (Figs. 9 and 10) belong to a family of structural groups we call "quadrangle groups." They only loosely resemble what elsewhere is normally described as "focal architecture" in a site center insofar as they contain the largest and most conspicuous buildings with

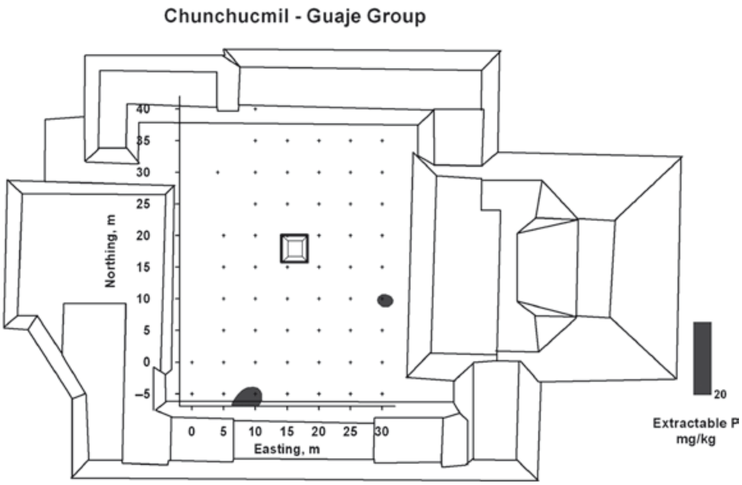

Fig. 9 Isopleths of P values in the patio of Guaje Group

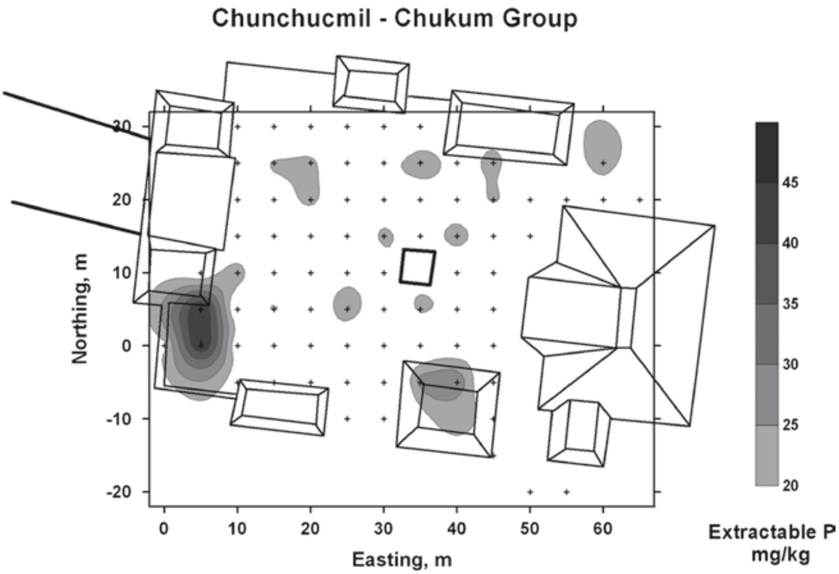

Fig. 10 Isopleths of P values in the patio of the Chukum Group

pyramids ranging from 7 to 17.5 m high. Although they stand out against the skyline, they were hardly located in what could be called public spaces here or at other sites.

Quadrangle group structures are arranged in a highly formulaic configuration enclosing a rectangular patio. Range structures are found on three sides and a pyramid on the remaining side. Another defining characteristic is the presence of a small (<1 m high) obviously ritual platform we call a "performance platform" in front of the pyramid's steps. Patio sizes range from 400 to 6,300 m^2, with an average 2,000 m^2. Some quadrangle patios also contain banner stones, probably to identify particular lineages, and large worked stones in the size range and general shapes of plain stelae and altars; none of them, however, is in its original position, so it is difficult to identify them as such. These groups are often connected by *sacbeob*. We have so far positively identified 15 quadrangle groups, but there might be more as they tend to grade into patio groups that are typical of elite residences at other lowland Maya sites. Most ($n + 11$) of them cluster in or near the center; others are found as far away as 2 km.

Despite the fact that Chunchucmil's quadrangle groups contain the only large structures at the site (the only exception being the linear acropolis-like structure in Area B), they emit an aura of physical and visual privacy. First, these small patios could have hosted only a small fraction of Chunchucmil's population for public ritual observances. Second, movement into the patios was carefully controlled by openings between buildings or elevated terrace edges of a meter or more in height, despite the fact that the patio area is often approached by a *sacbe*. Third, clear visual access to the performance platform on the patio floor and the base and stairs of the large pyramid where some rituals were probably performed is restricted by the very buildings that flank the patios. Fourth, quadrangle groups tend to be circumscribed by *albarradas*-like ordinary residence groups at the site. And, fifth, they have all of the observable accoutrements of domesticity, including kitchens, metates, food preparation vessels, and other work areas behind or to the side of the patio arrangement, and some even within it (see Fig. 4). Quadrangle groups, then, seem to have been the headquarters and living spaces of some sort of elite corporate group or "great house" (also see Lucero 2007). Dahlin (2005) has labeled the patio spaces "parochial," or "by invitation only." Almost by default, if feasting occurred at Chunchucmil, at least some would have occurred on the enclosed parochial spaces in its quadrangle groups. For example, one can easily imagine that these plazas were the locus of redistribution rituals designed to integrate resident with nonresident lineage mates, as well as hosting competitive feasting among the great houses (Dahlin and Ardren 2002). There is also reason to think that feasting rituals were used here to announce and celebrate commercial agreements as suggested by Cogolludo's statement "In sales and contracts there is no written agreement, nor do they have promises of payment for security, but the contract was valid when the contracting persons drank together publicly. This was in particular the custom in the sale of slaves or hollows containing the cacao (plantations)." (cited in Tozzer 1941:96, footnote 425).

The Guaje Group, the second largest quadrangle group, is located in the very heart of the city, and has the second highest pyramid (13 m) and a larger than average plaza area (1.7 ha). Although it is adjacent to Sacbe 2, it is entered from Area A. The Chukum Group is one of the smaller quadrangle groups, with a patio about the same size as that at the Guaje Group, but it has the fewest ancillary structures of any of the quadrangle groups. The Chukum Group is adjacent to another large "commons" to the south (see Fig. 4).

Average P values in the Guaje Group patio are generally very low, 11.3 mg/kg, and range from 2.9 to 24.1 mg/kg (Table 2). Elevated P values were found at the plaza edges with one concentration at the south edge reaching 24.1 mg/kg. P values in the Chukum Group patio are also low, averaging 15.8 mg/kg, and range from 4.0 to 47.1 mg/kg. The concentrations are spotty and not very high except for one in the SW corner. The performance platform seems also to be associated with slightly elevated P. In both of these elite residences, the highest values are generally low and found at the corners of buildings, the edges of the patios, and in association with performance platforms. This patterning was almost certainly generated by food preparation and disposal consistent with feasting activities.

Also sampled were the only ballcourt in the site center and an 800-m^2 semienclosed plaza (Area C) behind it but with access to it (Fig. 11). Fox (1996) plausibly suggests that feasts accompanied the ball game, and Area C seemed a likely locus for this activity. The ballcourt and Area C constitute an appendage of the Chakah Group, the largest quadrangle group at the site and the primary candidate to have served as something akin to a civic center. It is not entirely clear, however, how public Area C and the ballcourt were, as there seems to have been a wall or low narrow building between it and Sacbe 2 that might have obstructed the view, or at least held back passersby from entering the area of the ballcourt; thus, it is possible

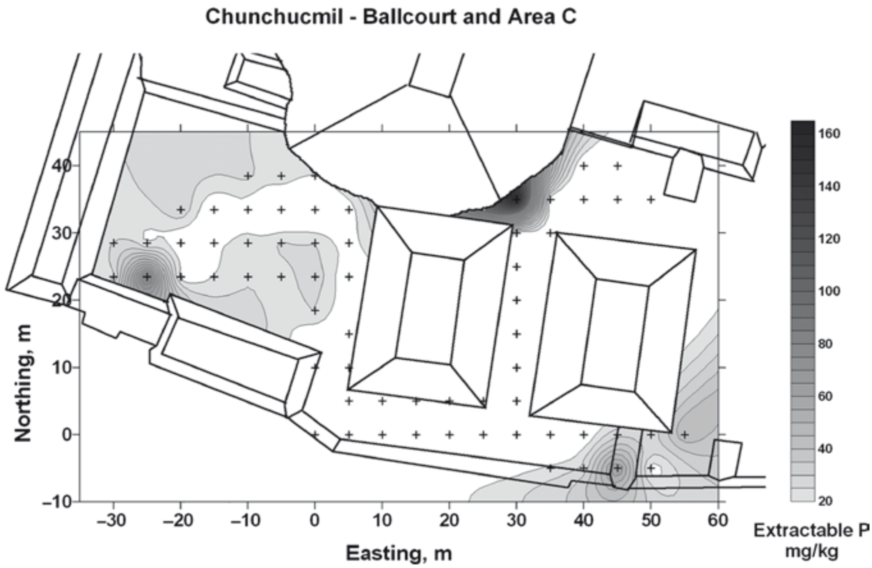

Fig. 11 Isopleths of P values in area C and the Ballcourt

that the ballcourt could not be seen or entered from Sacbe 2. On the west is another range structure (ca. 2 m high) that juts out from the corner of the secondary pyramid and takes a turn to partially isolate the plaza from Sacbe 2 immediately to the south. On the other hand, this plaza is set apart from the rest of the Chakah Group by a short (~3–4 m high) range structure spanning the distance between the largest pyramid at the site (17.5 m high) and the secondary pyramid, thus obscuring the view from their primary patios. The east is partially bounded by the back of the western ballcourt structure.

Extractable P values in the playing field of the ballcourt were low, which, as expected, would have been swept clean. One hotspot (162.9 mg/kg) is wedged between the NW corner of the western bank and endzone of the ballcourt and the base of the adjacent large pyramid; it is almost certainly a refuse deposit. Average P values (<20.2 mg/kg) in Area C are slightly higher than those on the Guaje and Chukum patios (11.3 and 15.8 mg/kg). The slightly elevated P next to the back (SE) corner of the eastern bank of the ballcourt is probably associated with the postabandonment squatter settlements on the central segment of Sacbe 2. If feasting did normally accompany the ball game, we feel that an interpretation of feasting is warranted in the patio area of Area C.

In sum, the patterning of P concentrations in parochial spaces (including perhaps Area C) at Chunchucmil is consistent with feasting. Both their patterning and the P values differ sharply from the extraordinarily high values and associated patterning in Area D, which replicate those of a modern marketplace. It is important to emphasize the distributions of P, suggesting that feastings are confined to parochial spaces thought to have been elite residential compounds and the headquarters of well-defined corporate groups. Finally, the generally very low P values (average 8 mg/kg and generally <15 mg/kg) in Plaza B – the only candidate as a venue for public ceremonialism – suggest that neither market nor feasting activities occurred regularly there.

Trinidad de Nosotros

Our second study site, Trinidad de Nosotros (or Sik'u' in Itzaj Maya), is a small to medium sized community (ca. 1 km^2) located on the north shore of Lake Petén Itzá in Guatemala (see Fig. 1). Trinidad is situated near the east–west midpoint of the lake, at the base of a path of least resistance through the rolling topography to the north, and one of the best natural portages on the lake. This setting made it a logical way station and transshipment point for canoe trade traversing the central Petén lakes.

Recent investigations have also delineated extensive harbor facilities, including a 70-m-long breakwater, a 40 × 20 m loading platform directly adjacent to the lake, as well as a possible dock (Moriarty 2007) (Fig. 12). Trinidad's zenith as a small port and trading center occurred during the Late Classic period (ca. AD 550–850), when the nearby center of Motul de San José emerged as a regional political capital (Foias 2003). During this time, Trinidad's residents enjoyed a degree of access to exotic imports second only to the royal residents of central Motul. Our evidence suggests a particularly high level of access to obsidian, and various indices (average blade widths, cutting-edge to mass ratios, core to blade ratios, and others) strongly support the proposition that Trinidad played a key role in the distribution of obsidian arriving via the lake (Moriarty et al. 2008). Other economic activities at Trinidad included extensive chert tool production (Lawton 2007) and fishing (Thornton and Emery 2007), with both goods likely distributed throughout the Motul area.

Trinidad's central position on the lake, easy access, and role as a port closely correspond to the crossroads model favored for pre-Columbian markets elsewhere in Mesoamerica (see Hirth 1998:453). The extent and organization of public plaza space at Trinidad also suggest this possibility. Trinidad's six plazas cover an area of more than 2 ha, a total more characteristic of major political centers (see Table 4 and Inomata 2006 Table 1), and well beyond the needs of Trinidad's Late Classic resident population which likely numbered no more than 750 (Moriarty et al. 2008).

Trinidad has two quite distinct kinds of plazas (Fig. 12). The combined mapping, excavation, and geochemical data are sufficient to distinguish in a general sense their separate functions. The central-most plaza complex (Plazas I–IV) surrounds a large Late Classic ballcourt, is bounded by small temples, range structures, and elite residences, and is accessible primarily by a formal staircase on the southern end. Plazas I–IV also have long sequences of plaster floor construction, and together form a coherent central precinct that likely served as the ceremonial heart of the settlement. On the other hand, Plaza V, the largest at Trinidad covering an area of ca. 0.75 ha, exhibits only limited evidence for a

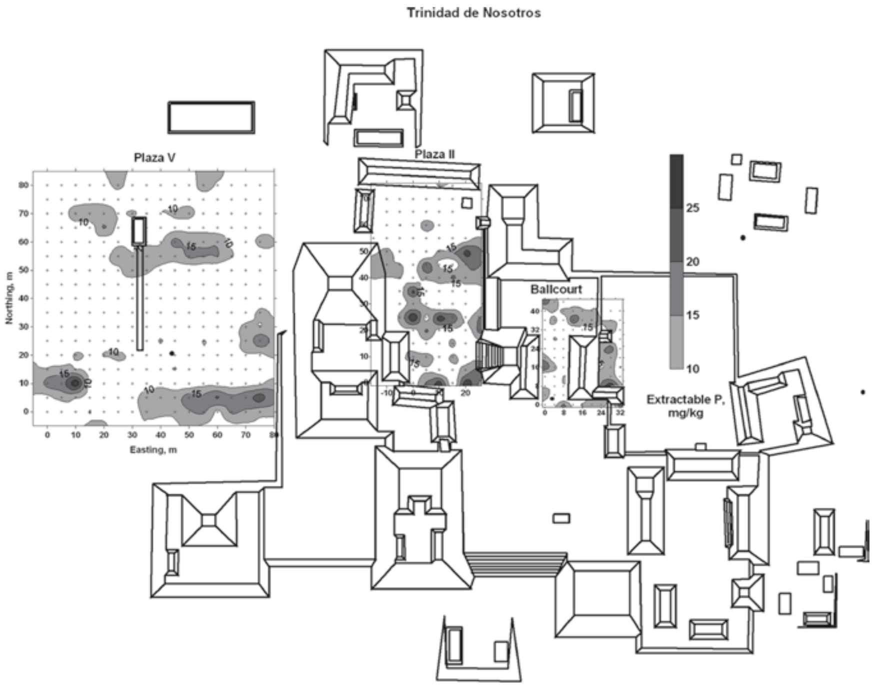

Fig. 12 Map of central Trinidad with isopleths of *P* values

ceremonial function. Plaza V is only delineated by low mounds on its western and northern edges. Temple complexes form the southern and eastern boundaries and generally face away from the plaza. Further, the plaza was only roughly leveled and shows little evidence for durable plaster flooring, suggesting relatively informal access to this plaza. This Plaza was nonetheless kept clear of major constructions throughout the Late Classic period.

We tested two areas: Plaza V and part of the central area, including the ballcourt, Plaza II and portions of Plazas III–IV. Soil sampling was on a 5-m grid. P values are much lower in the regional soils as a whole than around Chunchucmil. Baseline P values were ~6 mg/kg , and P concentrations near background levels were evident in the ballcourt playing alley and the northern third of Plaza II. Significant concentrations (>20 mg/kg) were found at the base of a temple staircase (Structure F-6), in the ballcourt's northern end zone (Plaza III), and on the western edge of Plaza IV just behind the ballcourt's eastern lateral structure (Str. F-2). The plaza edges were areas of high P, and corners of structures are likely locations for the preparation, consumption, or discard of perishable consumables. Strong confirmation for part of this interpretation came from middens identified east of the ballcourt and within areas of elevated P. Excavation of these deposits produced fragments from thousands of polychrome serving vessels, bones and shell from more than 33 faunal taxa, and hundreds of exotic artifacts including obsidian, greenstone, and pyrite. The ratio of serving to storage vessels, the diversity of faunal remains, and other indices provide definitive evidence for feasting and other ritual activities on a lavish scale (Moriarty and Foias 2007; Moriarty and Thornton 2007). Some idea of the festive and musical atmosphere that attended these activities is suggested by fragments from more than a dozen ceramic drums, several bone raspers, and more than 150 whistle figurines.

There is not much question that the location of these Trinidad deposits and their composition, as well as the P signature within nearby plazas, suggest the ballcourt and surrounding plazas were settings for feasting and other ritual activities involving food. In contrast, the areas of low *P*, particularly the ballcourt playing alley and the northern third of Plaza II, may have been utilized for other purposes. They may have been carefully cleaned following any food-related activities. It is worth noting that the P signatures identified within this portion of Trinidad appear remarkably similar to those identified in the main plaza and ballcourt at El Coyote and interpreted as resulting from a similar range of activities by Wells (2004:73–75, and see below).

Plaza V soils are generally low in P value (average 14.8 mg/kg), but have concentrations of extractable P (>10 mg/kg) in two large roughly rectangular zones aligned east–west across the northern and southern halves of the plaza. The largest of these zones measures some 40 × 8 m. Although the difference between the background and concentrations were slightly lower than those in the ballcourt area and considerably less than those seen in Chunchucmil's Area D, these concentrations also likely resulted from food preparation, consumption, spillage, and wastage.

Although, as with the Trinidad ballcourt area, the P concentrations in Plaza V may have resulted from feasting and other ritual activities, a number of factors suggest an alternate interpretation. First, as with Area D at Chunchucmil, these areas show little evidence for association with ceremonial architecture. Further, limited investigations revealed numerous low stone alignments within the plaza approximately correlating with the areas of elevated P. Although these features have not yet been cleared, they may constitute the remains of perishable structures, similar to those identified at Chunchucmil and interpreted as market stalls (Area D above). Finally, Midden assemblages located along the western boundary of Plaza V bear little resemblance to those in the ballcourt deposits, and contain a relatively even mix of serving and storage vessels, a composition most similar to standard domestic assemblages recovered elsewhere at Trinidad (Moriarty et al. 2008) (Table 3).

Table 3 The relationship of architectural features to extractable phosphorus data at Trinidad de Nosotros, Peten, Guatemala

Location	Area (ha)	Small structures	P range (mg/kg)	P average (mg/kg)	Location P max	P pattern
Plaza II	0.26	No	5.9–31.5	14.1	S end of plaza, corners of Str. F-6 staircase	Plaza edges, Str. corners; N end clear
Plaza III (N end zone of ballcourt)*	0.07	No	7.5–26.2	15.3	N of Str. F-2	Structure edges
Plaza IV*	0.26	No	9.9–29.8	15.9	E of Str. F-2	Structure edge

*Only certain portions of these plazas associated with the ballcourt were tested for P

Summary of the Antigua, Chunchucmil, and Trindad Data

The distribution of P concentrations on Chunchucmil's and Trinidad's plazas is very similar in many important respects. The distribution of P values in the middle of the quite large plazas without architectural complexes of clear ceremonial function (Chunchucmil's Area D and Trinidad's Plaza V) most resembles that at the modern marketplace at Antigua. Further, both appear to have rows of stone alignments that resemble the foundations for market stalls. In contrast, P values on plazas with clear ceremonial architecture and associated with ballcourts in a central precinct, most resemble food preparation and disposal areas where one would expect to find feasting activities. This interpretation is partially supported at Trinidad by an abundance of "high-end" artifacts directly interpretable as resulting from feasting in associated middens. These spaces look public in the case of Trinidad and parochial in the case of Chunchucmil.

KISS, or Keep It Simple Stupid

Based on all the archaeological, architectural, and geochemical evidence at Antigua, Chunchucmil, and Trinidad, we find the identification of separate feasting and marketplace areas convincing, but, unfortunately, it is probably not so simple to adhere to the KISS admonition at all sites. For example, it is a reasonable assumption that many plazas served multiple functions and P patterns can produce a confusing palimpsest. El Coyote in the lower Cacaulapa River Valley in NW Honduras is a case in point. El Coyote consists of ca. 250 structures, including 28 platforms (1–10 m high) arranged around six contiguous plazas. The central plaza measures 0.5 ha, is paved, and delimited by a number of monumental buildings (Wells 2004:69). Excavations yielded a low artifact density within the main plaza, but included a high fraction of large fragments of large plainware jars, groundstone implements, and a variety of multifunctional obsidian and chert tools. Most artifacts were clustered in the SE quadrant of the plaza and around a low platform in its center. Middens behind the component buildings contained remains associated with ritual activities and food production and consumption, as well as materials indicating the production of crafts utilizing lithics, bark beaters, mortars, and pestles. The El Coyote samples were subjected to the dilute HCl extraction procedure of Middleton and Price (1996; Wells 2004). This procedure extracts a greater portion of soil P than the Mehlich II procedure (Terry et al. 2000). Mean background (control) concentrations of HCl-extractable P were calculated to be 634 ± 486 mg/kg, while they were 5,156–11,107 mg/kg, or 8.1–17.5 times that in a midden, and >2,000 mg/kg, or >3.15 times the background "in the middle and at the southern end of the plaza, around the two small platforms, with the highest levels appearing in a linear pattern to the east of the southernmost platform" (Wells 2004:73). The latter area is associated with large bowls and jars, censers, and grinding and other food processing implements, so food preparation and consumption here is without question.

El Coyote differentials in P values (8.1–17.5 times) in the central plaza are in line with those in the parochial and obvious ritual contexts in the Guaje and Chukum groups at Chunchucmil (8.3–11.8 times background values respectively). Moreover, the highest El Coyote values are all associated with obvious midden and the small central platform that resembles the performance platforms in Chunchucmil's elite quadrangle groups. They do not reach anywhere near the differentials in Plaza D, or marketplace, at Chunchucmil (35–53 times the background values, but they are comfortably close to those on Plaza V at Trinidad (7.6 times background)). Thus, while the overall patterning in the central plaza at El Coyote favors primarily ritual activities, including feasting ceremonies, its use as a market is certainly not precluded.

Other specifically constructed "public" spaces that might otherwise meet the standards of feasting/redistribution interpretations are totally unsuited for other reasons. Let's start with the absurd – the wide expanse of interconnected paved surfaces at Coba that is known as *la gran nivelacion* (Fig. 13) (Navarrete et al. 1979; Graham and von Euw 1997). This extraordinarily large complex of large interconnected, open, leveled, and paved spaces between Sacbeob 3 and 8 measures 64 ha. It is laced with sacbeob, both intrasite and intersite; indeed, Sacbe 1 is 100 km long and runs all the way to Yaxunah. And, it has monumental architecture at its edges, including the Nohoch Mul, Chumuc Mul, and Coba Groups. Needless to say, *la gran nivelación* is a constructed public space of the first order.

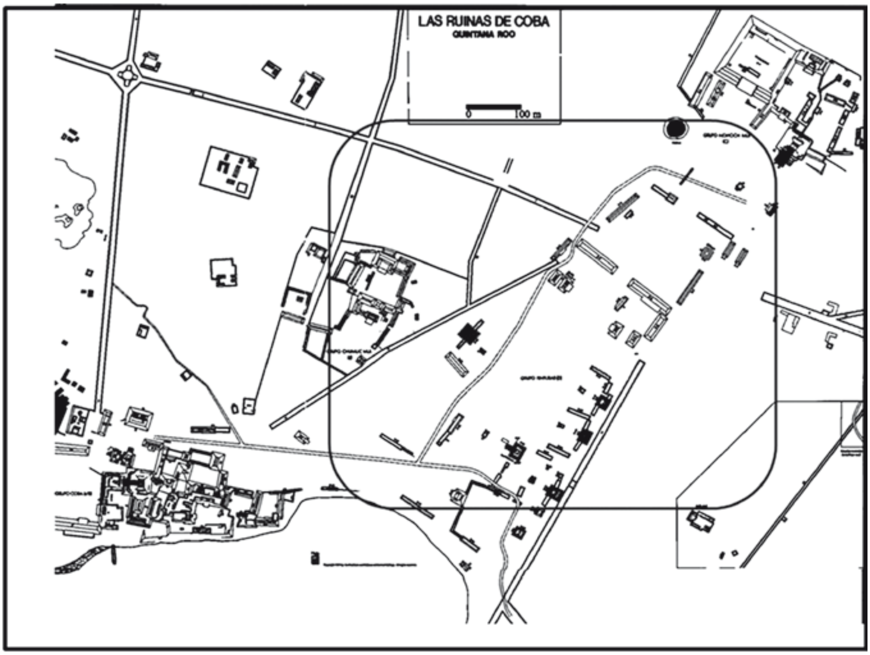

Fig. 13 La Gran Nivelación at Coba

Here are a few other public plazas (data is from, Wikipedia) to titillate the reader's imagination. Tiananmen Square, built during the Ming Dynasty in the first quarter of the fifteenth century, is said to be the largest known urban plaza in both the ancient and modern worlds. It measures only 44 ha. It was intended as a gathering place, to witness pronouncements of state, military parades, and, starting in the late nineteenth century, civic demonstrations. NBS nightly news, another impeccable source, reported on August 12, 2008 that up to 1 million people congregated on one occasion here in October 1949! The 5.7 ha Plaza de la Constitución, or Zocalo, in Mexico City is a miniscule by comparison. Built in the sixteenth century by the conquering Spanish over the Templo Mayor at the heart of the former Tenochtitlan, it was part of a planned city, with all major avenues oriented toward it. It is bordered by ornate government buildings and one of the world's largest cathedrals, although until 1812, when it was renovated to commemorate the Spanish constitution, it held a central market. It was rededicated to Mexico's Independence from Spain in 1843. It serves many functions as a gathering place for cultural, state, social, and sporting events (and increasingly public demonstrations). Red Square, built next to "the merchants' quarter" in 1493 in Moscow is a measly 23 ha. Red Square served first as Moscow's primary marketplace and only later for public ceremonies and proclamations. Major streets emanate out to become major highways outside the city. Closer to home, Columbus Circle in New York City, the largest public plaza in the United States, is a hopelessly embarrassing 1.37 ha. Fed by some of the city's major avenues and streets in a neighborhood of tenements, warehouses, and commerce, it grew in importance with the construction of stops on New York's elevated train system. The area quickly became gentrified and morphed into the city's locus of wealth and entertainment (theatres, museums, restaurants, hotels) after Columbus Circle was established in 1905 in what was known as the Merchants Gate in the SW corner of Central Park. At least it squeezed ahead of Trafalgar Square in size, ca. 1.2 ha. Traflagar Square is at the heart of London and the junction of its major transportation arteries and two stops on London's underground. It was built in 1820–1845 to commemorate the Battle of Trafalgar and England's national (mostly military) heroes. It serves as a symbol of England's greatness, a gathering place on festive occasions like New Years Eve, a tourist attraction, and a place to feed a wondrously large flock of pigeons (35,000 at its peak) until 2000 when it was finally declared a health hazard and the bird droppings a denigration of some of England's most famous symbols of power.

One may question the authority of these facts and figures, but they are probably correct within an order of magnitude. And, these modern analogies of "specially constructed spaces" strongly imply that equivalent Maya venues did not host feasts but public spectacles, such as military parades, pronouncements of state, etc. to promote *communitas*; such throngs perhaps numbered into tens of thousands of people at Maya sites (see Table 4 and Inomata 2006 Table 1 for congregational capacities of various large Maya plazas) and unimaginable amounts of food if feasting occurred on them. Nor would these public events generate enough phosphorus to be detectable, except perhaps for Trafalgar Square and its plague of pigeons. The analogous spaces are places where visitors or celebrants suck on the equivalent of popsicles and gnaw on corndogs or spring rolls. OK, so there were probably some venders of snack foods. The total volume of this kind of food, however, would contribute almost nothing to the permanent nutrition of the soils on these huge plazas. Neither should we expect to find large quantities of fine serving wares, unless the sponsors of such galactic scale events were far more profligate and ostentatious than we find plausible. Like the lady said, “size does matter.”

Maya feasting/redistribution events, therefore, probably occurred in more manageable spaces. The numbers of congregants, and volumes of food and drink, probably were staged in spaces that are variously referred to at epigonal sites as “courtyards,” “court complexes,” “palace groups,” etc. (Rice 2009; Lucero 2007; Delvendahl 2008:149–167; Lecount 2001); they are not unlike the parochial patios in the Guaje and Chukum groups at Chunchucmil. Such spaces could accommodate fewer participants and would not entail the preparation of unrealistic quantities of food, for as Jennings et al. plausibly assert, “Investments in feasts could be dauntingly high – taking up a sizable portion of a region’s resources, demanding many people’s labor over the course of several weeks, months, even years, and occasionally plunging individuals and communities into servitude and debt. The material remains of a three-day feast, therefore, might represent the fruition of a community’s three-year commitment to sponsoring a feast” (Jennings et al. 2005:275–276).

At smaller secondary and tertiary sites (e.g., El Coyote, Trinidad), and even small rural villages with smaller populations and shallower hierarchies, however, feasts probably were more inclusive and *did* occur on focal plazas (Wells 2004; Brown and Sheets 2000; Brown 2001). But, where do we draw the line? Certainly, it must be arbitrary, so with some trepidation we suggest that an upper logistic limit to the number of invited celebrants at ancient Maya feasts were perhaps for <2,000–3,000 people , and we would arbitrarily place an upper limit on the size of plazas at which feasts occurred to <3–4 ha. The ballgame-related feasting identified at Trinidad would certainly seem to fall within this tentative range, occurring as it did within a ceremonial precinct with circumambient space (Plazas I–IV) covering nearly a hectare and capable of holding several thousand individuals.

In either case – parochial spaces at especially large sites and public plazas at lesser sites – one could expect that, for the sake of convenience, the overwhelming majority of food preparation was close to kitchens and storage facilities at the edges of plazas to minimize hand-carrying large volumes of heavy and fragile cooking and serving vessels, other kitchen utensils, furniture (if any), food and drink, and firewood. Food was probably served in open air spaces in the center of these plazas (Brown 2001) and in association with performance platforms or other obvious ritual structures. These practices should be revealed in the patterning of P concentrations.

Marketplaces do not have the same size limitations. They could, and probably did, occur in spaces as small as (or perhaps even smaller than) 0.3 ha, but also on plazas too large to accommodate feasting, like some of the modern and historic squares mentioned above. Indeed, a brief exploration of *la gran nivelacion* at Coba in 2008 revealed a number of low rock alignments and rock piles not unlike those found in the marketplaces at Chunchucmil and Trinidad; these do not appear on any maps and unfortunately time did not permit our mapping of them either. Marketplaces could be expected to be associated with a different assemblage of building types – gallery structures and/or small, usually crude alignments of structures approximating the size of market stalls; one would think that the arrangement of market stalls in orderly rows would occur when the number of vendors reached some critical threshold to make vending, shopping, and regulation more efficient and convenient, perhaps ca. 0.75 ha. We would expect this pattern to show up to some extent in P isopleths even in the absence of structural alignments, i.e., where goods were displayed on blankets, mats, or tarpaulins.

Table 1 shows plazas at 15 sites that have tentatively been identified as marketplaces, judgments that were based primarily on contextual evidence. Plaza sizes range from 0.3 ha at two of Caracol's *sacbe* termini and the South Group at Piedras Negras up to 6 ha at Calakmul; average size is 1.6 ha. Certainly, associated architecture and accessibility matter in addition to size. Most lack substantial architecture within them or on their peripheries, but some like Chichen Itza, La Milpa, Piedras Negras, and Seibal do have them. The alignment of the linear structures of the North Plaza at Calakmul (Fig. 14), for example, is reminiscent of modern markets as well as the arcades found on Tikal's East Plaza and at Pueblito's Plaza E (Jones 1996; LaPorte and Chocón 2007). The "galleries" or "arcades" at these latter sites are in a rectangular arrangement. Some have rock alignments: Chichen Itza, Chunchucmil, Sayil, and Trinidad. All of them are accessible by *sacbeob* or other transportation networks, and all but Trinidad and Mayapan (Marilyn Masson PC 2008) have paved surfaces. Most are centrally located. Caracol's "peripheral markets" are the sole known exceptions, but here, too, *sacbe* surfaces in its epicenter have rock alignments reminiscent of market stalls (Arlen Chase PC 2008); what helps this peripheral marketplace interpretation is, of course, their connectedness with the site center via Caracol's network of *sacbeob*, which reveals a heavy administrative hand. However, no one should be surprised if peripheral markets are found at other sites, many of which will probably turn out to be more autonomous (e.g., Fry 1980). It will be interesting to see what the geochemical data say about these plazas.

Table 4 Areas of some of the larger central plazas in the Maya Lowlands with estimates of their capacities to hold celebrants (using formulae from Inomata (2006)

Site	Plaza	Area (m)	Capacity (1 m^2/person)	Capacity (3.6 m^2/person)
Coba	*la gran nivelacion*	640,000	640,000	177,778
Calakmul	Central Plaza	112,000	112,000	31,111
Chichen Itza	Plaza Mayor	86,000	86,000	23.889
Dzibilchaltun	Central Plaza	19,000	19,000	5,278
Copan	Great Plaza	12,747	12,747	3,541
Aguateca	MainPlaza	11,456	11,456	3,182
Tikal	Great Plaza	8,506	8,506	2,363

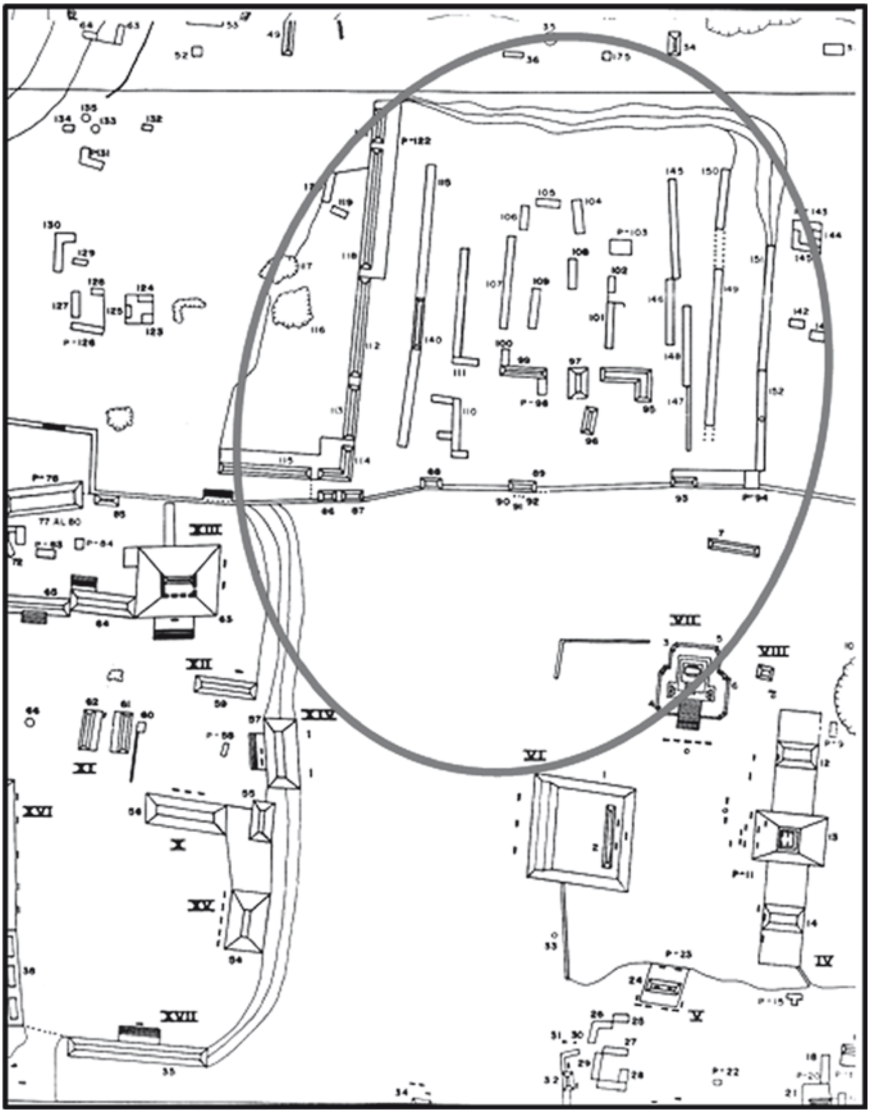

Fig. 14 The North Plaza at Calakmul

Conclusions

Based on the results of our geochemical prospecting at Antigua, Chunchucmil, and Trinidad, we are prepared to say that at least some Maya practiced a market economy; that extraordinarily high P values indicate that food staples that sustained Maya urban sites (at least in part) were vended in marketplaces; that marketplaces can be positively identified by the patterning of P isopleths; that this patterning is quite distinct from that resulting from feasting/redistribution; and that marketing could have occurred at large public plazas at large sites (probably in addition to peripheral markets) while feasting/redistribution occurred in parochial spaces, but both perhaps occurring in focal plazas at smaller sites.

Final Thoughts

Smith (2003) and McIntosh and McIntosh (2003) have shown that in Southeast Asia and Africa respectively even prestate societies had market economies, so on the face of it, cross-cultural comparison would qualify market exchange among the ancient Maya as a possibility. Moreover, the late Barry Isaac once quipped, "It is sophomoric to argue whether [archaic states] had marketplace exchange or governmental redistribution; they most assuredly had *both*. The proper question concerns the relative balance between these two modes of economic integration, and the products/services, processes and functions of each" (1996:331). Yet, we are only just now beginning to go beyond the position characterized by Patricia McAnany writing at about the same time: "we have only very rudimentary notions of Classic Maya economic organization of … Maya household and polity. This state of the art, in part, is due to the fact that we simply haven't been aggressively asking questions or structuring focused programs of inquiry regarding the Classic economic system …" (McAnany 1993:65; also see Masson 2002:2). While some Mayanists agree with Issac, it is highly unlikely that we can focus programs of inquiry regarding Classic economic systems without developing more definitive lines of evidence that can actually recognize market exchange.

The development of a structured program of geochemical prospecting for marketplace activities provides a new opportunity for aggressively asking the right questions and allows us to go beyond the bread and circus paradigm. It could have a potentially enormous impact on the way we envision ancient Maya urban logistics and the role of cities in organizing ancient lowland Maya society. For example, to be a viable economic strategy, market production means that surpluses were generated from within the region or nearby regions, and the generation and disposition of those surpluses need not have been under state control i.e., controlled through taxes and tributes.

Regional market systems integrate communities from a fuller range of a region's environmental diversity and specialized production. Market systems link people to market forces rather than strict domestic self-reliance and self-sufficiency or to state-run redistribution. Equally important, market systems are complex, multifunctional social systems and arenas of lively social interaction. Therefore, the existence of market exchange among more or less autonomous segments of majority populations – in marketplaces – may stimulate alternative ways of thinking about the very fabric of ancient Maya lifeways. What role did market production and exchange play in organizing and sustaining urban life? How important was a market economy in integrating Maya urban places with their surrounding regions?

Was market production and exchange all part-time occupations? Were some full-time, as perhaps marked by capital expenditures in market stalls from which food was vended? Were markets permanent or periodic, rotating on weekly or monthly schedules? How vulnerable were producers and market-dependent consumers to market forces? Who controlled or administered markets – and, to what degree?

We have no illusions that geochemical prospecting will answer all questions about these lower levels of the economy, but we may now begin to ask more penetrating questions and hope that new geochemical and archaeological techniques will be developed that will push the envelope even further. For example, what kinds of goods were vended there and how were marketplaces organized?

We have one last word, a caveat. Archaeological geochemistry in the Maya area is in its infancy and is maturing at a rapid rate. On the other hand, plazas once thought to have had minimal archaeological value are being disturbed at an alarming rate by touristic development and even scientific investigations. They have been variously denuded of "natural" vegetation, backdirt, and rubble from excavations have been heaped here, surfaces have been leveled, field camps complete with kitchens and latrines have been established on them, along with pathways and other tourist facilities, etc. For example, all but ¼ of the Mercado at Chichen Itzá has already been disturbed. The plaza at Chan Chich in the Three Rivers Region of Belize is irreparably damaged by the construction of a hotel. Part of Tikal's purported marketplace on the East Plaza is now a parking lot with restroom facilities. At this point we do not know if geochemical evidence to infer past activities on some of these disturbed plazas is irretrievably gone; we hope in the near future to assess the feasibility of geochemical testing on soils taken from already disturbed plaza surfaces. In the meantime, we would like to reiterate that plazas and their soils do have archaeological value and we urge our colleagues to systematically collect soil samples before these spaces are disturbed. Better yet, don't disturb them at all.

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Part II
Ethnography, Ethnobotany, Language and Diet

An Epigraphic Analysis of Classic-Period Maya Foodstuffs

Kerry Hull

Introduction

Many facets of the ancient Maya diet have been studied through paleobotany, bone-chemistry research, paleopathology as well as other traditional archeological methods (Boot 2005; White 1999; Wright 2006). Epigraphic studies of late have also begun to contribute to our overall understanding of certain foodstuffs used by the ancient Maya elite during the Classic and Post-classic periods (Reents-Budet 1994; Houston et al. 2006). The results from this productive union of epigraphy and science have opened the door to understanding the specific uses of many Maya ceramic vessels and have further helped to unlock the nature and content of Maya hieroglyphic writing. We now know that many Maya vessels were labeled with "name tags," essentially designators of vessel type and descriptions of the substances they held (Houston and Taube 1987). In this study, through the use of ethnographic and linguistic data, I will investigate a number of the key terms relating to food and drinks found in Maya hieroglyphic inscriptions and offer some insights into their contextual meaning in Classic and Post-classic Maya cultures. In addition, I present a number of new or refined interpretations of food or drink-based terms, some of which point to the unparalleled importance of cacao as an elite commodity, according to the epigraphic record. I will also look at the iconography of foodstuffs as they are depicted in Maya art as a means of better understanding the role of markets and product distribution during the Late Classic period. Finally, I introduce examples of specific titles relating to foodstuffs that appear in the name phrases of Maya elite and attempt to assess and interpret the cultural currency associated with such gastronomic epithets.

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The Tortilla of Life

Any discussion of food among the Maya must of course begin with tortillas, bread, and the maize tamale (all written epigraphically as *waaj*) – the staple foods of the Maya. Thomas Cyrus and other early researchers correctly identified the "*Kan*" symbol as the sign for tortilla, bread, or maize (Thomas 1882:156, 1888:357; Tozzer 1910:290; Schellhas 1904), though it was Taube (1989) who has most clearly defined the importance of the maize tamale in the lives of the Ancient Maya. Thomas (1882) and others were also able to identify several kinds of tamales in Maya codices.

Upon further investigation, we can find a wide variety of tamale types specified epigraphically and iconographically. In the Dresden Codex, for example, there are mentions of *huh waaj*, "iguana tamale" (Dresden Codex, 67b) (Fig. 1a), *kutz waaj*, "turkey tamale" (Dresden Codex, 30b) (Fig. 1b), *aj-chij waaj*, "deer tamale" (Dresden Codex, 65b) (Fig. 1c), *kay waaj*, "fish tamale" (Dresden Codex, 67b) (Fig. 1d), and *kabil waaj*, "two-layered bread" (Dresden Codex, 69b) (Fig. 1e). Furthermore, the Dresden Codex also contains clear iconographic depictions of deer, iguana, turkey, fish, and other types of stuffed tamales.

In addition to bread or tamale types, epigraphic data also record a variety of other foodstuffs. One particularly interesting food item (only recently identified by

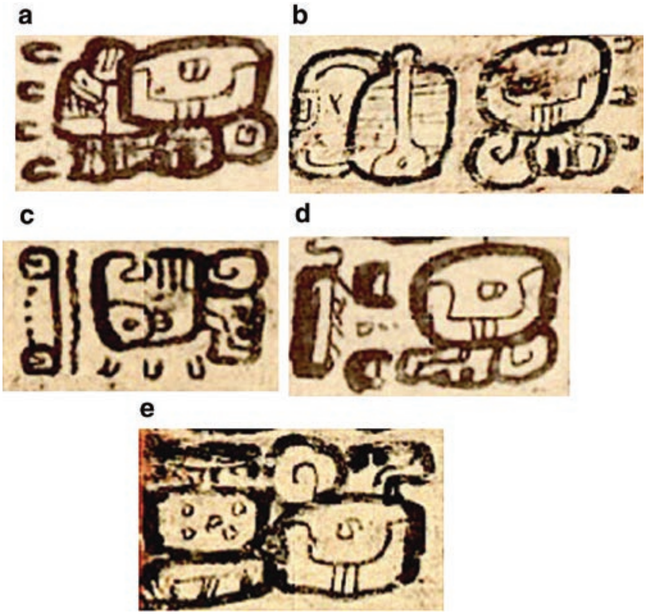

Fig. 1 Tamale and bread types in the Dresden Codex: (**a**) *huh waaj*, "iguana tamale" (Dresden Codex 67c), (**b**) *kutz waaj*, "turkey tamale" (Dresden Codex 30b); (**c**) *aj-chij-waaj*, "the deer-tamale one" (Dresden Codex 65b); (**d**) *kay waaj*, "fish tamale" (Dresden Codex 67c); (**e**) *kabil waaj*, "two-layered bread" (Dresden Codex 69b)

Fig. 2 **SAK-chi-hi-li WE'**, "white venison food" (after Zender 2000:Fig. 10)

Fig. 3 Diphrastic kenning reading **TI'-WAAJ TI'-HA'**, for "consumption/sustenance" (drawing by Graham and Von Euw 1992:139)

Marc Zender) is *sak chih we'*, or "white/'artificial' venison food" (2000:1, 044) (Fig. 2). Venison, which was commonly consumed by the Ancient Maya, is still a regular part of the diet for many Maya of the Yucatan today.

The consumption of food and drink is also attested epigraphically. The pairing of the signs for "water," *ha'*, and *waaj*, "tamale," has long been known to refer to bountiful times in augury statements. Reading the *ha'/waaj* compound as a *difrasismo* (diphrastic kenning) for "sustenance" has also been suggested by Hull (2003:442). Indeed, in modern K'iche', the pairing of *wa ja'* forms a noun meaning "nourishment (general term for all food and drink)" Christenson (n.d.). However, the related pairing of *uk'*, "drink", with *we'*, "eat," seems to index a more general notion of "consumption" (cf. Stuart et al. 1999:II-36; Houston et al. 2006:111), especially when prefixed by T128, deciphered as *ti'*, "mouth" or "eat" (Fig. 3). Furthermore, Boot has proposed that both the *ha'/waaj* and *uk'/we'* couplets likely relate to feasting or dining in Late Classic and Post-classic times (2005:2). As depicted on a number of ceramic scenes (see K767, K2800) and some monumental architecture, feasting among the Ancient Maya seems to have been an integral part of social as well as political interactions both at the intrasite and intersite level (cf. Reents-Budet 2000). It was the drinking of cacao-based beverages, however, that figured most prominently into many of these socioeconomic interactions throughout Central America beginning in Pre-classic times (Reents-Budet 2006).

Cacao Drinks in the Classic Period

Researchers in the twentieth century made considerable progress in identifying foodstuffs in the four extant Maya codices, especially considering the phonetic decipherment of the Maya script was still many decades away. For example, in addition to correctly isolating terms for various kinds of bread, Cyrus Thomas, while not deciphering its syllabic structure, also indentified the hieroglyphic sign for "cacao" in the Dresden Codex (Thomas 1888:355) (Fig. 4a). The phonetic decipherment of the cacao glyph came in 1973 with Floyd Lounsbury's (1974) insightful reading of the syllables **ka-ka** as *kaka(w)*. Building on Lounsbury's work, David Stuart (1988) identified the term on numerous ceramic vessels, which were phonetically spelled out as **ka-ka-wa**. Chemical analysis of the residue from the now-famous lock-top vessel from Tomb 19 of Structure C-1 at Rio Azul confirmed that this vessel indeed held cacao. As it turns out, cacao is the most commonly encountered

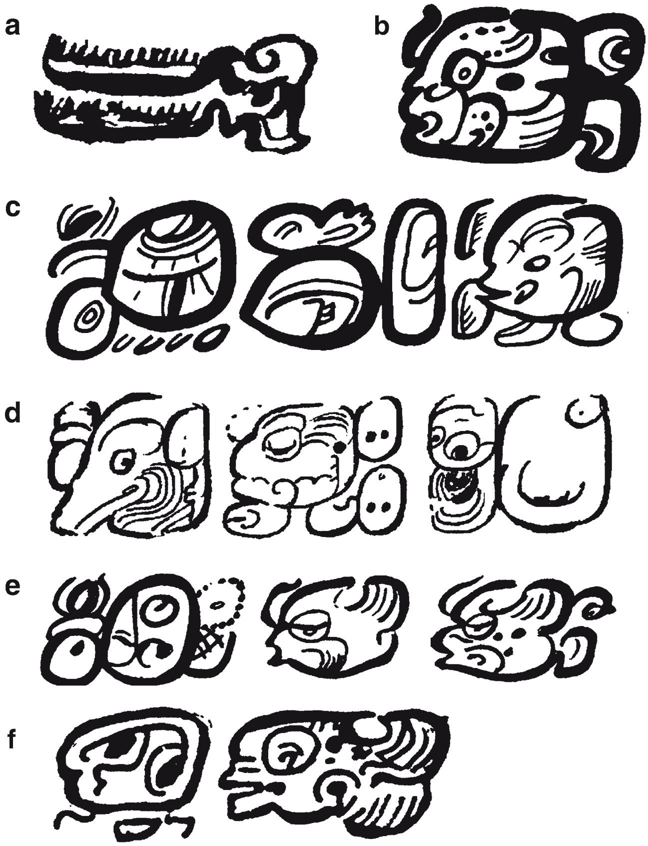

Fig. 4 Cacao types and drinks: (**a**) Syllabic spelling of *kakaw*, for "cacao" in the Dresden Codex (Villacorta and Villacora 1976:130a, 19), (**b**) (MS0151) *kakaw* glyph in Primary Standard Sequence (PSS), (after Reents-Budet 1994:Fig. 4.8); (**c**) **TI tzi-ji te-le ka-KAKA W-wa**, "for foresty/wild cacao" from vessel MS1373 (drawing by Dorie Reents-Budet 1994:Fig. 4.17); (**d**) **TI KAKA W-wa-la u-lu**, "for chocolate-like *atole*" from Kerr vessel K2777 (drawing by David Stuart 2006:Fig. 9.7); (**e**) **TI-a-ch'a ka ka-wa**, "for new cacao" (drawing by David Stuart 2006: Fig. 9.15); (**f**) **CHAB-li KAKAW**, "fermented/sweet cacao" (drawing by David Stuart 2006:Fig. 9.12)

foodstuff mentioned in the PSS, or Primary Standard Sequence, the glyphic formula common to many Maya vessels (Fig. 4b).

Cacao has a long history of use throughout Central and South America (McNeil 2006a). The recent find of a spouted cacao vessel at Colha provides evidence for the use of domesticated cacao in drinks as early as 600–400 B.C. in the Maya area (Powis et al. 2002:98). In Maya mythology, however, it is Hunahpu who is credited with making the first cacao drink in some traditions (Brasseur de Bourbourg 1857–1859:499).

In more recent times, ethnographic data have provided a very clear picture of the various uses of cacao drinks, especially in ritual contexts (see Kufer et al. 2006:601; Heinrich et al. 2006; Faust and Hirose López 2006). For example, in the mid-twentieth century, Charles Wisdom recorded the use of cacao drinks in sorcery rituals among the Ch'orti' Maya of southern Guatemala (1940:148).[1] Recent research among the Ch'orti' by Johanna Kufer has found cacao and cacao drinks, especially "black chilate" (gruel made from cacao and maize), still being used in various ceremonies such as the seminal rain ceremony that takes place in April (Kufer 2005:134).

One key aspect of many cacao-based drinks is the frothing that took place prior to consumption. We know from numerous sources from Colonial times to the present that cacao drinks were regularly frothed in their production (Sahagún 1950–1982, Book 4; Wisdom 1940:190). For example, Wisdom noted that the Ch'orti' Maya had, "A frothed drink made from the roasted seeds [of cacao that] is much consumed ceremonially" (Wisdom 1950:60). One of the more common methods for frothing cacao drinks was through the use of stirring sticks or beaters.[2] Such beaters are still commonly encountered among many Mesoamerican groups today.[3] In addition, Kufer (2005:131) notes that the Ch'orti' add a little wheat flour in order to enhance the frothiness of a cacao drink known as *tiste*. A good early description of a frothed cacao drink comes from Landa, our trusted sixteenth-century source from the Yucatan: "They make of ground maize and cacao a kind of foaming drink which is very savory, and with which they celebrate their feasts" (Tozzer 1941:90). Frothy cacao drinks were most likely part of Classic Maya feasting rights while hosting

[1] According to several secondhand reports from different consultants, Wisdom notes that a sorcerer is initiated through a seven-day fast, after which he or she goes to the church at 11:00 p.m. and recites the following words (orthography altered, translation mine): "*Jachpe'n tu' Maria, Jachpe'n tata' Jwan, awajk'e'n inte' tas e kakaw*" "Arise, Mother María. Arise, Father Juan; give me a cup of chocolate!" The devil then appears to the initiate, and they both go to the cemetery to meet Juan and Maria. Once there, Juan gives him the cacao to drink, after which he then agrees to give his soul to the devil (Wisdom 1940:336, and footnote 24).

[2] Indeed, Dakin and Wichmann (2000:63, 65) have proposed the term "chocolate" derives from the proto-Uto-Aztecan term *čikola:-tl*, meaning a stick used to stir cacao (lit. "beater-drink"). However, Kaufman and Justeson trace the origin of *kakawa* to Mije-Sokean (cf. Kaufman and Justeson 2006).

[3] By way of example, Wisdom describes a cacao frothing stick as being between 8 and 16 in. long and made of cedar, which is used, it is said, since cedar wood does not give a "foreign taste to foods" (1940:148).

foreign elite, as various ethnographic descriptions and Classic-period iconography would suggest (Reents-Budet 2006:219–220; cf. Houston et al. 2006:127–130).

Fortunately, there is ample epigraphic evidence for a robust variety of cacao drinks from the Classic period. Stuart (2005, 2006) has recently provided an extensive epigraphic review of the various types of cacao-based beverages. In addition to the simple notations of *kakaw* on pottery vessels, we also find more specific references such as *te'el kakaw* (Fig. 4c).[4] Since the term *te'el* means "forest" in Ch'ol (Aulie and Aulie 1978:110) and "tree" in Tzotzil (Laughlin 1975:333), *te'el kakaw* could either be interpreted as "from-the-tree cacao" or "foresty-cacao." Another likely possibility, however, is that it refers to "wild cacao" (lit. "of-the-forest").[5] The more descriptive term *tzih te'el kakaw* also appears, which could mean "fresh, wild cacao," where the term *tzih* relates to the idea of "raw," "fresh," or "pure"[6] in many Mayan languages today, though the exact meaning is still somewhat in debate epigraphically (see Stuart 2005:144–145).

On one Late Classic vessel (K2777) the contents are described as *kakawal ul*, "cacao-like *atole*" or "chocolatey *atole*," where cacao is used as an adjective describing the kind of *ul*, or "*atole*" (Stuart 2006:192) (Fig. 4d). Other adjectives such as *k'an*, "ripe," can modify the cacao label as "ripe cacao" (K0625). Likewise, *k'an* also appears with other drinks such as *k'an ul*, "ripe atole" (Stuart 2005:142) and with *sakha'*, or *atole* (see discussion below), in the phrase *k'an tzihil sakja'l*,[7] "ripe, fresh atole" (Grube 1990:325; Tate 1985:Fig. 8).

In 2002, Marc Zender deciphered a unique cacao-based drink on Kerr vessel 8713 whose text reads: *yuk'ib ti ach' kakaw*, "his drinking cup for new/fresh cacao" (Zender Oct. 22, 2002, personal communication by e-mail to Samuel Edgerton) (Fig. 4e). The adjective *ach'*, according to Zender's argument, is related to the Yukatekan term *ak'* and Tzeltalan *ach'*, both meaning "green, fresh, young" (*verde, fresco, tierno*) (cf. Bastarrachea et al. 1992:78).

A particularly interesting cacao drink is mentioned on K681 as *chab kakaw* (cf. Stuart 2005:140, 2006:195–196) (Fig. 4f). The glyph for *chab/kab* is the well-known "earth" sign, which makes little sense in this context as "earth." However, *chab*, deriving from proto-Mayan *kaab'*, is also the term for "honey" or "sweet" in Mayan languages (Kaufman 2003:676–677). In the codices we find the same sign representing honey or bees (see Madrid Codex 109c–110c). Therefore, Stuart has suggested reading the *chab kakaw* expression as "sweet cacao" (2006:196). Another possible interpretation, however, is that *chab kakaw* refers to a fermented cacao

[4]Reents-Budet translates *tzih te'el kakaw* as "fresh cacao made from the sweet pulp of the cacao tree" (1994:75).

[5]In Chiapas, Mexico, cacao grown in the higher altitudes is called "wild cacao" (International Bureau of the American Republics 1904:80).

[6]Stuart (2006:196) notes the entry in Colonial Tzotzil (Laughlin and Haviland 1988) of *tzeel kokov*, "pure chocolate," perhaps providing one of the best clues to the use of *tzih* in the hieroglyphic script.

[7]This Terminal-classic Chocholá-style vessel uses the velar spirant *j* instead of the expected glottal spirant *h* in the term for "water," showing the breakdown in the epigraphic distinction at that time (cf. Grube 2004).

concoction made with honey, which is commonly added to drinks by many Maya groups either to sweeten[8] them or as a fermenting agent (Bancroft 1886:723; Coe 1994:140).[9] For example, Nadaillac et al. noted the use of fermented honey drinks among the Itzajs in the late nineteenth century (1884:268, note 2). According to Sahagún, the Aztec elite would imbibe a chocolate drink made "with wild bee honey" (1950–1982, Book x:93). The Lacandon Maya also have a ceremonial gruel drink made with sweetened corn mixed with honey that is ritually fed to god pots (McGee 1990:48). Furthermore, certain images of vessels from the Classic period are explicitly marked as "honey pots" (e.g., K1092). Houston et al. (2006:116–117) have suggested these containers represent a type of *balché*, a beverage similar to honey wine that they term "mead drinks." Thus, in light of the extensive ethnographic evidence for honey being added to cacao, I would follow Reents-Budet's earlier suggestion (1994:75) in viewing *chab kakaw* as a type of fermented honey-cacao drink.[10]

We know from ethnographic sources that some varieties of cacao drinks were occasionally mixed with alcoholic substances (Aguilar-Moreno 2006:275). On Piedras Negras Panel 3, the hieroglyphic texts specifically states they were drinking *kal-kakaw* "drunk [inebriating] cacao" (Houston et al. 2006:Fig. 3.1b). One of the fermented drinks listed by Nadaillac et al. for the Itzaj in the late nineteenth century was a mixture of cacao and maize (1884:268, note 2). Incidentally, this fact may help to explain Bernal Diaz del Castillo's statement that sometimes Aztec men wanted to possess cacao "to get access to women" ("*para tener acceso con mujeres*") (1984:323). Head (1903:79) also noted that early Spanish monks were prohibited from drinking cacao since it "was regarded by some as a violent inflamer of the passions" (cf. Aguilar-Moreno 2006:286).

There are a handful of other kinds of cacao drinks mentioned in the glyphic texts, but as of yet, secure translations are still lacking for many of them (see Stuart 2005, 2006). For instance, on the lid of a vessel (K1446) from the site of Rio Azul, currently in the Detroit Institute of Arts, there is a three-glyph inscription which reads: **yu-k'i-bi TA-?-? ka-[ka]-wa**, *yuk'ib ta ?? kakaw*, "(It is) the drinking cup for ?? cacao" (see Stuart 2005:140). The cacao type, unfortunately, is composed of two signs without sure readings. However, it represents yet another variety of cacao drink from the Late Classic period.

Another rare type of cacao drink is mentioned on a vessel from Rio Azul (see Stuart 1988). The text contains two otherwise unattested cacao-related drinks:

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[8] Stuart (2006:195–196) has suggested *chab kakaw* is a label for "sweet cacao."

[9] Sir J. Eric Thompson also noted the use of honey as a thickening agent in drinks in the highlands of Guatemala. Honey, together with sweet potato and corn cruel, were added to a type of *atole* made from the *kokom* plant, a tuberous plant of unknown type, to make it thick and pasty (Thompson 1972:109).

[10] Interpreting *chab* as "honey" would also figure into the unique occurrence of *uchab yutal* on K5042, meaning "the honey or the *yut*." Though several readings have been proposed for the term *yut*, none is fully satisfactory yet (cf. Beliaev et al., this volume).

yu-k'i-bi TA-wi-ti-ki ka-ka-wa TA-ko-xo-ma mu-lu ka-ka-wa, *yuk'ib ta witik kakaw ta koxoom mul kakaw*, "(It is) the drinking cup for *witik* cacao (and) for *koxoom mul* cacao." As Stuart has noted, *witik* appears in a well-known place name from Copan, but the meaning here and at Copan remains enigmatic (2006:193). Furthermore, *koxoom mul* has yet to be found as a cacao type in either ethnographic or linguistic sources. Still, there are some avenues for investigation to unpack the meaning of the phrase. The root *kox* could be referring to the cacao as "granulated" based on a similar meaning found in Yukatek (Bricker et al. 1998:134). The most commonly encountered meaning associated with the term *koox/kox* in many Mayan languages, however, is a pheasant-like bird, a fact Stuart has previously noted (2006:193). Indeed, *koox/kox*[11] is widely dispersed in Ch'olan and Yukatekan languages as a bird name. For example, in the Ch'ol, *kox* is given as "*tecolote* (owl)" (Schumann 1973:84) or "*pava* (female turkey)" (Aulie and Aulie 1978:39). In Ch'olti', Morán (1935[1695]) similarly recorded the term *ahcox* as "*paba* [*pava*] (female turkey)." According to Wisdom (1950), *ahqox* is "pheasant" in Ch'orti'. In addition, in Yukatek, *koox* refers to an "*Oco-faisán* (pheasant)" (Bastarrachea et al. 1992:96). Moreover, *kox* in Yukatek is described as "*un ave que es especie de faisán y es negra; ave como gallina* (a bird that is a species of pheasant and is black; bird like a chicken") (Barrera Vásquez 1980:340). In Itzaj *kox* is used for the "crested guan" (Hofling and Tesucún 1997:361) just as *"ko7ox"* is in Lacandon (Boremanse 1979:47).

It is clear that there is considerable variation in bird type for the term *koox/kox*; however, this is not necessarily uncommon in ornithological terms among Mayan languages. Indeed, Kaufman and Norman (1984:123) simply give the translation of the proto-Ch'olan *kox* as "bird species," reflective of the differing translations found in various Mayan languages. At least in Yukatekan languages, however, the crested guan usually seems to be the intended reference. In Mopan, Fergus and Hull (n.d.) positively identified *kox* as a crested guan through multiple consultants in several Mopan-speaking villages in Belize in 2008.[12] Note also that entries in Yukatek specify it as an "*ave, parecida al faisán y que por lo común nida en altas montañas* (bird, resembling a pheasant and that commonly nests in high mountains)" and "*ave negra parecida al faisán* (black bird resembling a pheasant)" (Barrera Vásquez 1980:340). The crested guan fits both descriptions perfectly since it is black in color and prefers nesting in higher areas. In fact, in Yukatek there also exists a verbal form *koxox*, which is derived from the noun *kox*, meaning "*pretención a elevarse como el ave* ***kox*** *en las altas montañas; salvaje, montaraz, indomesticable* (aspiration to elevate oneself like the bird **kox** in the high mountains; savage, wild, untamable)" (Barrera Vásquez 1980:340).

[11] The variation between long and short vowel in this term is apparent from this review of some of the linguistic sources, though Kaufman and Norman reconstruct a long vowel *koox* for proto-Lowland Mayan (1984:123).

[12] Ulrich and Ulrich (1976:46) also note the term "*cox*" in Mopan and translate it as "*cojolito (tipo de ave)*," the same term which is translated "crested guan" by Hofling for Itzaj (1997:361).

At first glance, the crested guan (*Penelope purpurascens*), a pheasant, or any other bird for that matter, would seem to have little connection to a cacao-based drink. However, I would suggest what we may be dealing with is the name of the drink rather its recipe per se. Thus, “crested guan cacao” does not necessarily imply a cacao drink made with any part of a bird, rather it designates a known term for a particular kind of drink. Evidence for just such a bird-based naming scheme for cacao can be found in Mopan, which has a sweet type of cacao called *käkäj t’ut’* (lit. “cacao-white-fronted parrot”) (Tuy Toch 2003:47).[13] This entry raises the possibility that the *koxoom mul kakaw* mentioned in the previously discussed text of the vessel from Rio Azul could likewise refer to a crested guan-named cacao drink.

The second glyph block in the expression is **mu-lu**, *mul*, which is a widely attested root across Mayan languages, and most often signifies “piling up.” For example, in Chontal, *muljatz’än* is “*amontonar* (to pile up)” (Keller and Luciano 1997:164) and in Ch’orti’, *mujr* refers to a “pile, heap, mound, pyramid, low protuberance in the body” (Wisdom 1950:531). Just how this might be connected to a cacao drink is not yet clear.[14]

Overall, the lack of firm semantic control over either *koxoom* or *mul*, in addition to the yet-unexplained presence of the *–oom* “agentive” suffix on *kox*, relegate the reading of “crested-guan *mul* cacao” to simply a working hypotheses at present. However, if “crested guan” is not the intended referent in this cacao drink name, the limited range of other meanings associated with the *kox* root[15] in

[13]The term *t’ut’* in Mopan refers to the White-fronted Parrot (*Amazona albifrons*) (Fergus and Hull n.d.)

[14]Another possibility, however, is that *mul* represents the name of the vessel type, similar to *yuk’ib* meaning “cup,” *lek* for “plate,” etc. If the underlying form of the glyphic *mul* is *mul[ul]* with the final derivational suffix simply underspelled, this could indicate a particular kind of drinking vessel associated with this cacao mixture. Case in point, *murur* in Ch’orti’ means a “*tecomate* (gourd)”, one that is regularly used as a drinking cup (Hull 2005:102). In K’iche’, according to Christensen (n.d.), the term *mulul* means a “gourd used for cup or pitcher (jícara)”. Furthermore, Edmonson notes that in K’iche’ *mulul* is a “jar, clay pot” (1965:75). One could object to this suggestion since the vessel type was already named as a *yuk’ib*, “drinking cup.” However, references to dual vessel types with *yuk’ib* are well attested in the Primary Standard Sequence (PSS), such as *ujaay uyuk’ib*, “his shallow bowl, his drinking cup” (e.g. K5466, K4925, K4378, K6055, K4684). In this case, however, the syntactic function of the vessel type is different since *mul[ul]* is not possessed as are *u-jaay, yuk’ib*, etc., which are possessed nominals whereas *mul[ul]* would be functioning as an adjective modifying the type of cacao. If this interpretation is correct, it could allow for a translation of *ta koxoom mul[ul] kakaw* as “for crested guan-cup cacao.” Moreover, it is possible that this “crested guan-cup cacao” refers to a lidded vessel bearing the image or carving of a crested guan from which this drink was imbibed. Just such vessels with molded images of beings on the lid are known to have cacao types mentioned on them, such as K5357.

[15]*Kox* also means “*cojear*,” or “to be lame” in numerous Mayan languages (cf. Laughlin 1975:178). It is noteworthy that the common Spanish name for the pheasant or crested guan in Central America is *cojolita* or *cojolito* (cf. Hofling 1997:361), showing some semantic overlap between the two.

Greater Tzeltalan, Yukatekan, and Ch'olan languages does not bode well for the full decipherment of this phrase without the aid of additional data from other ethnographic or linguistic sources.

In summary, what we find through an investigation of cacao-based drinks in the epigraphic record is that in all their varieties they were highly valued among the Ancient Maya upper elite as well as secondary or even tertiary elites (see Reents-Budet 2006:214–215). Indeed, no other consumable is mentioned more often than *kakaw* on Classic-period vessels. The sheer number of different cacao drinks that have come to light epigraphically in recent decades attests to both the importance of cacao as an elite commodity and to the highly varied "drink menu" that existed during the Classic period.

Ul and Atole

There are also numerous mentions of *ul*, or *atole*, on shallow bowls, often with flat or rounded bottoms (Stuart 2005:142) (Fig. 5a). Deciphered by Barbara Macleod and Nikolai Grube, the term *ul* (pM **7uul* [Kaufman 2003:1,186]), is

a

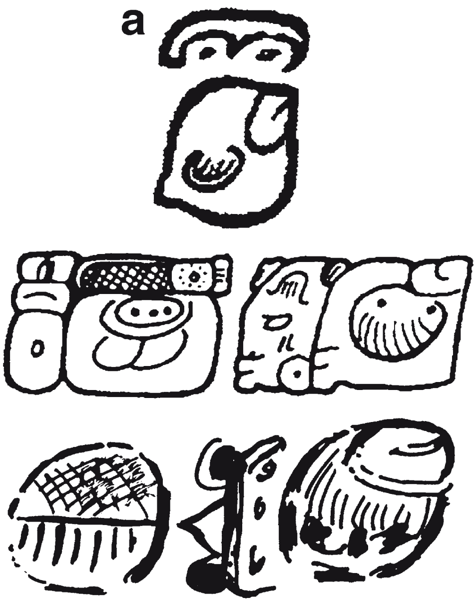

Fig. 5 (**a**) **u-lu**, *ul*, "*atole*" on K4387 (drawing by David Stuart); (**b**) The collocation **TI-ch'a-ja u-lu**, *ti ch'aj ul*, "for bitter *atole*" on K4387 (drawing by Nikolai Grube); (**c**) **pa u-lu**, *pa[']ul*, a kind of *atole* mixed with tortillas or perhaps a variety of bitter *atole* (drawing after Houston et al. 2006:109, Fig. e)

regularly spelled out phonetically as **u-lu** and, as far as we know, is never written with a logogram. The term *ul* (or *ulul*), *atole*, refers to a kind of boiled maize gruel commonly consumed throughout the Maya region today. In some cases, *ul* is said to be made specifically from green or new corn. In the Yucatan, Bricker et al. (1998:21) describe *'ùul* as "gruel made from green corn with a bit of salt." Similarly, Bastarrachea et al. (1992:89) give *uul* in Yukatek as "*atole hecho con maíz nuevo molido sin fermentar* (*atole* made from ground new corn without fermenting)." In the Classic period, however, *ul* likely referred to a general class of *atole* drink since, as pointed out by Houston et al. (2006:108), new corn would not have been readily accessible through much of the year.

Ethnographically and epigraphically, *ul*, or *atole*, appears in many different mixtures and flavors. Among the Tzotzil Maya of Chamula, Stross notes that "*Atole* has many varieties, some sweetened, some soured, and the varieties have more names than there are additives" (2006:229). I have already described the occurrence of *kakawal ul* on K2777, meaning "cacao-like *atole*" or "chocolatey *atole*" (Fig. 4d), as well as *k'an ul*, "ripe *atole*," found on the rim text of a vessel from La Entrada (see Stuart 2005:142). Additionally, on a Chocholá-style vessel from the northern Yucatan (K3199), another type of *atole* is recorded as **ch'a-ja u-lu**, *ch'aj ul*, meaning "bitter *atole*" (Grube 1990:325) (Fig. 5b). The term **ch'ah* in proto-Ch'olan means "bitter" but is realized as *ch'aj* in most modern Ch'olan languages (Kaufman and Norman 1984:118; Kaufman 2003:1, 237). However, **ch'äj* in proto-Ch'olan (**k'aj* in proto-Mayan) refers to "pinole," which refers to a "ground parched corn" (Kaufman and Norman 1984:119). This in turn is mixed with water and sometimes other ingredients to make a number of different drinks (cf. Stross 2006:229). For instance, in the late nineteenth century, Molina Solís (1896:254) described a beverage called *kah* [*k'ah*] among the Maya of the Yucatan as follows (original orthography retained): "*tenían el kah (pinole), hecho de maíz tostado, y que molido con pimienta ó cacao, se desleía con agua caliente ó fresca, al gusto de la persona* (They had *kah* (pinole), made from roasted corn, and with ground pepper or cocoa, it was dissolved with hot or cool water, to the taste of the individual)." Thus, the epigraphic term *ch'aj ul* could either refer to a "bitter *atole*," or possibly to a mixed *atole* drink made by adding ground parched corn.

Finally, there is also a single mention of **pa u-lu**, *pa['] ul* on Vessel MN16318 in Tikal National Park (Houston et al. 2006:108–109) (Fig. 5c). The term *pa'*, from WM **pa7ty* (Kaufman 2003:1,192), means "tortilla" and "bread" in Ch'orti'. Houston et al. have therefore suggested that it refers to "perhaps an atole of new maize mixed with shredded tortillas" (2006:108). We might also interpret **pa u-lu** as an underspelling of *pa[j] ul*, "bitter *atole*." The adjective *paj* meaning "bitter" is widely attested across Mayan languages, and in Ch'orti' it is used to describe several different types of *atole* known as *pajb'ursa'*, or "bitter *atole*" (Hull 2005:91) and *pahpah sa'*, "unsweetened atol (atol agrio)" (Wisdom 1950).

Fig. 6 **TA SAK-HA'**, "for *atole*" (lit. "white-water") on K4995 (after photo by Justin Kerr)

Sakha': The White Water of Ritual

Sakha' was also an important beverage for the Ancient Maya (Fig. 6). First and foremost, ethnographic sources make clear that *sakha'* was exclusively a ritual drink (Villa Rojas 1945:54; Redfield and Villa Rojas 1934:39; Houston et al. 2006:108). The Motul Dictionary of Yukatek describes "*zaca*" [*saka'*][16] as "*atol en lengua mexicana, hecho de agua y maíz; bebese frío, sin cocer ni calendar* (*atol* in the Mexican language, made from water and corn; drunk cold, without cooking or warming up)" (Barrera Vásquez 1980:709). In other Yukatekan sources, "*Zaca*" is "a liquid made from grinding soaked but uncooked corn" (Bolles 1997). Gann (1918:21) states that *saka'* was "very much like posol, but the corn is not cooked soft, so that the beverage is gritty." Gabriel (2004:163, footnote 7) states that "*sak'a*"[17] is "maize cooked without lime, ground, stirred into cold water, sweetened with sugar or honey." Pacheco Cruz (1962:178) gives a similar description of "*zaca*" as "*agua blanca, derivado también del maíz, que beben endulzado con miel i fresca, no tibia ni caliente* (white water, also derived from corn, that they drink sweetened with honey and fresh, not warm or hot)." According to Faust (1998:619), "*sakha'*" must be made with white corn only and should not be soaked in lime lest it change its color to a light yellow. Furthermore, the Ch'orti' *sakja'* or *saksakja'* is an unsweetened drink which is used for ceremonial purposes and can be quite alcoholic (Hull n.d.).

According to Gabriel, "*sak'a*" is used as a drink for a wide variety of ceremonies such as field clearing, sowing maize, maize growing, watermelon ceremonies, sowing beans, harvesting of honey, hunting, bad winds, and new house dedication (2004:160). Additionally, the Lacandon Maya have a ceremonial drink called *säk ha'*, which is a type of gruel made with sweetened corn mixed with honey that is

[16] Both *sakha'* and the reduced form *saka'* are common in Yukatekan sources (cf. Barrera Vásquez 1980:709).

[17] The two terms *sakha'* and *sak'a* are equivalent in meaning, the latter being a variation of the former in Yukatek. The change from the non-glottal /k/ to the glottalized /k'/ is attested in other Mayan languages with the term *sak*. For example, in Ch'orti', *sak* means "white," but glottalized variations of this root are also found in *sak'ujres*, "to whiten, to bleach," and in *sak'us*, "white-winged mosquito" (*us* = mosquito') (Hull n.d.).

fed to god pots in rituals (McGee 1990:48). It is always offered together with other drinks, such as *balché*, in such god-feeding ceremonies. Similarly, Kufer has also noted the use of *sakja'* among the Ch'orti' in combination with cacao drinks in ceremonial offerings (Johanna Kufer 2003, personal communication). In short, the importance of *sakha'* in Maya ritual cannot be overstated. For many Maya groups today, *sakha'* is the ceremonial libation *par excellence*.

One intriguing yet inadequately investigated aspect of *sakha'* is its relationship to cacao. A number of researchers have noted the use of cacao in some varieties of *sahha'* among several Maya groups today (Coe and Coe 1996; Stuart 2006; McNeil 2006b:348; Faust and Hirose López 2006:412). In fact, there is overwhelming ethnographic evidence equating one type of *sakha'* with a kind of mixed chocolate drink. For instance, Barberena discussed the use of a drink called *sakha*' made of cacao and corn in the Maya area in the early twentieth century (1914:147). Wisdom (1940:91) reported the use of ground cacao that was added to unsweetened *chilate* (i.e., *sakja'*) for ceremonial use among the Ch'orti'. Morán (1935) describes "*zaca*" in Ch'olti' as "*bebida buena, chocolate de cacao, maiz y achiote* (good drink, chocolate of cacao, corn and annatto)." Identically, in Yukatek, *saka'* refers to a "drink of foaming chocolate" or "chocolate of cacao, maize, and achiote" (Bolles 1997). Furthermore, in the Yucatan Peninsula, "*saka'*" is a said to be a drink that "*algunas veces mezclan cacao en ello: bebida ordinaria de los indios, de maíz cocido, agua y cacao* (sometimes they mix cacao in it; ordinary drink of the natives, of cooked corn, water and cacao)" (Barrera Vásquez 1980:709). In another early Yukatekan source, "*çaca*" is straightforwardly described as a "*Beuida llamada chocolate* (drink called chocolate)" (Bolles 1997). In addition, according to Vidal (1935:239), "*la espumosa zaca, de cacao y de maíz* (the frothy *saca* [*saka'*], of cacao and corn)" is one of the favorite drinks of those living in the Yucatan.[18] The Itzaj also used a drink called "*zaca*" which, according to Head (1903:16–17), "consisted of cocoa mixed with a fermented liquor prepared from maize." Villagutierre Soto Mayor similarly notes that "*zaca*" was made with the froth of cacao among the Itzaj (1985:126). Indeed, historical sources report that the Itzaj Maya of Tayasal brought an offering of this type of *sakha*' made of maize and cacao to the visiting missionaries before they arrived at the island in 1618 (Fancourt 1854:197, 201). Nadaillac (1884:268, note 2) also mentions an unnamed drink (almost certainly *sakha'*)[19] among the Itzajs made from a mixture of cacao and maize that was fermented. Thus, *sakha'*, in addition to being a ceremonial drink made by soaking uncooked maize and consumed cold, can also refer to a drink mixture consisting of maize and cacao. It is therefore highly likely that the occurrences of *sakha'* in

[18] For the Lacandon Maya, just such frothy cacao is mixed with *säk ha'* in gourds and fed to the gods (McGee 1990:48).

[19] That this drink refers to *sakha'* is confirmed by the statement of Bancroft (1886:723) that "The fermented liquor, made of maize and cacao, which was drunk by the Itzajs, was called *zaca*." Landa probably also referred to *sakha'* when he stated that the Maya of the Yucatan would "get from cacao a grease which resembles butter, and from this and maize they make another beverage which is very savory and highly thought of" (Tozzer 1941:90).

the hieroglyphic inscriptions refers to just such a base mixture of cacao and corn, possibly with several other ingredients. Stuart (2006:187) has independently noted this connection between cacao and *sakha'* in the epigraphic record and similarly concludes that "ancient references to *sakha'* may well have been to drinks that at least in part consisted of chocolate" but "could have referred to one of several different concoctions."

Other Drinks from the Epigraphic Record

The above discussion is by no means an exhaustive survey of all drink types. Indeed far from it. There are yet other drinks mentioned on ceramic texts, some of which have been discussed in detail by other authors. For example, David Stuart has offered several possible interpretations for a drink named *ixi'mte'el kakaw* (lit. "maiz-tree cacao"), noting it could refer directly to "maize" (*ixi'm*) or perhaps have some other botanical relation (Stuart 2005:135–136; 2006:197–199). In a less literal interpretation, on the other hand, Martin sees the pairing of *ixi'mte'el* and *kakaw* as "a compound term" that compares cacao "to the magical bounty that grew from the flesh of the Maize God" (2006:177–178). Even though *ixi'mte'el kakaw* is, according to Stuart (2005:135), "by far the most common descriptive term for chocolate contents of vessels," its semantics remain open to further refinement.

Another regularly encountered term is the problematic *yut/yutal* that McLeod first proposed meant "food" (Reents-Budet 1994:161, footnote 17). Today, while no consensus yet exists on its meaning, Beliaev et al. (this volume) argue for the commonly held idea that it references a "fruity" variety of cacao, which they related to proto-Cholan **(h)ut*. In my view, however, is not fully clear whether the root *yut-* is in fact related to the proto-Ch'olan **(h)ut*, "eye," "face," or "fruit" (Kaufman and Norman 1984:120) and its reflexes in modern Mayan languages in light of a number of complicating phonetic factors. For one, as Stuart has pointed out, there is a single instance of **U-yu-ta-la?** that carries a possessive marker **U-** before the **yu-** syllable, indicating that the noun root is *yut* not *(h)ut* (Stuart 2006:188). Therefore, while the Ch'orti' term *yutir*, "fruit," based on the nominal root *yut* does provide linguistic support for interpreting the glyphic *yutal* as "fruity," its linguistic pedigree from the proto-Ch'olan **(h)ut* has not been firmly established.

Finally, there are a few mentions of the term *sa'*, meaning "corn gruel" or "atole," alone and in compounds. Though epigraphically scarce, *sa'* is a well-attested term in Yukatekan and Ch'olan languages. In Ch'ol, it refers to "*masa* (corn dough)" (cf. proto-Ch'olan *sa'*, "corn dough" (Kaufman and Norman 1984:130). In addition, *sa'* can also be a drink type made with corn dough. For instance, among Ch'orti', the cooked drink *sa'*, or "atole," is highly favored and appears in numerous mixed variations (cf. Hull 2005:99–100). In Itzaj, *sa'* refers to "atole, finest atole" (Hofling and Tesucún 1997:549). Ulrich and Ulrich (1976) also give *sa'* as "atole" in Mopan. The well-documented Yukatek language gives more details about the nature of *sa'*. In Yukatek it is defined as "*atole, bebida preparada* *con masa de maíz y sazonada con chile* (atol, drink prepared with corn dough and seasoned with chile)" (Barrera Vásquez 1980:707). Furthermore, Bolles (1997) reports that *sa'* is most often served as a hot drink in the Yucatan.

Epigraphically, the term *sa*' also appears paired with *kakaw*, "cacao" as in *sa'aal kakaw* (K7529; see also Stuart 2006:195, Fig. 9.10). There are two prevailing interpretations, the latter of which I support. The first sees *sa'aal* in connection with *kakaw* as a reference to the site of *sa'* or *sa'aal*, i.e., Naranjo, whose emblem glyph contains the *sa'*, "atole," glyph (see Tokovinine and Fialko 2007 for a more detailed analysis). Thus, *sa'aal kakaw* would be indicating the origin of the cacao from the Naranjo area (Stuart 2006:194). Another option, however, is that *sa'aal kakaw* indexes a specific recipe of *atole* in which cacao was added. The question is not yet resolved, but there is ethnographic evidence supporting the latter. Among the Ch'orti', there exists a drink known as *kakawbir sa'*, and refers to "atolillo (hot drink made of chilate and cacao)" (Wisdom 1950). The term "*kakawbir*" (lit. "cacao-ed") alone is defined by Wisdom (1950) as "flavored with cacao, any cacao-flavored drink." I would therefore suggest that *sa'aal kakaw* may also represent a hot *atole* drink mixed with cacao. Such hot cacao-based drinks are still commonly used by the Ch'orti' in ceremonial contexts (Kufer 2005:134–135).

Foods and Titles Among the Classic Period Maya

A number of elite Maya titles relating to foodstuffs appear in the hieroglyphic record. An excellent example of such a food-based title is found on the Rim Text of The Xcalumkin Vase (K8017), which reads **AJ-ma-tz'u**, *aj-ma'tz'*, which Marc Zender suggests means "he of new corn" [in Grube et al. (n.d.)] (Fig. 7). In many Mayan languages, *matz'* (also *maatz'* or *ma'tz'*) is a type of *atole*, originating from the proto-Ch'olan *matz'*, "corn gruel" (Kaufman and Norman 1984:125) and proto-Mayan *maatz*' (Kaufman 2003:1,184). In Poqomchii' *maatz'* also refers to *atole* or corn gruel (Campbell 1971:204). According to Stross, among the Tzeltalans, "Thrice ground maize known as *matz'* is placed in water and stirred, making a cold maize gruel also known as *matz*'" (2006:582). In the Yucatan, Thomas Gann also noted in 1928 that the Maya of that region had a special vessel to preserve their

Fig. 7 The title **AJ-ma-tz'u**, *ajma'tz'*, "He of New Corn," of a Xcalumkin ruler on K8017 (drawing by Paul Schoenmakers)

"atole de mats Nuevo, or atole from new corn" (1928:261). The Lacandon Maya ordinarily consume "*ma?ats*," according to McGee, "at breakfast or for a midday snack" (2002:143). In fact, "*säk ha'*" is the ceremonial counterpart of more quotidian "*ma?atz*" for the Lacandon (McGee 2002:143). Fittingly, Morán (1935) similarly defines "*matz*" in Ch'olti' as simply a "*bebida ordinaria* (ordinary drink)." However, as a foodstuff, *ma'tz'* was important enough for a ruler from Xcalumkin to have taken this title for himself as "he of new corn" on K8017 (Fig. 7).

Not only corn but also cacao is found in Classic-period titles. Considering the importance that *kakaw* (cacao) had in the lives of the Ancient Maya elite, it is hardly surprising to find this term used as part of such title sequences. For example, in 2002, while attempting to inventory stelae of the site of Itzimte that had been noted by Teobert Maler and Sylvanus Morley in the 1920s, excavators re-discovered Stela 7 within Plaza B (Mejía and García Campillo 2004:821). The majority of the preserved inscription on the front of Stela 7 records the name of the scribe who carved it. Of interest to our discussion is that the scribal signature contains a cacao-related title. The first section of the text starting at C1 reads: **yu-xu?-lu K'AHK'-mo-o? i-tz'a-ti AJ-ka-ka-wa,** *yuxul k'ahk' mo' itz'aat ajkakaw*, "It is the carving of K'ahk' Mo', Wise One, He of Cacao" (see Mejía and García Campillo 2004:822–824). The high status of K'ahk' Mo' as a scribe and an elite member of the Itzimte hierarchy is aptly reflected in his use of a title bearing the highly prized commodity of cacao.

From the famous drinking scene on vessel K1092 (see Houston et al. 2006:194, Fig. 5.14), we also find the title *ajchij*, lit. "the pulque one," which can also be translated simply as "the drunkard" – a fine description of several individuals depicted on this pot (Fig. 8). Pulque is a drink made from the fermented sap of the century *(maguey)* plant. In Mayan languages it is known as *kih* or *chih* [pM **kiih* (Kaufman 2003:1,161) or **kehj* (Brown and Wichmann 2003), both of which can refer to *maguey* and pulque. Somewhat surprisingly, considering its popularity in modern indigenous societies of Mesoamerica, there are only a few references to pulque in the inscriptions on Maya vessels. Stuart, however, has recently pointed out one occurrence on the Tikal MT219 where the text reads *yuk'ib ta chih*, "his drinking vessel for pulque" (2005:145). In non-PSS contexts, there are several references to drinking pulque in the monumental inscriptions at Copan and a handful of cases in the iconography of certain drinking vessels specifically labeled as pulque pots (Houston et al. 2006:120–122).

Fig. 8 AJ-chi-ji, "drunkard" title on vessel K1092 (drawing by Barbara Kerr)

Finally, Simon Martin has recently presented his findings on a number of new titles relating to food and drinks from the stunning—and mostly unpublished—new murals discovered at Calakmul. These murals were excavated by Ramón Carrasco and Verónica Vázquez, both of INAH, in the Chiik Nahb Acropolis at Calakmul. Here, in one of the clearest fashions to-date, the market scenes of Sub 1-4 of Chiik Nahb vividly depict the activities that surrounded the distribution of foodstuffs and other items in the Late Classic period for the Ancient Maya.

At first glance, the visual parallels of these murals to busy modern-day Maya market scenes are striking to say the least. Individuals are displayed transporting goods, selling a variety of items, and consuming products on the spot. For example, scene Southeast 2A shows a merchant carrying a large pot to market, and a similar pot is shown being set down in the Southeast 1B scene. The interactions of client and seller also appear in numerous scenes, such as that on Southeast 2B (see Mejía and García Campillo 2004:24). In this section of the mural, a woman with a large-brimmed hat serves her client food from a basket bearing two "tamale" glyphs. Furthermore, the accompanying hieroglyphic text above the scene (as noted first by Simon Martin) reads: **AJ wa-WAAJ-ji**, *ajwaaj*, "tamale person." The agentive prefix **AJ**- corresponds to the *aj* (*a-, ah-*) marker found throughout most Mayan languages. In Ch'orti' Mayan today, names for specific venders at markets regularly take this same prefix to designate them as a "person who sells X": *ajchonak'ar* (*aj-*, "one who," *chon-* "sell," *ak'ar* "charcoal"), "charcoal vender," *ajchonpa'* (*aj-*, "one who," *chon*, "sell," *pa'*, "tortillas"), "tortilla vender," *ajchonb'u'r*, (*aj-*, "one who," *chon*, "sell," *b'u'r*, "beans"), "bean vender," and *ajman*, (*aj*, "one who," *man*, "buys") 'buyer' (Hull n.d.). Similar agentive prefixes can be found throughout all the market scenes of the Calakmul murals labeling the individuals involved in mercantile activities. Other titles at Calakmul include *aj-ul*, "he/she of atole," *aj-waaj*, "he/she of bread," *aj-ixi'm*, "he/she of corn," *aj-k'uhmil?*, "he/she of tamale dough" (a reading proposed by Simon Martin), and *aj-atz'aam*, "he/she of salt." Each of these titles expands our knowledge of Classic Maya foods and drinks; case in point, the terms *k'uhmil* and *atz'aam* appear nowhere else in the epigraphic record except for here in the murals of Structure Sub 1-4 of Chiik Nahb Acropolis at Calakmul. The murals, however, do much more than simply provide new linguistic data. They also permit an intimate look into the social contexts in which such terms had relevancy in ancient Maya society, i.e., the marketplace.

Determining the size of the market shown in the 18 mural scenes uncovered so far at Calakmul is not necessarily a simple task. Do the scenes represent large-scale regional markets or local ones? Their location on the main building of the Acropolis could suggest a market in a major plaza within the city center rather than a smaller one on the outskirts of the city. Centrally located market spaces have been identified at numerous Classic-period sites, e.g., the East Plaza behind Temple I at Tikal, which Chris Jones believes was Tikal's primary market area (Sharer and Traxler 2006:85; but see Hammond 1991:260). Other locations, such as the site of Cancuen along the Pasión River, themselves served as vibrant trading ports where goods were exchanged in economic systems controlled by the elites. Cancuen, which lacks much of the pyramidal architecture of contemporary cities of the Late Classic period, seems to have functioned primarily as a trade center, partially due to its control of the major trading route along the Pasión River (Demarest 2004:173). Other sites were connected through vast road systems, known as *sakbe*, which facilitated trade and other forms of commerce (Chase and Chase 1996; Sharer and Traxler 2006:85). Such interconnected causeways leading to centralized market zones under the control of elites would have helped to consolidate the economic influence and power of local rulers. Nevertheless, Demarest has critiqued the earlier-held view that markets and long-distance trade were a central component in the development as well as decline of major Maya city centers. Instead, Demarest suggests that "periodic markets in the plazas of major and minor ceremonial centers were probably the major mechanism of exchange" (2004:148–150). Demarest cites certain current research which points to more local trading of objects relating to status, such as quetzal feathers, jade, etc., to uphold intrasite alliances of the elite (2004:107). According to Laporte (2004:222), this trend of "regionalization," i.e., smaller-scale commerce areas taking on greater importance, continued through the Late Classic and into the Terminal Classic period as more and more markets moved to the peripheries of major centers. In most cases, everyday buying and selling of foodstuffs and other products would have been largely based on smaller markets at the local rather than the state level (Demarest 2004:150). In all likelihood, the murals at Calakmul probably depict just such a local market scene.

Conclusion

In summary, as the great social common denominator across cultures, foodstuffs have been shown to be an important subject in the Maya epigraphic and iconographic record. The wide range of iconographic depictions of foods and drinks as well as scenes of situational eating and drinking provide clues to both social contexts in which they appeared. In the above study, I have briefly analyzed many of the foodstuffs appearing in the hieroglyphic inscriptions and have offered several new interpretations of their meanings. Specifically, I have argued that *chab kakaw* refers to a kind of intoxicating cacao drink fermented through the addition of honey. Additionally, I have also provided evidence that *sakha'*, the proto-typical ritual libation in many Maya societies, may have contained cacao, based on a preponderance of ethnographic data supporting that identification. Furthermore, I have suggested that the rare cacao drink labeled *koxoom mul[ul] kakaw* may indicate a bird-named beverage ("crested guan *mul* cacao") based on its similarity to the cacao type known as *käkäj t'ut'* ("cacao-white-fronted parrot") in Mopan. Indeed, perhaps the most striking aspect of this epigraphic dietary research is the clear continuity that exists from the Classic period, through Colonial times, and into the present in terms of type, function—be it ritual or quotidian—and terminology.

This chapter continues the process of piecing together the diet of the ancient Maya from the scattered remnants of the hieroglyphic menu, and in so doing has assembled a growing corpus of terms for many of the most highly valued foodstuffs of the Maya elite, as well as gained a better understanding of the development and context of these linguistic forms.

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Sweet Cacao and Sour Atole: Mixed Drinks on Classic Maya Ceramic Vases

Dmitri Beliaev, Albert Davletshin, and Alexandre Tokovinine

Deciphering Classic Maya Recipes

Many Classic Maya painted vessels feature a genre of inscriptions known as the "dedicatory formula" or the "primary standard sequence" (PSS).These texts usually mention the vessel type, its contents, and its owner's name. The decipherment of the PSS on Classic Maya ceramics in the 1980s (Houston and Taube 1987; Houston et al. 1989; MacLeod 1989; Stuart 1988, 1989) opened the first page in the Ancient Maya cook book. The two main ingredients mentioned in the contents section of the PSS were cacao and atole (maize gruel), but the list of additives and flavors quickly expanded.

First of all, it was shown that different kinds of cacao and maize gruel beverages were in use in the Classic period. David Stuart (1989:152) identified two kinds of cacao. The first one was spelled as **tzi-te-le** or **'i-tzi-te-le**, and Stuart compared it to the Yukatek botanical term *itzimte* or *itzinte* (Stuart 1989:152). The second kind of cacao, read **yu-ta-la**, was left without translation (Stuart 1989:152). Subsequently, Nikolai Grube (1990:326; see also Stuart 2006:196) discovered the collocation **tzi-hi-li ka-wa** on Chochola ceramics and suggested that *tzihil* was an adjective "fresh." Another term for fresh chocolate – *'ach' kakaw* or "fresh cacao" – was identified by Marc Zender in 2002 (see Stuart 2006:199, Fig. 9.15).

Some ingredients mentioned in the PSS have proved to be notoriously hard to transcribe, translate, and understand. The initial interpretation of the **'i-tzi-te-le** sequence was refuted by Miguel García Campillo (1994) who read it as **'i-'IX-te-le** or **'IX-te-le** and proposed that *'ixte* corresponded to an unknown plant species. Alfonso Lacadena (personal communication 2005) suggested that *'ixte* could be the name of the "gogo tree." However, the discussion did not end as Stuart (2006:197–198) revised the transcription of **'IX-te-le** to **('i)-'IXIM-TE'-le** for *'iximte'el kakaw*.

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Stuart (2006:198) also noted that there were at least two plant species named *'iximte'*, *Karwinskia calderoni* and *Casearia nitida*, both used for medicinal and ceremonial purposes, although there was no ethnographic evidence that their leaves or fruits were added to drinks. An alternative interpretation of *'iximte'el kakaw* has been proposed by Simon Martin (2006) who argues that *'iximte'el kakaw* refers to mythic origins of maize and chocolate and does not identify any specific ingredient or flavor called *'iximte'*.

One may say that the discussion of the PSS has come full circle. Back in those days when the glyphs were not deciphered and the only clue was the funerary context of some vases, the PSS was interpreted as a ritual chant or a mythical narrative (Coe 1973). Today these texts, now read phonetically, are seen by some epigraphers as a collection of metaphors and not literal references to vessels' contents. Nevertheless, we believe that the potential of the PSS to reveal more about the consumption of exquisite foods and drinks at the courts of Classic Maya rulers has not been fully realized. In this chapter, we shall identify a number of new additives and flavors mentioned in dedicatory inscriptions on drinking vessels with a particular emphasis on mixed beverages.

Fruity Cacao

The most common kind of cacao mentioned in dedicatory inscriptions on Classic Maya ceramics is *yutal kakaw*, which is usually spelled **yu-ta-la** or **yu-ta** (Fig. 1). Barbara Macleod interpreted it as "cacao food/sustenance" based on reconstructed root **ut* "food" (Reents-Budet et al. 1994b:75, 161). This interpretation is widely accepted among the epigraphers.

Alfonso Lacadena (personal communication 2005) has suggested a new translation of **yu-ta-la ka-ka-wa** as *y-ut-al kakaw* "3SE-seed-POSS cacao" or "the seeds of cacao." However, this interpretation is not supported by the obvious function of the *yuch'ib* as a vessel for liquids nor the linguistic data. There is no doubt that *yuch'ib'* vessels were used for liquids, not for seeds or other hard foods.

Moreover, the reconstruction of **ut* is not supported by linguistic data. The only relevant entry is Ch'orti' *yutir* "fruit, berry, pinecone" recorded by Charles Wisdom (n.d.:772). Wisdom noted that *yutir* appears only with ergative *'u-* and analyzed it as compound *u-yut-ir* related to *ut* for "eye, any small opening or passage… any

Fig. 1 Example of the *yuch'ib' ta yutal kakaw* clause in a dedicatory inscription (after Stuart 1989:Fig. 5; this and subsequent drawings by Alexandre Tokovinine)

round fruit (especially seed, nut or berry)" (ibid.:749). Full-sentence examples provided by Pérez Martínez et al. (1996:268) include *e murak dyalma uyutir* ("*el jocotal dio muchos frutos*") and *uterar e naranja yaja, ayutiri me'yra* ("*aquel palo de naranja produce muchos frutos*"). It appears that the intransitive verb *ayutiri* and the participle *yutiria'ar* for "fruitful" given by Wisdom (n.d.:772) are derived from the noun stem *yutir*. The first-person possessive form of this word is *niyutir* and not *niwutir* (Pérez Martínez et al. 1996:268). Therefore, *y-* cannot be an ergative pronoun.

This observation is corroborated by the field data generously provided to us by Kerry Hull (personal communication, 2008). In the intransitive verb *yutiri*, *y-* is part of the root as in the following sentence: *ka'y yutiri e sandía* ("*la sanía empezó a echar fruta*"). The Set C pronoun *a-* would appear in the noncompletive (e.g., *aka'y ayutiri*), but it is absent in the completive form presented above, proving that *y-* is not epenthetic but rather part of the root. *Yutir* is attested in compounds as *yutir* and not as *utir*: *e ajchonyutirob' ujuxrwo'b' e yutir twa' achonpa* ("*los vendedores de fruta cortaron las frutas para vende*r"). The definite article before *yutir* in *e yutir* above suggests that the root must be *yut-*. Finally, *y-* does not disappear in other derived forms such as *yutur* for "*aguado*:" *intix yutur ninak'* ("*siento que mi barriga está muy dentenida*"). The only way to explain these data is that the root is *yut-*.

In the Jocotan dialect recorded by Pérez Martínez et al., *ut* seems to have a more general meaning and is greatly grammaticalized. Ergative markers are added to the second part of the compounds with *ut*: *ut ixim* "*maiz en grano*" – *ut niwixim*; *ut k'ab'* "*brazo*" – *ut nik'ab'*; *ut k'u'm* "*nixtamal*" – *ut nik'u'm*; *ut mangu* "*pepita de mango*" – *ut nimagu*; *ut tzaput* "*zapuyul, pepita de zapote*" – *ut nitzaput* etc. (ibid.:242–243). The same pattern is noted in Wisdom's materials where *ut* more frequently means "small piece, seed" and "front, face" than "fruit". As Hull suggests (personal communication, 2008), when the ergative *u-* is added to *ut*, the vowels elide resulting in *u't*. This rearticulation was attested for all speakers interviewed by Hull.

All other dictionaries of Ch'orti' also contain *yutir* as "fruit." Hull (2005:21, 23, 60, 61, 98, 100) included it among his examples like *ute'rar e chi' ak'a'wan i atak'a uyutir tame' septiembre* ("the nance tree produces fruit, and its fruit matures in September") or *e chuch axana tu'k'ab' e te' i uwya'r ja'x uyutir e te'* ("he squirrel walks on the branch of the tree, and its food is the fruit of trees"). Moreover, these examples show that *yutir* can be used with all kinds of trees – nance, mango, cacao, gourd – as well as in a general sense of "tree fruit."

A rare nominal form *yutar* is attested in the Ch'orti' dialect recorded by Wisdom (n.d.:468, 696) as in examples like *inte' chacha'r uyutar* "a cluster of its fruit" and *inhini uyutar nite'* "I pluck the fruit of my tree." In one case (*chichi' u yutar* "sweet fruit, tasty fruit"), Wisdom noted that it "could be yutir" (ibid.:704).

There is no doubt that Ch'orti' *yutir*/*yutar* is related to pan-Mayan #(*h*)*ut* "face, fruit" (Kaufman and Justeson 2003:324 reconstructed it as **Haty* with weak /h/). This is corroborated by other Cholan languages: CHL *wut* "fruta", *wut taj* "*piña de pino*", *wut te'* "*fruta de arbol*" (Aulie y Aulie 1978:132); CNT *jut* "*fruta* (*cuando el árbol o la planta está en contexto*)", *juti* "*echar fruta, dar fruta*" (Keller y Luciano

1997:144–145). Even in Moran's dictionary of Cholti, the closest relative of Ch'orti', there is an entry <*u ut te*> "fruta" (Moran 1935[1695]:16). However, Ch'orti' data clearly demonstrate that *yutir* and *ut* are different words.

In the PSS, we find at least fourteen examples where another attributive is inserted between *yutal* and *kakaw*. In twelve cases, it is *iximte'el* and in one case it is *ho' kab'* – a reference to a mixture of "five honeys" or a place name associated with the archeological site of Ixtutz (Stuart 2006:194, Fig. 9.10). The inscription on the unprovenanced vessel photographed by Justin Kerr (Kerr n.d.:K625; Stuart 2006:194–196, Fig. 9.11) is of particular significance because it contains an expanded version of the collocation: *yuch'ib' ta yuta[l] k'an kakaw* "his drinking vessel for *yutal* ripe cacao." In this context, *yutal* clearly functions as an adjective. Consequently, *-al* can be analyzed as an adjectival suffix or as a nominal suffix deriving a noun that designates a more specific or general category of fruits. Both *yutir* and *yutar* for "fruit" are attested in Ch'orti' (see above). Therefore, we believe that the phrase *ta yutal kakaw* should be translated "for fruity cacao" or "for fruit cacao."

Stuart (2006:188) expressed doubts that *yutal* could mean "fruity" because of a rare phrase *'uyutal kelem* ("the *yutal* of the young man") on the carved vessel from Yucatan published by Dütting (1992: Fig. 17). However, this is clearly part of the owner's title: *chak-ch'ok winik 'u-yutal kele'm*. A similar title appears on the unprovenanced plate (Kerr n.d.:K6080) that probably came from El Zotz. The inscription on plate K6080 explicitly states that its content has nothing to do with cacao or drinking because this is an "eating utensil" (*we'ib'*) for tamales with deer meat (Zender 2000). Consequently, these instances of *yutal* are not counterexamples for translating *yutal kakaw* as "fruit(y) cacao" because their contexts are vastly different.

What kind of drink might a "fruity cacao" be? The common assumption about Classic Maya cacao beverages is that those were various kinds of chocolate or drinks made from cacao beans. In line with this assumption, a "fruity cacao" would be a kind of chocolate drink with some fruit flavors. There can be other interpretations. One of the common forms of traditional cacao drinks in Highland Guatemala today is the so-called "*refresco de pocha*" or a beverage made from the pulp of the cacao pod itself that can be consumed fresh or allowed to ferment (McNeil 2006:345–346). If Classic Maya "fruity cacao" is a drink from fresh or fermented cacao pods, then it is not chocolate at all. However, this hypothesis would have to be proved by means of residue analysis or other techniques applied to "fruity cacao" vessels found in secure archeological context (e.g., McNeil et al. 2006). Unfortunately, most known Classic Maya painted vessels have been looted and do not have provenance.

Sweet Chocolate

A rare qualifier for cacao beverages is attested on a lidded tripod (TIK MT 4) from Burial 10 at Tikal (Culbert 1993:Fig. 19a). The inscription on the lid of the vessel can be read as **yu-UCH' tza [2]ka-wa yu-ne B'OLON-TZ'AK-b'u-'AJAW**

Fig. 2 *Tzah kakaw* on Tikal MT 4

y-uch'[ib'] [ta] tzah kakaw y-unen b'olon tz'akb'uul 'ajaw "It is the drinking vessel for sweet cacao of the son of *B'olon Tz'akb'uul 'Ajaw*".

We believe that *tzah kakaw* in this inscription (Fig. 2) can be translated as "sweet cacao." *Tzah* is a common adjective meaning "sweet" in Maya languages: pM **tzah*, pCH **tzah* "sweet" (Kaufman and Norman 1984:133). It is attested in all Ch'olan languages: CRT *tzah* "tasty, savory, anything tasty, tasty fruit", *tzah ha'* "any fruit beverage"; CHL *tzaj* "dulce" (Aulie y Aulie 1978:117); CNT *tzaj* "dulce" (Keller y Luciano 1997:254).

The significance of this decipherment is that it allows for a more precise translation of *kaab'il kakaw* or *chaab'il kakaw* ("honey cacao") which has been translated simply as "sweet cacao" (e.g., Stuart 2006:195–196). As we have demonstrated, if a term for "sweet" already exists in the inscriptions, there is no apparent reason to use a more generalized meaning of the word "honey." Another implication is a possibility of identifying a non-honey sweetener in residues. At the very least, lack of evidence for honey in residues should not automatically imply that no sweeteners were present. For instance, the sweetener could be extracted from maize stalks (Smalley and Blake 2003:679–681).

Cherry Chocolate

Another uncommon additive to cacao drinks appears on four Early Classic vessels (Fig. 3). It is consistently spelled with an undeciphered sign vaguely resembling a syllable **tzi**. However, the real **tzi** appears to be a phonetic complement to this sign and is present in three out of four spellings. The first example of the term on an Early Classic lidded vessel (Kerr n.d.:K8458) that once belonged to the ruler of El Zotz (Houston 2008:2–3, Fig. 4) appears in a clause **yu-ch'i-b'i ta-²ka-wa ta-'AJAW ta-[?]-ka-wa**, *y-uch'ib' ta kakaw ta 'ajaw ta* [?] *kakaw* "his drinking vessel for cacao, for the lord, for [?] cacao." The inscription on the unprovenanced lidded vessel that could be from Xultun (Kerr n.d.:K5367) contains a more abbreviated version with only **yu-ch'i-b'i tzi-[?] ka-wa** *y-uch'ib'* [*ta*] [?] *kakaw* (Fig. 3a). A nearly identical clause appears on a tripod (TIK MT 5) from Burial 10 at Tikal (Culbert 1993:Fig. 19b): **yu-'UCH' ta-tzi-[?] [2]ka-wa** *y-uch'*[*ib'*] *ta* [?] *kakaw*

Fig. 3 References to *suutz kakaw*: (**a**) K5367; (**b**) Tikal MT 5; (**c**) K8042

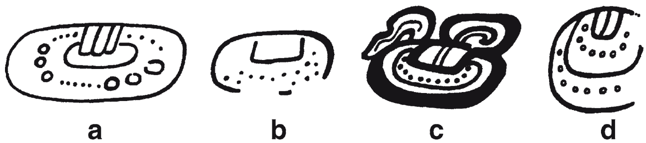

Fig. 4 Variants of the **SUUTZ** logogram: (**a**) K8042; (**b**) Tikal MT 5; (**c**) K5367; (**d**) K8458

(Fig. 3b). Finally, an unprovenanced vase possibly looted from Naranjo (K8042) features a similar passage where the phonetic complement **tzi** appears below the undeciphered logogram (Fig. 3c): **ch'i-b'i ta-[?]-tzi ka-wa** [*yu*]*ch'ib' ta* [?] *kakaw*. The occasional absence of **tzi** suggests that it functions as a phonetic complement to a logogram. The last example is of particular importance because it shows that **tzi** complements the end of the unknown word. Therefore the undeciphered sign is a logograph that ends in *-tz*. It is clear that the word in question should refer to some kind of flavor added to cacao drinks. In Ch'orti', we find *sutz* for "any cherry-like fruit (capulin)" (Wisdom n.d.:644). Capulín or black cherry (*Prunus serotina*) is a North American wild cherry with round black, sour, edible fruit. In the absence of a full phonetic substitution, this decipherment is by no means certain, but it does offer a plausible interpretation of those clauses. The logograph probably depicts a *capulín* berry (Fig. 4). The disharmonic phonetic complement **tzi** implies that in the Classic period, this word likely had a long vowel and sounded like *suutz*.

Fig. 5 Example of the *yuch'ib' ta pa*[*h*] *'ul* clause on K5465

Sour Atole

An important beverage mentioned in the contents section of the PSS is atole (*'ul*, *sa'*, *sak ha'*). Nikolai Grube was the first scholar to identify a variety of atole – **ch'a-ja-'u-lu** *ch'aj 'ul* "bitter atole" – in PSS texts (Grube 1990:325). *Kakawal 'ul* or "chocolaty atole" is another kind of atole that has been recently discovered by epigraphers (Houston et al. 2001:32–34, Fig. 15c, Table 9). We believe that this list can be expanded thanks to a Middle Classic El Zotz-style bowl from Marianne Fevre Collecton (Kerr n.d.:K5465; see Coe 1973:No. 39; Houston 2008:4). The dedicatory inscription identifies it as **yu-ch'i b'i ta pa 'u lu** *y-uch'ib' ta pa*[*h*] *'ul* or "the drinking cup for sour atole" (Fig. 5). A similar collocation appears on another unprovenanced El Zotz-style vase (Kerr n.d.:K8418) and on the vessel MN16318 in Tikal National Park (Houston et al. 2006:Fig. 3.1e). The text on the third bowl (Kerr n.d.:K8780) attributed to the lord of El Pajaral or Zapote Bobal identifies its contents as just **pa-ja** *paj* (Fig. 5).

The spelling **pa-'u-lu** likely corresponds to *pah 'ul* or *paj 'ul* for "sour atole". *Pah* is a common Mayan word for "acid, sour" which is reconstructed for proto-Mayan. The relevant glosses include CLT *pa* "*agrio, amargo*" (Moran 1935[1695]:6, 9); CRT *pah* "sour, sourness," *pahpah* "sour," *pahpah sa'* "unsweetened atol (atolagrio)" (Wisdom n.d.:119); CHL *paj* "*agrio,*" *paj sa'* "*pozole agrio*" (Aulie y Aulie 1978:91); CNT *paj* "*agrio*" (Keller y Luciano 1997:179); TZN *pagh* "*cosa aceda*" (Ara 1986:356); YUC *pah* "*cosa agria o áceda,*" (Barrera Vásquez 1995:618); *ix pah sa'* "*atole agrio*" (Barrera Vásquez 1995:661). Therefore, there is ample linguistic evidence to interpret the collocation *pah 'ul* as a reference to sour atole.

Atole with Sweet Potatoes

A previously unknown kind of Classic Maya mixed drink is mentioned on the unprovenanced vessel currently located in the Santo Domingo Museum in Antigua. The dedicatory inscription along the rim of this bowl identifies the contents as **'i-si 'u-lu** or *'is 'ul* – "sweet potato atole" (Fig. 6). The gloss *'is* for "sweet potato" (Spanish *batata* or *camote*) is attested in Ch'olan languages (e.g., CHT *iz* "*batata, camote*" [Ringle n.d.:#417,#607], CHR *is* for "sweet potato" [Wisdom n.d.:485]). Colonial and Modern Yukatek has the same gloss and various terms for mixed

Fig. 6 *'Is 'ul* in the dedicatory text on the bowl in the Santo Domingo Museum

drinks of sweet potatoes and atole (*iz* "*batatas o camotes*" (CMM:222r);*'ìis* "*sweet potato*" (Bricker et al. 1998:13); *coppen* "*puchas o atol azedo y sabroso echo de maiz viejo con mezcla de batatas*" [CMM:82v]; *š 'ìisi'-sa'* "gruel made from corn and sweet potatoes" (Bricker et al. 1998:13, 238); *sa' is ul* "atole de maíz nuevo, hecho el mismo dío con camote molido" (Barrera Vásquez 1995:702). Brown and Wichmann (2004:169) reconstruct the corresponding proto-Mayan gloss as **'iihs*. Therefore, it seems plausible to interpret this otherwise unique example as a reference to a mixed atole–sweet potato beverage.

The shape of this bowl corresponds to one of the two subsets of Classic Maya atole vessels. In the initial analysis of the Classic Maya classification of serving vessels, Houston et al. (1989):722, Fig. 2) suggested that atole vessels with contents labeled as *'ul* and *sak ha'* tended to be globular. However, the most common form of a painted Classic Maya atole vessel is a shallow bowl with straight and then slightly flaring walls (Stuart et al. 2005). A vast majority of these atole vessels belong to the Chinos Black-on-cream ceramic type found at sites in Eastern Peten and Western Belize (Reents-Budet et al. 1994a, 2000). The same kind of bowl is depicted on the recently discovered Calakmul murals (Carrasco Vargas and Colon Gonzalez 2005) where the inscription identifies the contents as *'ul*. However, the *'is 'ul* bowl corresponds to the first, less common group of vessels. In our opinion, this may indicate that the consistency and/or temperature of the atole with sweet potatoes were different from a generic atole.

Sa', *sa'al kakaw*, and *sak sa'[al] chih*

Until recently, the discussion of atole-based beverages mentioned in the dedicatory texts on Classic Maya vessels centered on instances of the gloss *'ul* (spelled **'u-lu**) (Houston et al. 1989; Stuart 1989; Grube 1990). However, *'ul* is not the only term for maize gruel beverages in Maya languages including Yukatek, Ch'ol, Ch'olti', Ch'orti', Tzotzil, and Tzeltal, which have so far provided the most important insights for understanding Classic Maya inscriptions.

In the earliest dictionaries of Colonial Yukatek, the common word for atole is *sa'* (Ciudad Real 1995:150, 342; Pérez 1976:424; Acuña et al. 1993:811). It is used as a designation for atole beverages in general and is combined with the names of additional ingredients to designate mixed or flavored drinks. On the other hand, *'ul* is the name of a "sweet" atole made out of "fresh" and "tender" maize (Ciudad Real 1995:763; Pérez 1976:386). Contemporary Yukatek maintains the distinction between *sa'* as a general term for atole beverages and *'ul* for atole from green corn. For example, Bricker et al.'s dictionary contains *sa'* for "gruel" and "corn gruel" (1998:238) and *'is-'ùul* for "gruel made from green corn with a bit of salt" (1998:13, 21). Redfield and Villa give the same term for this kind of atole in Chan Kom (1934:39).

Early colonial Ch'olan languages are far less documented than Yukatek. Moran's Ch'olti' compilation features *matz'* as a "common drink" (Ringle n.d.:#1606). This gloss likely corresponds to Yukatek *matz'* for "maize gruel from which posole is made" and "atole gruel" (Ciudad Real 1995:487). The terms *sa'* and *'ul* are noticeably absent. However, *sa'* appears as a generic term for maize gruel-based beverages in Wisdom's dictionary of twentieth century Ch'orti' (Wisdom n.d.:453, 481, 483, 488, 630, 690, 694, 695). The more recent Ch'orti' dictionary research by Hull suggests that *sa'* may also stands for gruel in general, e.g., *sa'rum* for "daub," literally "gruel earth" (Hull 2005:100). In contrast to Ch'olti' and Ch'orti', Ch'ol preserves both terms *sa'* and *'ul*: *'ul* for "atole" and *sa'* for "gruel" (Aulie y Aulie 1978:103, 126).

As for Tzeltalan languages, the term *'ul* is attested in Tzeltal, where it denotes a special sweet drink made of the *matz'* corn gruel and commonly consumed during religious ceremonies (Berlin et al. 1974:116). *Sa'* for "gruel" is not present in Tzeltal. Either *sa'* or *'ul* is absent in Tzotzil.

In summary, whenever one or both glosses are attested in the Maya languages discussed above, *sa'* appears to be a generic term for maize gruel drinks or even gruel-like substances, whereas *'ul* corresponds to more refined and exclusive beverages consumed on special occasions. This difference in meaning is relevant to the classification of drinks in Classic Maya inscriptions where *'ul* is the term of choice in dedicatory texts on the vessels, which belonged to those on the very top of the society.

The term *sa'* is also attested in Classic Maya texts. It is usually spelled with the T278:553 logogram that has been deciphered as **SA'** based on the phonetic substitutions in the emblem glyph of Naranjo rulers (Tokovinine and Fialko 2007:1). We also know that **SA'** may designate beverages because of the scene on *Yik'in Chan K'awiil*'s drinking vessel found in Burial 196 at Tikal (Culbert 1993:Fig. 84) where **SA'** is inscribed on the body of a jar offered to God D by a hummingbird (Fig. 7b; see Beliaev and Davletshin 2006:33–34). This way of marking the contents of jars and bundles is well attested in Classic Maya imagery (Stuart 2006:190; Stuart et al. 2005; Houston et al. 2006:116–117). It is also significant that the dialog between God D and the hummingbird involves **ch'a-ja** *ch'aj* (Fig. 7c) – a term for pinole in Ch'olan languages (Kaufman and Norman 1984:119). If *sa'* is the most general term for maize gruel drinks, as we have argued above, then *ch'aj* is a kind of *sa'* or is made from *sa'*. This is consistent with the difference in meaning between *sa'* and *'ul*. The term *sa'* never appears alone in the dedicatory texts on drinking vessels with the exception of an unprovenanced vase published in Jusin Kerr's data base

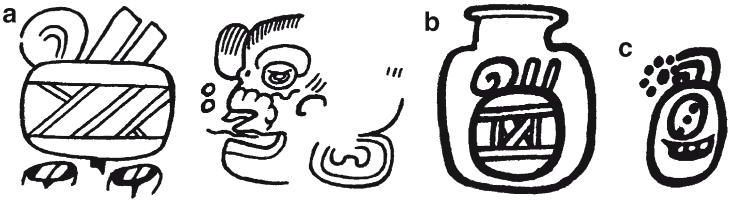

Fig. 7 **SA'** as a designation for beverages: (**a**) *sa'al kakaw* on K7529; (**b**) **SA'** inscribed on a jar in the scene on the vessel from Burial 196 at Tikal; (**c**) *ch'aj* mentioned in the dialog related to the jar inscribed with **SA'**

(Kerr n.d.:K5041). However, this inscription contains so many pseudoglyphs that it cannot be considered reliable.

Where we do find *sa'* or, strictly speaking, an adjective *sa'al* derived from *sa'*, is the term for mixed beverages (Fig. 7a). Until recently, the prevailing interpretation of combinations like *sa'al kakaw* was that they gave the provenance of the ingredients because of the **SA'** logogram in the Naranjo emblem glyph (Stuart 2006:193–195). However, the only relationship between the adjective *sa'al* on vessels and the place name *Sa'aal* or *Sa'il* in the Naranjo emblem glyph is that both are derived from the same noun (Tokovinine and Fialko 2007:1). The combination *sa'al kakaw* found on some unprovenanced vases (Kerr n.d.:K6813, K7529) and a vessel from Tikal (TIK MT003) should be translated as "gruel-ish chocolate" – a reference to a mixed beverage of chocolate and maize gruel or to a drink of gruel-like consistency. Different kinds of traditional mixed drinks based on atole and cacao are still widespread in Guatemala (McNeil 2006:349–351). We also can contrast *sa'al kakaw* to another Classic Maya mixed drink of maize gruel and cacao – *kakawal 'ul* or "chocolaty atole" mentioned on the unprovenanced vase photographed by Justin Kerr (Kerr n.d.:K2777; see Houston et al. 2001:Fig. 15c, Table 9). Whereas *kakawal 'ul* apparently refers to an *'ul* kind of atole with some cacao flavor, *sa'al kakaw* denotes a predominantly cacao beverage of gruel-like consistency and/or with some generic maize gruel. The existence of both terms implies that Classic Maya scribes, at least sometimes, strove for semantic precision in designating vessels' contents.

Sa'al kakaw was also presumably distinct from *sak ha'*, which was also a mixed beverage of cacao and maize mentioned in ethnohistoric (Villagutierre Soto-Mayor 1983:66; Ciudad Real 1995:256; Ringle n.d.:#2327) and ethnographic sources (Redfield and Villa Rojas 1934:39; McNeil 2006:351). *Sak ha'* is attested as **SAK HA'** in the PSS on two unprovenanced vases from Petén (Kerr n.d.:K4995; Hellmuth 1987:Fig. 411). *Sak ha'* is a cold beverage made of cooked maize kernels mixed with water and some cacao. It also appears that the consumption of *sak ha'* was reserved for important social or religious occasions.

Sa'al kakaw is not the only known mixed drink with the maize gruel. Copan Altar K mentions drinking **yu-ta-la SAK-SA'-chi-hi** (Fig. 8). We can either transcribe this spelling as *yutal sak sa' chih* or assume an underspelt *-al* and read it as *yutal sak sa'al chih*. *Chih* surely refers to pulque (Houston et al. 2006:116–122).

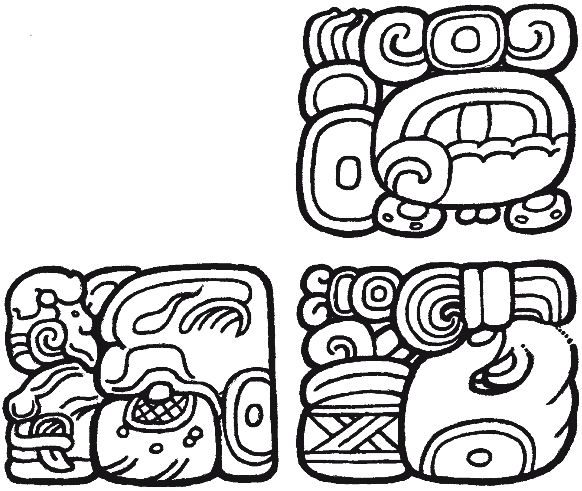

Fig. 8 Drinking *yutal sak sa' chih* mentioned on Copan Altar K:M2-N2

Therefore, the name of the beverage can be translated as "fruity white (maize) gruel pulque" or "fruity white gruel-ish pulque." The practice of adding different kinds of fruit punch or sour atole to pulque is well-attested in Central America (Orozco y Berra 1855:360–361; Carrasco 2001:87). Therefore, there are some ethnographic analogies of the drink mentioned at Copan.

Discussion and Conclusions

As we have seen above, new types of beverages can still be discovered in the PSS on Classic Maya vessels and it seems likely that even more varieties of flavored or mixed drinks will be found as our corpus of painted pottery expands. We have identified and discussed seven mixed beverages: *yutal kakaw*, *tzah kakaw*, *suutz kakaw*, *pah 'ul*, *is 'ul*, *sa'al kakaw*, and *yutal sak sa' chih*. Besides some immediate consequences of identifying new flavors of Classic Maya drinks for fields like residue analysis, there are some important implications for our understanding of the role of certain foods in the fabric of the Classic Maya society, which are worth discussing.

Even a brief look at the lists of ingredients of modern or ethnohistorically documented mixed beverages (e.g., McNeil 2006:Tables 17.1 and 17.2) suggests that the collocations in the PSS cannot be full recipes. They are surely missing essential ingredients. Therefore, we are dealing with a classification of beverages in which certain ingredients (*iximte', suutz, yutal, 'is*) or qualifiers of taste or color (*tzah, pah, sak*) are mentioned as the most distinct aspects of various drinks. It remains to be seen if clauses like *suutz kakaw* and *'is 'ul* should be transcribed as *suutz[il] kakaw* and *'iihs[il] 'ul* based on examples such as *'iximte'el kakaw*, *kakawal 'ul*, *chaab'il kakaw*, and *sa'al kakaw*, where adjectives are derived from the names of the ingredients. We may never know why these ingredients and attributes are highlighted or what was the ingredients' essential function with respect to the properties of drinks: whether they were flavors added to improve the taste or had some medicinal or ritual purposes.

When it comes to understanding the significance of PSS inscriptions, we need to consider two essential functions of Classic Maya painted pottery. On one hand, these vessels contained exquisite foods and beverages consumed at Classic Maya royal courts. Some of these occasions of exclusive consumption were likely feasts that took place in the courtly setting and involved elites from different polities (Reents-Budet 2000, 2001), although the frequency and the scope of such events can be brought into question because the available evidence is rather limited (Houston et al. 2006:127–130). On the other hand, the vessels were an important social and political currency in themselves, as they changed hands during feasts, royal audiences, and presentations of tribute, resulting in vast social networks maintained through the distribution of prestigious items (Adams 1971; Houston et al. 1992; Tokovinine 2006a,b:361–362; Valdés 1997). Therefore, the PSS may reflect the content of the vessel on the occasion for which it was dedicated, but it may also represent a desired or an ideal content that would fit well with the place of the object and its owner in the Classic Maya society.

It has been noted before (Houston et al. 2006:108) that the variety of the most commonly mentioned foods and drinks in the dedicatory texts is much more restricted even when compared to foods and drinks depicted in the scenes on the very same vessels. We have also seen in the case of *sa'* vs. *'ul* that drinks mentioned in the PSS correspond to most exquisite and not commonly consumed varieties of same classes of beverages. Consequently, the appearance of additional rare varieties of mixed drinks in dedicatory texts is intriguing. Does it represent actual drinking preferences of certain nobles? Does it reflect local shifts in the notion of acceptable exquisite drinks worth mentioning in the PSS? Are we merely dealing with a sampling error?

If we consider the geographical distribution of references to rare mixed drinks on vessels with known or suspected provenance, we do see some patterns (Fig. 9). Early Classic *suutz kakaw* vessels appear to be restricted to Tikal's political sphere of influence (Martin and Grube 2008:29–37). Sour atole is mentioned west of Tikal. *Sa'al kakaw* appears to be a beverage of choice east of Tikal. Tikal itself has the greatest variety of rare mixed drinks, a situation that nicely corresponds to its role as one of the Classic Maya "superordinate" royal courts (Martin 2001) with the largest sociopolitical network, the place of innovations and of meeting of different traditions of exquisite consumption.

Some data also suggest that shifts in consumption preferences at certain royal courts might have had something to do with personal preferences of their rulers. For example, three out of four rare mixed drinks at Tikal are mentioned on vessels from the same tomb. References to *sa'al kakaw* (Kerr n.d.:K6813; vessel fragment from the special deposit at the Central Acropolis [Vilma Fialko, personal communication 2006]) and to *kab'il* or *chab'il kakaw* (Kerr n.d.:K681 K1288, K5042, K5362, K5746, K8245) at Naranjo are restricted to vessels commissioned for the ruler

Fig. 9 Geographic distribution of rare terms for mixed drinks on vases with known or suspected provenience

"Aj Wosaj" *Chan K'ihnich*. We wonder whether such shifts in preferences for exquisite drinks during the reigns of individual rulers were a common phenomenon of Classic Maya courtly life.

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Prehistoric Chronology of the Common Bean in the New World: The Linguistic Evidence

Cecil H. Brown

Introduction

At European contact, Native American agriculturalists in both eastern North America and Middle America (Mexico and Central America) relied primarily on a group of three crops: maize, squash, and beans. The widespread geographical occurrence of this agrarian triad in historical times would seem to suggest its considerable antiquity in the New World. While archaeological investigation indicates that each of the crops was domesticated in the Americas thousands of years ago, it also indicates that times of domestication and times of diffusion were substantially different for each (Smith 2001). This study presents linguistic evidence bearing on the prehistoric chronology of one of these crops, the common bean (*Phaseolus vulgaris* L.).[1]

The common bean (hereafter bean) was domesticated in two New World regions, Mesoamerica and the Andes (Gepts 1998). The earliest date for cultivated beans in the Americas is around 4400 years BP (before present) (Kaplan and Lynch 1999:269). This date was determined through use of accelerator mass spectrometry (AMS) applied to an archaeological bean specimen recovered from Guitarrero Cave in Andean Peru.

AMS has produced a definitive bean chronology for at least one area of the New World. It is now decisively determined that in the northern Eastern Woodlands of North America beans became a significant part of the Amerindian diet beginning around 700 years BP (Hart and Scarry 1999, Hart et al. 2002). For various reasons, definitive bean chronologies are yet to be determined for other New World regions.

The present study offers a linguistic approach to dating beans that both complements and supplements archaeological dating techniques such as AMS. This involves

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[1] Similar linguistic evidence bearing on the prehistoric chronologies of maize and squash in the New World is reported respectively in Brown (2006a, b).

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use of the comparative method of historical linguistics to determine whether or not a word for bean pertained to languages ancestral to contemporary Amerindian languages. The date at which an ancestral or parent language was last spoken can be determined through use of a linguistic dating technique known as glottochronology. If a term for bean is determined to have been part of a lexicon of an ancestral language, the glottochronological date calculated for that language can be considered indicative of when cultivated beans were present in the region inhabited by the language's speakers. Thus, for example, dating an ancestral language of the American Southwest by glottochronology to 1600 BP and determining that this language had a term for bean would be compelling evidence that cultivated beans were present in the Southwest at least as early as 1600 years ago.

Methodology

For this study, 228 words for bean in 211 Amerindian languages and dialects were collected from dictionaries and other sources.[2,3] These languages and dialects are affiliated with 21 different genetic groups. Genetic groups recognized here include only those identified by Campbell (1997) as being bona fide genetic units such as Mayan, Mixe-Zoque, and Totonacan, three language families of Mesoamerica. Campbell considers as invalid or not proved many controversial classifications such as Greenberg's (1987:379–380) Mexican Penutian, which genetically unites Mayan, Mixe-Zoque, and Totonacan languages with Huave, a language isolate of the area. While I attempted to collect words for bean found in all languages of each of the 21 genetic groups, this was not always possible because of data limitations. Consequently, bean-term inventories for a few genetic groups are not as close to being complete as those for others.

Once terms were collected for each group, they were evaluated with regard to whether or not they indicate the occurrence of a word for bean in the genetic group's parent language. This involved (1) looking for phonological similarities among a group's bean terms and (2) attending to how phonologically similar terms are distributed across major subgroups of a genetic unit.

The task of determining term similarity is complicated by the many different orthographies employed in lexical sources. My extensive experience dealing with different orthographies for recording Amerindian languages (e.g., Brown 1999) helped in finding similarities obscured by different ways of symbolically representing the same sound. Another complication relates to the fact that I control

[2] Some languages have more than one term for bean.

[3] Many of the dictionaries, vocabularies, and word lists from which Amerindian-language bean terms have been extracted are listed in Appendix B of Brown (1999:184–220). Some words for bean in languages of eastern North America are from Munson (1973). Hill (2001) has been a source for bean terms of some Uto-Aztecan languages. Lehmann (1920) was consulted for terms for bean in a number of languages of southern Central America.

detailed knowledge of the regular sound correspondences of a limited number of Amerindian language families. Because of regular sound shifts, some bean terms found in two or more languages of a genetic group can appear phonologically dissimilar when they are in fact reflexes of the same ancestral bean term. While I may have failed to recognize a few instances of term cognation, a reasonably thorough familiarity with processes of phonological change helped to minimize such problems.

The manner in which similar bean terms are distributed across subgroups of a language family is indicative of whether or not these terms are reflexes of a word for bean that may have pertained to the family's ancestral language. As a convention, if similar bean terms are found in languages of the *majority* of subgroups of a genetic group, I conclude that a bean term probably pertained to the genetic group's parent language.[4] Conversely, if similar bean terms are not found in languages of the majority of major subgroups, I conclude that there is no evidence for positing a bean term for the genetic group's parent language.[5]

The Mayan language family, whose member languages are spoken in Mexico and northern Central America, presents an example of a distribution indicative of a parent-language bean term. In Table 1, all Mayan languages for which a bean term has been found (a total of 30) are listed and organized in the list by family subgroup affiliation.[6] I have identified five sets of phonologically similar bean terms pertaining to these 30 languages. Words belonging to the same similarity set have the same numerical suffix, for example, Chuj *tut* (4) and Mocho *tu't* (4). Only two sets, (1) and (2), contain bean terms that are found in languages of two or more major subgroups of the family. Terms suffixed with (2) are found in languages of two subgroups, Yucatecan and Greater Tzeltalan. Terms suffixed with (1) and also given in bold type are found in languages of four of the five major subgroups, that is, Huastecan, Greater Tzeltalan, Eastern Mayan, and Greater Q'anjob'alan. Since the latter constitutes a distribution in which similar bean terms occur in languages of the *majority* of major subgroups of a language family (four out of five), I posit that a bean term probably pertained to the lexicon of Proto-Mayan, that is, the language from which the 30 Mayan languages developed.[7]

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[4] In order to state definitively that similar terms trace to a single protoword, it must be established that these words demonstrate regular sound correspondences.

[5] Conclusions reached through use of these conventions have in some instances been modified when appropriate published and unpublished accounts indicate alternative analyses.

[6] The subgrouping of Mayan presented in Table 1 follows that used by Brown and Wichmann (2004:129–130). In this study, all analyses, except that for Mayan and Southern Uto-Aztecan, are based on subgrouping of genetic units as given in Campbell (1997). Southern Uto-Aztecan is based on Kaufman's (1994a) classification.

[7] I have detailed knowledge of regular sound correspondences that hold across languages of the Mayan family. The bean terms given in bold type and suffixed with (1) in Table 1 show expected phonological correspondences indicating that they are reflexes of a Proto-Mayan term for bean. Wichmann and Brown (n.d.) reconstruct this term as **keenaq'* and Kaufman (2003) reconstructs it as **kenaq'*.

Table 1 Terms for bean in Mayan languages sorted by classification

Mayan
Huastecan
Huastec: *tzanakw'*(1)
Chicomuceltec: *chenuk*(1)
Yucatecan
Yucatec: *b'u'ul*(2)
Mopan: *b'u'ul*(2)
Itza: *b'u'ul*(2)
Lacandon: *b'u'ur*(2)
Greater Tzeltalan
Cholan
Chol: *b'u'ul*(2)
Chontal: *b'u'u*(2)
Chorti: *p'uur*(2)
Cholti: *bul*(2)
Tzeltalan
Tzeltal: *chenek'*(1)
Tzotzil: *chenek'*(1)
Eastern Mayan
Mamean
Teko: *keenaq'*(1)
Awakateko: *chikun*(3)
Ixhil: *txikon*(3)
Mam: *cheenaq'*(1)
K'ichee'an
Kaqchikel: *kinaq'*(1)
Tz'utujiil: *kinaq'*(1)
K'iche': *kinaq'*(1)
Sakapulteko: *kinaq'*(1)
Uspanteko: *kinaq'*(1)
Poqomam: *kinaq'*(1)
Poqomchi': *kenaq'*(1)
Q'ekchi': *kenq'*(1)
Greater Q'anjob'alan
Chujean
Chuj: *tut*(4)
Tojolabal: *chenek'*(1)
Q'anjob'alan
Q'anjob'al-Jakalteko
Akateko: *ub'al* (5)
Jakalteko: *hub'al* (5)
Q'anjob'al: *wub'al*(5)
Mocho
Mocho: *tu't*(4)

Using the approach described, I have evaluated each of the 21 genetic groups and, in many instances, subgroups within groups as well, to ascertain whether or not a word for bean pertains to a group's or subgroup's parent language. My evaluations are limited to two results: Y (yes, evidence indicates a *probable* protoword for bean) and N (no, there is *no* evidence of a protoword for bean).[8]

Glottochronology

Glottochronology was devised by Morris Swadesh in the midtwentieth century as a method for determining the number of centuries since genetically related languages diverged from a common ancestor.[9] This involves comparing the core vocabulary[10] of two languages to determine the degree to which words are similar in the languages. Lesser lexical similarity indicates greater chronological depth for a split and more lexical similarity indicates less chronological depth. Swadesh, having established empirically a rate at which lexical replacement of core vocabulary occurs, developed a formula for determining the number of centuries since a language divergence took place. The number of centuries that have passed since the two split from a common ancestor can be computed by applying this formula to the number of similar words in the core vocabulary list found for the two languages.

Although glottochronological dates are frequently cited in literature dealing with language prehistory, many linguists are critical of the method and its results. Lyle Campbell (1998:177–186), for example, one of glottochronology's more fervent antagonists, cites a litany of methodological and analytical inadequacies. He finds shortcomings and flaws in all basic propositions underlying the approach.[11] Nevertheless, incongruously, Campbell frequently cites glottochronological dates in his book, *American Indian Languages: The Historical Linguistics of Native America* (1997) (e.g., see pages 1, 123, 132, 133, 138, 139, 142, 159, 165, 167, 172, 174, and 175).

[8] By concluding N, that there is no evidence of a prototerm for bean, I am not implying that an ancestral language did not have a bean term, only that the assembled evidence does not attest to one. In Brown (2006a, b) I argue at considerable length that in those instances in which terms for maize and squash, respectively, pertained to an ancestral language, but in which those crops were not especially salient for its speakers, such prototerms would tend to be replaced over time and not survive in offspring languages. On the other hand, I argue that if such terms are retained by most offspring languages, this attests to the great cultural importance of these items for speakers of an ancestral language. Thus, in this study, positing a bean term for an ancestral language is to be understood as implying the considerable cultural importance of beans for its speakers, probably indicating that beans constituted for them a major dietary resource.

[9] For Swadesh's description of this method see (1960), translated from Spanish to English by Joel Sherzer (Swadesh 1971:284–271).

[10] Typically this is a list of 100 items including, for example, such common things as seed, blood, and water, and such ordinary activities as eat, sleep, and hear.

[11] For these and a detailed description of the method, readers are invited to consult Campbell (1998:177–186). Also, the pros and cons of glottochronology are discussed at considerable length in various papers of a recent book edited by Renfrew et al. (2000).

Of late, glottochronology has undergone a renewal in interest. This is due in part to the appearance of studies showing that glottochronological dates dovetail closely with archaeological dates, for examples, see Bellwood (2005), Brown (2006a, b), Ehret (2000), and Wichmann et al. (2005). In one of these studies, I (Brown 2006a) demonstrate that glottochronological dates correlate strongly with archaeological dates relating to the prehistoric New World occurrence of *Zea mays* L. (maize) as a dietary staple.

In Brown (2006a), I analyze 626 words for maize in 591 Amerindian languages and dialects affiliated with 51 different genetic groups in order to determine whether or not a word for maize pertained to parent languages of each of the 51 genetic groups, and also to parent languages of certain subgroups of genetic groups. Parent languages for which maize terms are posited strongly tend to have glottochronological dates indicating that they were spoken around or after 3000 years BP, the period of time shown by stable carbon isotope studies of human bone collagen to have been the era in which consumption of maize developed significantly for many Amerindian groups, especially those of Mesoamerica (Smalley and Blake 2003). On the other hand, no evidence of a maize term for an ancestral language suggests a minor or even no role for maize in the lives of its speakers. Such parent languages strongly tend to have glottochronological dates indicating that they were spoken in years before 3000 BP when maize consumption in most areas of the New World is shown by stable carbon isotopes studies not to have been significant.[12] These findings indicate that while glottochronology may not always yield dates having the accuracy of those obtained through archaeological dating methods such as AMS, it can nonetheless provide a chronological perspective of an approximate nature that can be useful in the study of prehistory.

One finding of Brown (2006a) is that glottochronology tends to inflate genetic group dates when they pertain to groups whose parent languages were spoken more than 2500 ago. Statistical correlations between glottochronological dates and archaeological dates relating to the early New World occurrence of maize as a dietary staple are increased significantly in strength and in statistical significance by subtracting 800 years from each glottochronological date at or greater than 3300 BP and by reducing all glottochronological dates from 2600 BP through 3200 BP to 2500 BP.[13] The present study employs this adjustment in calculating glottochronological dates.

Most glottochronological dates for genetic groups cited in this study are dates used in Brown (2006a). These originally came from several sources, most from Swadesh (1959) and Kaufman (1990a, 1994a, b). I calculated a number of dates, often with the help of Pamela Brown. Others are from Broadwell (n.d.), Campbell (1997), Fowler (1983), Hill (2001), Holman (2004), and Wichmann (n.d.). When appropriate,

[12] The correlation described here is presented in Brown (2006a) as a 2×2 crosstabulation yielding a strong gamma score of 0.56 with statistical significance at the $p<0.05$ level.

[13] In Brown (2006a), by adjusting glottochronological dates in this manner, the 2×2 crosstabulation of glottochronological dates and archaeological dates yields an exceptionally strong gamma score of 0.81 with statistical significance at the $p<0.001$ level.

glottochronological dates from Brown (2006a) used here have been adjusted as described in the immediately preceding paragraph. Glottochronological dates not taken from Brown (2006a) were calculated by me and adjusted when appropriate.

AMS Dating of Beans in the Americas

Before the availability of AMS to archaeologists, excavated beans were indirectly dated. This typically involved radiocarbon dating of carbon-based materials (such as wood charcoal) with which beans are archaeologically associated. AMS allows the direct dating of the bean itself. As more and more AMS dates have been produced, it has become clear that indirect dates for beans have often been inaccurate, typically due to the intrusion of materials from one archaeological stratum into another (Hart and Scarry 1999). All archaeological dates cited here are AMS dates.

Table 2 presents the earliest AMS dates for cultivated beans for five regions of the New World. The region for which AMS dating of beans has been most extensive is eastern North America, especially the area east of the Mississippi River, with most dates coming from northern Eastern Woodlands sites. AMS dating shows that beans begin to become archaeologically visible in the northern Eastern Woodlands around 700 BP (Hart et al. 2002). In eastern North America west of the Mississippi River, sites in Missouri and Nebraska yield beans that are AMS dated at the earliest to around 850 BP (Adair 2003, Asch and Hart 2004). In the American Southwest, Bat Cave and Tularosa Cave yield cultivated beans dating much earlier, to around 2200 BP (Kaplan and Lynch 1999; Smith 2001; Wills 1988).

Prehistoric cultivated beans do not tend to survive in very hot and humid localities. Not surprisingly, all AMS dated beans from Mexico so far have been recovered from caves that are cool and dry. In fact, Mexico's cultivated bean chronology is based solely on beans from only five dry caves, one in Oaxaca, two in Tehuacán, and two in Tamaulipas (Kaplan and Lynch 1999; Smith 2001). The oldest dated cultivated bean for Mexico is from Coxcatlán Cave in Tehuacan with an AMS date of around 2300 BP (Kaplan and Lynch 1999; Smith 2001).

Table 2 Earliest AMS radiocarbon dates for cultivated beans in five regions of the Americas

Region of the New World	Earliest AMS date for cultivated beans
Eastern North America east of Mississippi river	700 years BP[a]
Eastern North America west of Mississippi river	850 years BP[b]
American Southwest	2200 years BP[c]
Mexico	2300 years BP[d]
South America	4400 years BP[e]

[a]Hart and Scarry (1999), Hart et al. (2002)
[b]Adair (2003), Asch and Hart (2004)
[c]Wills (1988), Smith (2001)
[d]Kaplan and Lynch (1999), Smith (2001)
[e]Kaplan and Lynch (1999)

All published AMS dates for prehistoric cultivated beans of South America come from the Andean region. A bean from Guitarrero Cave in the north central Peruvian Andes dated at around 4400 BP is not only the oldest prehistoric bean of South America, but, as noted earlier, is the oldest known cultivated bean in the New World (Kaplan and Lynch 1999).

Bean Chronology and Glottochronological Dates

Table 3 lists Amerindian genetic groups and subgroups with their respective glottochronological dates, bean-term evaluations, and other information. It sorts groups into seven geographic categories: eastern North America east of the Mississippi River, eastern North America west of the Mississippi River, American Southwest, Western America, Mexico and northern Central America, southern Central America (south of Guatemala and Belize) and South America. Languages of two genetic groups, Algonquian and Uto-Aztecan, straddle two geographic areas. In Table 3 Algonquian is placed with genetic groups of Eastern North America east of the Mississippi River because most Algonquian languages of my sample are spoken in that region. Uto-Aztecan is placed with genetic groups of Mexico and northern Central America for a similar reason. Within geographic areas, genetic groups are rank listed according to magnitudes of associated glottochronological dates, from lowest to highest. In addition, for each genetic group, I evaluate whether or not lexical evidence indicates the pertinence of a prototerm for bean to an associated ancestral language (Y indicates a probable term for bean, and N indicates that there is no evidence of a term for bean). In addition, for genetic groups for which a probable prototerm for bean is posited, a sample reflex of the prototerm from a contemporary language is presented.

Bean terms are posited for parent languages of only two groups of eastern North America east of the Mississippi, these being Western Muskogean and Huronian (of Iroquoian) (see Table 3). The glottochronological date for Western Muskogean is 540 BP, a date that conforms with the AMS attested fact that beans were not present in the area before around 700 BP (see Table 2).[14] The glottochronological date for Huronian, 740 BP, is slightly earlier than 700 BP but should be well within the margin of error for glottochronological dates.

[14] Discussion of this section assumes that parent languages were spoken in geographic regions in which their offspring languages were found at the time of European contact. Of course, Native Americans of prehistoric times migrated, perhaps more than just occasionally. However, given the enormous size of regions dealt with in this study, for example, eastern North America east of the Mississippi River, and Mexico and northern Central America, it is unlikely that languages typically became relocated in geographic space to such an extent that they were no longer spoken in the same general area as their respective parent languages. An exception to this generalization may be some Uto-Aztecan languages. Early offspring languages of Proto-Uto-Aztecan may have migrated from the Mexico/northern Central America region to the American Southwest (cf., Hill 2001) or vice versa. Languages of the Algonquian family may constitute another exception.

Table 3 Amerindian-language genetic groups and subgroups given with respective glottochronological dates, bean-term evaluations, and other information

Genetic groups and subgroups of eastern north America east of the Mississippi river	Glottochronological date	Bean-term evaluation for ancestral language	Sample reflex of prototerm for bean
Alabama-Koasati (of Muskogean)	390 BP[a]	N	
Western Muskogean	540 BP	Y	Choctaw: ***bala***
Huronian (of Iroquoian)	740 BP[b]	Y	Huron: ***düyá-resa***
Five Nations-Susquehannock (of Iroquoian)	1000 BP[c]	N	
Ofo-Biloxi (of Siouan)	1300 BP[d]	N	
Southwestern Muskogean	1640 BP	N	
Northern Iroquoian	2200 BP[e]	N	
Eastern Algonquian	2400 BP[f]	N	
Muskogean	2500 BP	N	
Algonquian	2700 BP	N	
Iroquoian	2700 BP	N	
Genetic groups and subgroups of eastern north America west of the Mississippi river			
Ojibwa-Potawatomi-Ottawa (of Algonquian)	270 BP[g]	Y	Ojibwa: ***mashkodesimin***
Pawnee (of Caddoan)	420 BP[h]	Y	Pawnee: ***atit***
Fox (of Algonquian)	460 BP[i]	Y	Fox: ***maskutcisa***
Missouri River Siouan	540 BP[j]	Y	Crow: ***awa'se***
Mississippi Valley Siouan	1600 BP[k]	N	
Northern Caddoan	1900 BP	N	
Siouan (Core)	2500 BP	N	
Caddoan	2500 BP	N	
Genetic groups and subgroups of the American southwest			
Apachean (of Athapaskan)	460 BP[l]	N	
Yuman	1600 BP[m]	Y	Mohave: ***marik***
Numic (of Northern Uto-Aztecan)	1600 BP	N	
Tanoan (of Kiowa-Tanoan)	2300 BP	N	
Kiowa-Tanoan	2500 BP	N	
Northern Uto-Aztecan	3100 BP	N	
Genetic groups and subgroups of western America			
Athapaskan	2500 BP	N	
Miwokian	2500 BP	N	
Genetic groups and subgroups of Mexico and northern central America			
Aztec (of Southern Uto-Aztecan)	1100 BP	Y	Classical Nahuatl: ***etl***

(continued)

Table 3 (continued)

Genetic groups and subgroups of eastern north America east of the Mississippi river	Glottochronological date	Bean-term evaluation for ancestral language	Sample reflex of prototerm for bean
Chinantecan (of Oto-Pame-Chinantecan)	1500 BP	Y	Chinantec (Usila): ***m^{4}jnai^3***
Zapotecan (of Popolocan-Zapotecan)	2400 BP	Y	Zapotec (Juarez): ***dàa***
Popolocan (of Popolocan-Zapotecan)	2400 BP	Y	Popoloca (Atzingo): ***ijmā***
Sonoran (of Southern Uto-Aztecan)	2500 BP[n]	Y	Tarahumara: ***muní***
Totonacan	2500 BP	Y	Totonac (Papantla): ***stapu***
Mixe-Zoque	2700 BP	Y	Texistepec Popoluca: ***säk***
Popolocan-Zapotecan (of Eastern Oto-Manguean)	2700 BP	N	
Otopamean (of Oto-Pame-Chinantecan)	2800 BP	N	
Mixtecan (of Eastern Oto-Manguean)	2900 BP	Y	Trique: **rune^{43}**
Southern Uto-Aztecan	3100 BP	N	
Oto-Pame-Chinantecan (of Western Oto-Manguean	3200 BP	N	
Tlapanec-Manguean (of Western Oto-Manguean)	3300 BP	N	
Mayan	3400 BP	Y	K'iche': ***kinaq'***
Western Oto-Manguean	3900 BP	N	
Eastern Oto-Manguean	3900 BP	N	
Uto-Aztecan	4000 BP	N	
Oto-Manguean	5200 BP	N[o]	
Genetic groups and subgroups of southern central America			
Cabecar-Bribri (of Talamancan)	1000 BP	N	
Matagalpan (of Misulmapan)	1300 BP[p]	Y	Matagalpa: ***pak***
Lencan	2500 BP	N	
Misulmapan	3500 BP	N	
Talamancan	3500 BP	N	
Genetic groups and subgroups of south America			
Jivaroan	140 BP[q]	Y	Huambisa: ***miik***
Tupi-Guaraní	1000 BP[r]	Y	Guarani: ***kumanda***
Salivan	2000 BP	N	
Purian	2500 BP	N	

(continued)

Table 3 (continued)

Note: Names of genetic groups are given in **bold** type and names of subgroups are given in normal type

Y evidence of a probable prototerm for bean in the group's parent language.

N no evidence of a prototerm for bean in the group's parent language

[a]Date calculated by the author. The calculation is based on the lexical comparison of Alabama and Koasati

[b]Date calculated by the author. The calculation is based on the lexical comparison of Huron and Wyandot using a highly truncated version of Swadesh's list of core vocabulary items. This date should not be uncritically accepted

[c]Date calculated by the author with the help of Pamela Brown. The calculation is based on the lexical comparison of Oneida and Seneca

[d]Date calculated by the author with the help of Pamela Brown. The calculation is based on the lexical comparison of Ofo and Biloxi

[e]Date calculated by the author with the help of Pamela Brown. The calculation is based on the lexical comparison of Tuscarora and Oneida

[f]Date calculated by the author with the help of Pamela Brown. The calculation is based on the lexical comparison of Delaware and Western Abenaki

[g]Date calculated by the author. The calculation is based on the lexical comparison of Potawatomi and Ojibwa

[h]Date calculated by the author. The calculation is based on the lexical comparison of Pawnee and Arikara

[i]Date calculated by the author with the help of Pamela Brown. The calculation is based on the lexical comparison of Fox and Kickapoo

[j]Date calculated by the author with the help of Pamela Brown. The calculation is based on the lexical comparison of Crow and Hidatsa

[k]Date calculated by the author with the help of Pamela Brown. The calculation is based on the lexical comparison of Osage and Lakota

[l]Date calculated by the author with the help of Pamela Brown. The calculation is based on the lexical comparison of Navajo and Western Apache

[m]Date calculated by the author with the help of Pamela Brown. The calculation is based on the lexical comparison of Yavapai and Kiliwa

[n]Date calculated by the author. The calculation is based on the lexical comparison of O'odham and Huichol

[o]I was unable to find any language of Eastern Oto-Manguean with a bean term that is phonologically similar to a bean term in any language of Western Oto-Manguean. Consequently, in terms of the convention followed here, there is no evidence for proposing that the ancestral language of Oto-Manguean had a word for the common bean. Nevertheless, Kaufman (1990b:102) reconstructs a bean term for Proto-Oto-Manguean, that is, **ntea*. According to him, reflexes of **ntea* occurring in Amuzgo-Mixtecan languages and in languages of Chinantecan denote "kidney" rather than "bean." Since Amuzgo-Mixtecan languages are affiliated with Eastern Oto-Manguean and Chinantecan languages with Western Oto-Manguean, it seems likely that the referent of **ntea* was "kidney" rather than "bean." Lexical evidence assembled by Rensch (1976:195–196) for his Oto-Manguean cognate Set 32 also suggests the latter interpretation

[p]Date calculated by the author. The calculation is based on the lexical comparison of Matagalpa and Cacaopera

[q]Date calculated by the author. The calculation is based on the lexical comparison of Aguaruna and Huambisa

[r]Date calculated by the author. The calculation is based on the lexical comparison of Guaraní and Oyampi

Bean terms are not posited for any parent languages of the other nine groups of eastern North America east of the Mississippi. Eight of these groups show glottochronological dates that are earlier by hundreds of years than 700 BP, conforming with the fact that cultivated beans were not present in the area before the latter date. Alabama-Koasati (of Muskogean) of the southeastern region of eastern North America has a glottochronological date of 390 BP (see Table 3). Lack of similar bean terms in Alabama and Koasati may indicate that beans found their way into some parts the American Southeast considerably later than 700 BP.

For the most part, there is no evidence whatsoever for positing bean terms for parent languages of the nine groups mentioned in the preceding paragraph. However, this is not the case for Five Nations-Susquehannock (of Iroquoian) (hereafter, Five Nations). All five languages of my sample affiliated with the Five Nations group have very similar, if not exactly the same, words for bean, indicating that a probable bean term should be posited for the group's parent language.[15] Marianne Mithun (personal communication), a well-known specialist on Iroquoian languages, informs me that phonologies of the terms in question are such that they could all be reflexes of a Proto-Five Nations word for bean. However, she also points out that the observed bean term phonologies would not be unexpected if borrowing were to account for term distribution. Indeed, it is her opinion that diffusion is the appropriate explanation.

The five Nation languages of my sample (Cayuga, Seneca, Onondaga, Oneida, and Mohawk) are spoken in New York State in areas that are geographically contiguous. Geographical contiguity facilitates diffusion of words, especially words naming things typically involved in trade such as agricultural produce. Another reason for believing that Five Nation bean-term similarity is explained by borrowing involves the glottochronological date for the group's parent language. By glottochronological reckoning, Proto-Five Nations was spoken at the latest around 1000 years BP. This date is some 300 years earlier than the archaeological appearance of cultivated beans in the northern Eastern Woodlands where Five Nation languages are spoken today. Of course, it is possible, but not especially likely, that the glottochronological date for Proto-Five Nations is simply inaccurate, inflating the language's actual age by 300 or more years.

However, there is additional evidence favoring the diffusion hypothesis. Another Iroquoian language, Tuscarora, shows the same bean word as those found in the Five Nation languages (Marianne Mithun, personal communication).[16] The occurrence of the same bean term in both the Five Nation languages and in Tuscarora could be interpreted as evidence for positing a probable bean word for the parent language of Northern Iroquoian of which Five Nations and Tuscarora are major subgroups. Proto-Northern Iroquoian has a glottochronological date of 2200 BP (see Table 3). Given the decisive AMS date of 700 BP for the earliest cultivated beans in eastern North America east of the Mississippi, it would be absurd to assert

[15] The Five Nations terms for bean are: Cayuga *usá'heda*, Seneca *'osáe'ta'*, Onondaga *usahé'ta*, Onieda *osahé:ta'*, and Mohawk *osahéta*.

[16] The Tuscarora term for bean is *θaehe'*.

that cultivated beans were known to speakers of Proto-Northern Iroquoian of over 2000 years ago. Even assuming, for example, that the glottochronological date for Proto-Northern Iroquoian overestimates chronological depth by a thousand years – which could hardly be so – would be tantamount to drawing the highly dubious conclusion that people of eastern North America east of the Mississippi were familiar with beans some 500 years before they become archaeologically visible in the region. Thus, possession of the same bean term by Tuscarora and by the Five Nation languages must be due to borrowing.

Tuscarora was spoken by groups in what is now Virginia and North Carolina when European settlers first came to eastern North America. Today, after several waves of northerly migration over many years, Tuscarora is spoken in New York State in geographic proximity to the Five Nation languages. The League of the Iroquois in New York admitted the Tuscarora as its sixth member nation in 1722. Thus, bean term diffusion, which explains the similarity between Tuscarora's word for bean and those of the Five Nation languages, must have occurred in historic times. The same historic-era borrowing dynamic probably also accounts for the sharing of a bean term by the Five Nation languages.

The earliest AMS date for cultivated beans from sites in eastern North America west of the Mississippi is around 850 BP. Bean terms are posited for four language groups of the region, all of which, as might be expected, show glottochronological dates no earlier than 850 BP (see Table 3). Missouri River Siouan's glottochronological date of 540 BP is the oldest date of the four. No bean terms are posited for the remaining four groups of the region (see Table 3). Glottochronological dates for the latter four, as expected, are earlier than 850 BP. Mississippi Valley Siouan's date of 1600 BP is the latest of the four dates.

A bean term is posited for only one of the five language groups of the American Southwest (see Table 3). This group, Yuman, has a glottochronological date of 1600 BP. This date is in accordance with the earliest AMS bean date for the region (around 2200 BP). Three language groups of the Southwest having dates older than 2200 BP (see Table 3), as might be expected, show no evidence suggesting that bean terms pertained to their respective parent languages.

For parent languages of the two genetic groups of Western America, Athapaskan and Miwokan, no bean terms are posited (see Table 3). Indeed, beans almost certainly were unknown to speakers of Proto-Athapaskan and Proto-Miwokan or even to speakers of any of their respective offspring languages until late historic times. Bean words of each of the five Miwokan languages sampled for this study are loans based on the Spanish word for bean, *frijol*.

The oldest AMS bean date for Mexico is around 2300 BP. Of the nine groups of Mexico and northern Central America for which bean terms are posited for parent languages, only two show glottochronological dates later than 2300 BP (see Table 3). The remaining seven have dates ranging from 2400 to 3400 BP. The latter dates suggest that beans were known to some groups of Mexico and northern Central America before 2300 BP.

The oldest glottochronological date for a group of Mexico and northern Central America for which a bean term is posited, 3400 BP, belongs to Mayan. The existence of a bean term in Proto-Mayan is all but certain. Kaufman (2003) in his recent etymological dictionary of Mayan reconstructs a Proto-Mayan term for bean (**kenaq'*). Reflexes of the latter protoword not only are found in languages of the majority of major subgroups of the family (see terms suffixed with (1) in Table 1), but also these words show expected sound correspondences. In addition, unlike the case of similar bean terms in languages of the Five Nations group discussed earlier, the phonologies of reflexes of the Proto-Mayan term do not accord with what would be expected if diffusion accounts for term distribution.

The 3400 BP Mayan glottochronological date suggests beans were known to some prehistoric Amerindians of Mexico and northern Central America about 1100 years earlier than indicated thus far by AMS dating. Possibly, the glottochronological date for Mayan may be somewhat inflated. However, it should borne in mind that the Mayan date used in this study has already been significantly adjusted for inflation. The original glottochronological date for Mayan, 4200 BP, first calculated and published by Kaufman (1976:103), like all glottochronological dates of this study older than 3299 years BP, has been reduced by 800 years. Nevertheless, the adjusted Mayan date (3400 BP) may still be inflated. If so, it is difficult to imagine that it is excessive by much. Conceivably, inflation could be as great as 200 or 300 years. It is highly unlikely that it is 400 years or more. However, even under the unreasonable assumption of 500 years inflation, producing a date of 2900 years BP for Proto-Mayan would suggest some peoples of Mexico and northern Central America knew of beans some 600 years earlier than indicated thus far by AMS dating.

A bean term is posited for the parent language of only one of the five genetic groups of southern Central America (south of Guatemala and Belize) (see Table 3). This group, Matagalpan, has a glottochronological date of 1300 BP. Lencan, for which no evidence for a parent-language bean term exists, shows the next oldest glottochronological date, that is, 2500 BP. This very limited evidence indicates that beans first occurred in the region sometime between 2500 and 1300 BP. To my knowledge, no archaeological beans from the area have been dated through use of AMS.

Despite the fact that a very large number of languages pertaining to many different genetic groups are spoken in this vast region of the New World, only four language groups of South America are included in this study (see Table 3). Dictionaries for many South American languages do not exist or are not readily accessible. In my maize-term study (Brown 2006a), which is similar in many respects to the present work, I was able to assemble words for maize from a large number of South American languages by using vocabulary lists prepared by Loukotka (1968) and by Huber and Reed (1992). Unfortunately, these lists do not also include Amerindian-language words for bean.

As noted, all published AMS dates for prehistoric cultivated beans of South America come from the Andean region, the oldest being around 4400 BP. None of the four South American genetic groups of Table 3 has member languages spoken in the Andean region. Rather, languages of all four groups are spoken in lowland areas east of the Andes. The glottochronological dates for parent languages of the four groups, constitute, to my knowledge, the only dates of any kind relating to prehistoric bean chronology in non-Andean regions of South America.

Bean terms are posited for parent languages of two South American groups, Jivaroan and Tupi-Guaraní. Glottochronological dates for these groups are, respectively, 140 and 1000 BP. There is no evidence for positing bean terms for ancestral languages of the remaining two groups, Salivan and Purian, which have 2000 BP and 2500 BP as respective glottochronological dates. This very limited evidence suggests that cultivated beans first occurred in South America outside the Andean region sometime between 2000 and 1000 BP.

Conclusion

In Brown (2006a), I line up glottochronological dates for prehistoric Amerindian languages against archaeological dates for the occurrence of maize as a dietary staple in the Americas in order to evaluate glottochronology's usefulness as a tool for studying prehistory. A strong correlation is found between glottochronological and archaeological dates, indicating the usefulness of glottochronology as a dating technique and its considerable potential to contribute to sorting out prehistory.

The purpose of the present similar study is somewhat different. Here, glottochronology and the comparative approach are used as a supplement to archaeological dating techniques to help establish the prehistoric chronology of beans in the New World. However, a byproduct of this study is further confirmation of the validity and usefulness of the method. For example, AMS has been most extensively used to date beans from archaeological sites of eastern North America. Consequently, the most definitive bean chronology for a region in the Americas is that of eastern North America. Glottochronological dates for the latter region (see Table 3) dovetail very closely with AMS bean dates (see Table 2). This is further corroboration of the legitimacy of glottochronological dates.

There are probably a number of different reasons why AMS dating of archaeological beans in other parts of the Americas has not been as extensive as that undertaken for eastern North America. The use of glottochronology in dating beans can be especially valuable for these regions. For example, for some hot and humid areas of the New World, macrobotanical specimens of prehistoric beans may never be forthcoming due to rapid putrefaction. For such regions, glottochronology may be either the most viable or the only approach available for dating beans.

The region of Mexico and northern Central America is a case in point. In Mexico, prehistoric beans, none of which has been AMS dated earlier than around 2300 BP, have only been recovered from a few dry caves. The excavation of prehistoric beans from other types of archeological site does not appear promising. Undoubtedly, there are hundreds, if not thousands, of Archaic and Early Formative sites in Mexico and northern Central America in which cultivated beans have been deposited and subsequently have entirely disappeared through natural processes of decay. This may help to explain why there is such a discrepancy between the glottochronological date for Proto-Mayan (3400 BP) which had a term for bean and the oldest AMS bean date for Mexico (around 2300 BP). Prehistoric cultivated beans known to speakers of Proto-Mayan of 3400 years ago have disappeared, perhaps forever, from the archaeological record because of decomposition. Apparently, none found their way into dry caves where they might have been preserved for future AMS dating. Hopefully, a few might have done so and may now await archaeological discovery. However, even if beans known to speakers of Proto-Mayan never become archaeologically apparent, we nonetheless know of their existence because of glottochronology and the comparative method of historical linguistics.[17]

Finally, linguistic results for Mexico and northern Central America may resolve a paradoxical finding of archaeological dating, that is, that the oldest AMS dated cultivated bean of the American Southwest (dated to around 2200 BP) is only slightly younger than the earliest AMS dated bean of Mexico (dated to around 2300 BP) (see Table 2). As mentioned earlier, multiple domestications of the bean occurred in the Andes and in Mesoamerica (Gepts 1998). Mesoamerica is a culture area of southern Mexico and northern Central America. Since beans were domesticated in Mesoamerica and probably diffused from there to the Southwest, the earliest beans from Mexico and northern Central America should be at least several hundred years older than the oldest beans from the Southwest. However, according to archaeological dates, they are not. On the other hand, the linguistic evidence indicates that beans of Mexico and northern Central America may actually be as much as 1000 years older than beans of the American Southwest.

Postscript

The immediately preceding section of this study (including footnote 17) is virtually unchanged from that of the draft sent to the *American Anthropologist* for consideration for publication. After submitting, I was contacted by Michael Blake, an archaeologist, who requested to see a prepublication copy. His response was enormously gratifying. He reported that in 1985 and 1990 he and John Clark recovered by flotation Early Formative *Phaseolus* specimens from open sites in the Mazatán region, Chiapas, Mexico. These specimens consisted mostly of *P. vulgaris*, but there also may have been remains of the generally smaller species, *P. acutifolius* (Feddema 1993). In 1993, Blake and Clark had one of the larger fragments from an early context dated through use of AMS. The fragment is reported as sample

[17] I may be overly pessimistic with regard to the possibility of finding prehistoric bean remains in open sites of the region. In response to my pessimism, Gayle J. Fritz in a personal communication writes, “I've shifted over the years away from thinking that beans are very unlikely to enter the archaeological record at open sites where they have to have been charred. At later pre-contact sites in eastern North America, we frequently find charred beans, sometimes a whole lot of them. Any flotation assemblage with lots of stuff will probably include anywhere from a few to many beans. So when archaeologists begin to float lots of soil from Archaic sites in Mexico, I think there's a good chance that the 2500–4000 year old beans that you convincingly predict were grown there will turn up.”

Beta-62914 in Blake et al. (1995:164, Table 1), but the authors did not mention that it was *Phaseolus*. In his dissertation, Clark (1994) describes the specimen as a carbonized bean (Appendix 3, page 547). In both reports the AMS date is presented as 3135 ± 55 BP (uncalibrated). The calibrated calendar age is 1514–1287 cal BC. Thus, unknown to me while preparing this paper, archaeology had produced evidence conforming with my conclusion, based solely on linguistic results, that the common bean was known to groups in Mesoamerica more than 3000 years ago.

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Death and Chocolate: The Significance of Cacao Offerings in Ancient Maya Tombs and Caches at Copan, Honduras

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Introduction

The mortuary rituals of the ancient Maya were laden with symbolism and this extended to the foods that they produced during ceremonies and offered to gods and revered ancestors. Comestibles placed in tombs were not simply meals, but tangible obsecrations meant to ensure the intercession on behalf of the living by ancestors with ancient gods. Such meals undoubtedly embodied the best that the community had to offer and were produced with an adherence to strict laws governing who could collect and create foods for rituals. Communing with the dead would have been a serious undertaking with great care taken in the construction of ritual gifts. The range of dishes placed in tombs and offerings were attached to a legacy of myths and the use of certain foods, and possibly food combinations, would have been intended to produce a particular outcome. This chapter is focused upon comestibles containing cacao, which were created for offerings in three Early Classic (c. A.D. 430–600) Maya royal tombs, an elite burial, and a cache associated with a tomb. I will first explore the motivation behind offering food to deceased ancestors, and then discuss the importance of cacao to ancient Mesoamericans, following this with a description of its use in tombs and offerings at Copan, and the connection of cacao to Maya conceptions of death and rebirth.

Cacao, Food, Death, and Culture

Cacao was an important food in ancient Mesoamerica, and was likely prized as much for its perceived nutritional benefits, as for its stimulating qualities and value as an item of trade and tribute. As Hastorf and Weismantel (2007:308) have noted, food serves two purposes within culture, one as a biological necessity and vital part

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of the economy and ecology of every community, and two, "as a symbol: a means for communicating a highly condensed set of profound statements about ecology, biology, and economy, as well as about the political, cultural, and religious systems of a given society." Foods are consumed before they are mythologized, and the myths that develop around them provide insight into their cultural importance. Clues to cacao's ancient value and associations can be found in the way it was used in iconography, the manner in which it was consumed, and the degree to which it was placed in offerings.

Feeding the dead was and continues to be a common practice in many parts of the world. On the surface such traditions demonstrate the sentiments that the living have for the dead. However, these rituals, as seen by individuals outside of the family, demonstrate that the living are capable of conducting appropriate rituals of respect for the deceased. For the Maya, and other cultures (particularly those with ascribed status), the dead legitimate the rights of the living (see Pearson 1993:203). As the status of elites is predicated upon their relationship to their ancestors it is in the interest of powerful living people to remind the rest of the community of their descent. Pageantry organized around the offering of food and goods to honored deceased leaders both recalls the relationship of the current oligarch to those dead and highlights the fact that the contemporary ruler is the person with the power to call on ancestral forces.

Mary Helms (1998:12) has noted that in kin-based societies (such as the chiefdom of Early Copan), the dead are perceived as having an active role in the society. For the Maya the existence of a person did not cease with death. Not only were tombs re-entered and offerings placed in them, in some cases psychoducts (open channels from tombs to the temples above them) were created to allow communication with the dead (Schele and Mathews 1998). A multitude of Maya iconography depicts deceased rulers as resurrected from Xibalba, the land of the dead, and carried up to the sky (Schele and Mathews 1998).

Eichinger Ferro-Luzzi (1977:507) has proposed that food offerings for the dead (and gods) can be understood as a language, a way of communicating with other-worldly spirits to bring about a desired outcome in the lives of the living, in effect, a materialized prayer. On the basis of archaeological and ethnographic evidence, cacao has long been an important part of such Mesoamerican obsecrations (Boone 1983; Hall et al. 1990; McNeil 2006c; McNeil et al. 2006; Parsons 1936). Vessels bearing the glyph for cacao or containing cacao residue have been found in elite Maya tombs dating back to the fourth and fifth centuries A.D. (Adams 1999; McNeil et al. 2006; Stuart 2006).

Cacao's Role in Ancient Maya Culture

The seeds of the *Theobroma cacao* tree were one of the most culturally valued plant products in Pre-Columbian Mesoamerica. In ancient iconography cacao was frequently paired with maize, the central plant of Mesoamerican lifeways, and comestibles made of a mix of these two plant products might have been particularly important as ritual offerings (Kufer and Heinrich 2006; Martin 2006; McNeil 2006a). As cacao trees favor shaded lowland moist climates, particularly those along riverways, the seeds could not be grown in all lands and in many areas they could only be acquired through trade (Millon 1955) (Fig. 1). Because the coveted cacao seeds were not an abundant resource, they were connected to wealth in Pre-Columbian Mesoamerica. As is frequently recounted, when the Spanish arrived on the shores of Mexico the brown non-descript seeds functioned as a form of currency (Landa 1941 [1566]; Millon 1955). While it is unclear when this tradition began, cacao was certainly an important tribute item by the Classic period as demonstrated both on a mural at the Maya site of Bonampak in Mexico where a sack of cacao rests beneath a ruler's throne (Houston 1997), and on Maya vessels depicting similar scenes (Stuart 2006). Rulers might have imbibed cacao regularly not only because of its refreshing qualities, but also as a symbol of their ability to

Fig. 1 Cacao tree growing in a shaded backyard in Copán Ruínas, Honduras. Cacao pods grow directly off the trunk and primary branches of the tree. Photograph by C. McNeil

consume wealth. As a food and food additive, cacao was prized for its stimulating affects as Mesoamerica had no other widespread plant with such properties (Bletter and Daly 2006). While cacao contains relatively small amounts of caffeine, to a people without any other significant stimulants, its affects would have been noticeable. It is a food which can 'awaken' the mind and this quality may have led to the associations between cacao and rebirth that will be discussed later in this chapter.

While today the only *Theobroma* with a natural distribution in Mesoamerica which is commercially valued is *T. cacao*, a second, *Theobroma bicolor*, continues to be important in Maya and Ladino rituals in some parts of Mesoamerica and was likely considered to be a type of cacao by the ancient Maya (Kufer and McNeil 2006; McNeil 2006c).[1] Some of the vessels discussed in this chapter may have contained *T. bicolor*, commonly called 'pataxte,' and not *T. cacao*.

Two major discoveries in the late 1980s made possible a new era in understanding ancient cacao use. In the first of these, David Stuart (1988) deciphered the glyph for cacao opening a window into the contexts in which the ancient Maya mentioned this important food. In addition, Stuart (2006) has deciphered inscriptions containing the cacao glyph on ancient vessels, providing information on the contents of feast foods. In this volume, Beliaev et al. translate additional feasting-ware inscriptions to elaborate the ingredients of Pre-Columbian comestibles.

In the second discovery, W. Jeffrey Hurst, of Hershey Technical Laboratories, working with samples provided by Grant Hall developed a method for assessing the presence of *T. cacao* and potentially *T. bicolor* in the ancient residues of Maya vessels (Hall et al. 1990; Hurst et al. 1989). Using reverse-phase high performance liquid chromatography, Hurst developed a method for analyzing chemical extractions from vessel residues, or ceramic fragments, to determine whether theobromine and caffeine are present (Hurst 2006). The presence of theobromine indicates that one of the two Mesoamerican *Theobroma* species was formerly used in a container. As *T. bicolor* has little to no caffeine in its mature seeds, the absence of a caffeine signature could indicate that a vessel once held this species (Hammerstone et al. 1994; Sotelo and Alvarez 1991). However, caffeine occurs in a much smaller quantity than theobromine in *T. cacao*, and it is possible that the caffeine could be more difficult to detect in the residue if the sample has been subjected to certain taphonomic processes.

Since Hurst first devised his method for analyzing ancient samples for cacao, he has processed over a 100 vessel residues greatly increasing our knowledge of the type of containers which contained cacao and the combinations of ingredients in which cacao was consumed and offered (Hurst 2006; Hurst et al. 1989; Hurst et al. 2002; McNeil et al. 2006; Powis et al. 2002, 2007; Prufer and Hurst 2007).

Both the seeds and sweet pulp of the cacao tree were eaten in Pre-Columbian times, but the seeds were the most widely valued, as only they could be passed

[1] The word Ladino is used for people of mixed or European ancestry who do not follow lifeways strongly rooted in traditional Mesoamerican belief systems.

along the extensive trade routes of Mesoamerica and people living in areas inhospitable to cacao tree growth would not have been familiar with the pulp. Unfortunately, all parts of the cacao pod contain the same amount of theobromine and caffeine, so currently there is no way to distinguish between vessels which held a beverage or sauce of the ground seeds and those that held a beverage or sauce of the sweet pulp.

Cacao in Ancient Vessels at Copan

The vessel residues discussed in this chapter come from excavations of the University of Pennsylvania Museum's Early Copan Acropolis Program (ECAP), which was directed by Robert J. Sharer. The Copan Acropolis is a human-produced hill containing the remains of buildings spanning this polity's Classic Period (approx. A.D. 400–850). The Maya built platforms and structures in their great polity centers using them for some period of time and then 'canceling' them and building new structures over them. This canceling process preserved structures to varying degrees within the Acropolis: in one case an entire building was carefully buried intact. However, most commonly only the platform of the building remains. Royal tombs were sometimes constructed within these platforms.

The ECAP project tunneled into the lowest levels of Copan's Acropolis to learn more about the development of the ancient kingdom during the Early Classic period (c. A.D. 400–600) (Sharer et al. 1999). In the base of the Acropolis they discovered two royal tombs, Hunal (Burial 95-2) and Margarita (Burial 93-2), as well as two elite internments, and many structures and caches. In the upper levels of the Early Classic Acropolis, ECAP uncovered a third royal tomb, Sub-Jaguar (Burial 92-2). Vessels discussed in this chapter were found in the three tombs, one of the elite internments (Burial 92-3), and a cache (Offering 93-16) found outside of the Margarita Tomb.

Artifacts from the single-chambered tomb in the Hunal structure indicate that this sepulcher likely held the remains of Copan's first Maya ruler, K'inich Yax K'uk' Mo' (Sharer et al. 1999; Sharer 2004). An inscription on Altar Q at Copan states that this individual was the founder of the Classic period dynasty, reigning from A.D. 426–437, although other inscriptions provide contradictory dates (Stuart 2004). The Margarita Tomb holds the body of a royal lady who archaeologists speculate was the Copan-born wife of K'inich Yax K'uk' Mo' (Bell 2002; Sharer et al. 1999). Her tomb, which rests above that of the male ruler, is a more complex structure than the Hunal tomb. It has a lower chamber (Chamber 1) containing her body and an upper offering chamber (Chamber 2). Stairs and a hallway built onto the northern end of the tomb allowed re-entry after the initial internment event until approximately A.D. 470 when access to this location would have ceased because of new construction which sealed the hallway leading to the tomb and its stairway (Sharer et al. 2005:176). One of the elite burials, Burial 92-3, contains an ornate jade and coral inlaid shell collar with a feathered serpent motif.

Sharer (2004:310) believes that because of its finely produced artifacts, this could be a re-deposited royal burial. Lastly, the Sub Jaguar Tomb may be the resting place of Ruler 8, Wil Ohl K'inich, who ruled from A.D. 532 to 551 (Sharer and Traxler 2003).

The Maya, and other Mesoamerican cultures, constructed their ritual centers as idealized versions of the natural world with temples and their pyramidal platforms echoing mountains, stelae 'trees,' plazas 'primordial seas,' and tombs and temple interiors 'caves' where the living could commune with the dead and the gods (Dunning et al., 1999; Schele and Mathews 1998). Some structures, such as the Pyramid of the Sun at Teotihuacan were built over natural caves (Heydon 1981). The royal tombs at Copan may have been symbolic caves at the heart of the ancient Acropolis. The Hunal and Margarita tombs appear to have been re-entered after the initial deposition of the body (Bell et al. 2004). This is particularly clear in the case of the tomb in Margarita, which is structured to facilitate such re-entry, unlike the Hunal tomb which could only be re-entered from the ceiling by removing a capstone. Descending into the dark sepulchers likely signified a descent into the Underworld, the land of the dead from which the rulers would be reborn. The temples later built above the tombs harnessed the power of the venerated bones of famed ancestors and became a location for communion with them. K'inich Yax K'uk' Mo' became the most venerated ancestor of the Copan Maya and it is likely that he and his spouse, represented the 'parents' of the great Classic period dynasty.

The tombs and caches found by ECAP contained an array of offerings including 63 vessels. Some of these ceramic forms were overturned or empty. When contents remained in the vessels they were carefully excavated with samples taken for a range of analyses (see McNeil 2006b:272–276 for sampling protocols). Residue samples were exported to the United States with permission from the Instituto Hondureño de Antropología e Historia. Sub-samples of the residue were sent to W. Jeffrey Hurst for reverse-phase high performance liquid chromatography to determine the presence of theobromine and caffeine (see Hurst 2006; Hurst et al. 1989). To date, Hurst has analyzed 31 of the samples from Copan (McNeil et al. 2006). Of these, 11 contained the remains of at least one species of *Theobroma* and nine contained caffeine, indicating that at least 9 out of 11 vessels held *T. cacao* as a comestible ingredient (Table 1).

The 11 vessels represented a diversity of forms: one platter, one deer effigy vessel, two small cylinder vessels, two cylinder tripod vessels, three ring-based bowls, one vertical-walled cache bowl, and one large bowl with mammiform supports (McNeil et al. 2006) (Table 1; Figs. 2–5). As will be discussed further in this chapter, these vessels likely held a range of beverages and foods containing cacao. Residue analysis (Hurst et al. 1989; McNeil et al. 2006) and the decipherment of cacao vessel inscriptions (see Stuart 2006, and Beliaev et al., this volume) have greatly expanded our understanding of ancient cacao comestibles. Residue analysis in particular has proven that cacao, contrary to the tales of Europeans (Coe and Coe 1996), was not simply a beverage prior to the arrival of the Spanish, but was also used in dishes with tamales and various types of animal flesh (McNeil et al. 2006).

Table 1 Vessels containing either theobromine, or theobromine and caffeine from the ECAP contexts

	Context	Vessel and sample numbers	Vessel description	Theobromine present	Caffeine present
1.	Hunal tomb	Vessel 1, 1/6/381-138 2000 M-138	Effigy vessel in the form of a deer	Positive	Positive
2.	Margarita tomb, Chamber 1	Vessel 18, 1/6/481-1 Residue sample: 2001 M-223	Ring-based bowl	Positive	Negative
3.	Margarita tomb, Chamber 2	Vessel 1, 1/6/208-1 Residue sample: 1994 M-75	Cylinder tripod	Positive	Positive
4.	Margarita tomb, Chamber 2	Vessel 5, 1/6/208-6 Residue sample: 2001 M-214	Cylinder tripod	Positive	Positive
5.	Margarita tomb, Chamber 2	Vessel 8, 1/6/215-2 Residue sample: 2001 M-295	Ring-based bowl	Positive	Positive
6.	Offering 93-16, outside the Margarita tomb	Vessel 2, 1/6/206-2 Residue sample: 2004 M-058	Large open bowl with mamiform feet	Positive	Negative
7.	Sub Jaguar tomb	Vessel 1, 1/7/290-16 Residue sample: 1993 M-193	Small cylinder	Positive	Positive
8.	Sub Jaguar tomb	Vessel 3, 1/7/290-99 Residue sample: 1998 M-104	Small cylinder	Positive	Positive
9.	Sub Jaguar tomb	Vessel 13, 1/7/290-11 Residue sample: 1992 M-105	Large cache vessel	Positive	Positive
10.	Sub Jaguar tomb	Vessel 17, 1/7/290-23 Residue sample: 2001 M-323	Platter	Positive	Positive
11.	Burial 92-3	Vessel 2, 1/5/15-3 Residue sample: 1993-129	Ring-based bowl	Positive	Positive

Ancient Comestibles Containing Cacao at Copan

Residue analysis at Copan revealed cacao's importance as a ritual offering. Every tomb or cache from which ceramic containers were tested, held at least one vessel with cacao. The form in which cacao was offered was likely varied, possibly from unprocessed seeds to fully prepared beverages or sauces. Traditionally cylinder vessels, sometimes with tripod feet, are thought of as ritual cacao beverage containers. This can be attributed to the prevalence of such vessels with a frothy substance resting above their rim in court scenes on ancient Maya painted vases (Reents-Budet 1994;

Fig. 2 The Vessel 1 from the Hunal tomb. A deer-shaped effigy vessel imported to Copan from the Guatemalan highlands. Early Classic period, Copan, Honduras. Excavated by the Early Copan Acropolis Program of the University of Pennsylvania Museum. Collection of the Instituto Hondureño de Antropología e Historia. Photograph by C. McNeil

this volume); however, a number of such vessels tested negative for cacao at Copan (McNeil et al. 2006). In cases where cylinder vessels bear the primary standard sequence with a cacao glyph, one can be more certain of its former contents (Reents-Budet 1994; Stuart 2006), but at Copan such glyphs are not found in the Early Classic period (McNeil et al. 2006). Therefore, residue testing is the only way we can determine the contents that the vessels formerly held.

Four cylinder vessels with cacao in their residues were found in Copan's tombs. One of these, Vessel 1 (1/6/208-1), was a stuccoed cylinder tripod vessel from Chamber 2 of the Margarita tomb (the upper offering platform), which retained its lid (Figs. 3 and 6). Its residue was dessicated into a 3 mm layer along the bottom of the vessel. The comestible in its original form was likely a highly frothy cacao beverage. This drink was not sweetened with honey as there was little pollen in the vessel (McNeil et al. 2006), but could have been sweetened with other additives such as a maize syrup. When I processed the sample for pollen I discovered that cinnabar was well distributed within it. Because the interior of the vessel is not painted with pigment containing cinnabar and the vessel was lidded, I concluded that this mineral was intentionally placed in the beverage. Another cylinder tripod vessel from Chamber 2 (Vessel 5, 1/6/208-6) tested positive for theobromine and caffeine (Fig. 3) and two small cylinder containers (Vessel 1, 1/7/290-16 and Vessel 3, 1/7/290-99) from the Sub Jaguar Tomb also tested positive for cacao (Fig. 5).

Vessel 1 from Chamber 2 of the Margarita Tomb is by far the finest of the four cylinder vessels. The vessel was imported from the area of Teotihuacan and painted at Copan in a Highland Mexican style with an image of the Hunal Structure (Reents-Budet et al. 2004) (Fig. 6). Out of the doorway of Hunal peers a goggle-eyed figure who David Stuart has suggested could be K'inich Yax K'uk' Mo' (Fash 2001).

Fig. 3 Cacao vessels in the Margarita tomb. Early Classic period, Copan, Honduras. The thin orange ring-based bowl (Vessel 18, 1/6/481-1) in the lower right corner was found in Chamber 1. The other three vessels came from Chamber 2. The small ring-based bowl (Vessel 8, 1/6/215-2) in the lower left contained the bones of tiny fish. Excavated by the Early Copan Acropolis Program of the University of Pennsylvania Museum. Collection of the Instituto Hondureño de Antropología e Historia. Photograph by C. McNeil

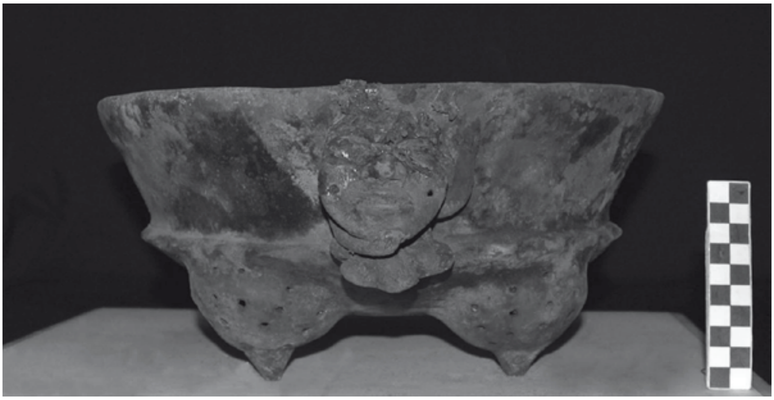

Fig. 4 Vessel from Offering 93-16 which contained cacao (possibly *Theobroma bicolor*) and turkey bones. Early Classic period, Copan, Honduras. Excavated by the Early Copan Acropolis Program of the University of Pennsylvania Museum. Collection of the Instituto Hondureño de Antropología e Historia. Photograph by C. McNeil

While this fine-lined painted stuccoed vessel is the quintessential cacao container, the majority of the other cacao vessels from Copan defied the stereotypes. Vessel 1 (1/6/381-138) from Hunal is a wide-bodied container which takes the form of a deer (see Fig. 2). This vessel was imported from Highland Guatemala and is similar to vessels found at Kaminaljuyu (see Kidder et al. 1946; Reents-Budet et al.

Fig. 5 Vessels from the Sub-Jaguar tomb that contained cacao. Early Classic period, Copan, Honduras. Excavated by the Early Copan Acropolis Program of the University of Pennsylvania Museum. Collection of the Instituto Hondureño de Antropología e Historia. Photograph by C. McNeil

Fig. 6 Cylinder tripod vessel (1/6/208-1) from Chamber 2 of the Margarita tomb. Early Classic period, Copan Honduras. Excavated by the Early Copan Acropolis Program of the University of Pennsylvania Museum. Collection of the Instituto Hondureño de Antropología e Historia. Photograph by C. McNeil

Fig. 7 This shell hand was found resting in the center of Vessel 1 in the Hunal tomb. Its palm was stained a rich reddish chocolate-brown color from the mix of cinnabar and cacao found in the vessel. Early Classic period, Copan, Honduras. Excavated by the Early Copan Acropolis Program of the University of Pennsylvania Museum. Collection of the Instituto Hondureño de Antropología e Historia. Photograph by C. McNeil

2004). Resting in its center imbedded in residue was a delicate scoop 'hand' carved from a Spondylus shell (Fig. 7). The mixture of cinnabar and cacao in the vessel stained the center of the artifact a reddish chocolate brown. This object has holes on one side that could have been used to attach an organic handle, which has since decayed. Assuming that it was a tool for removing cacao from the bowl, the form of the cacao was likely powdered and mixed with ground maize to produce a 'pinole' as the scoop would have been too delicate to use on the durable seeds or hard cakes of pure processed cacao and ineffectual with a liquid. Pinole with *T. cacao* or *T. bicolor* has the consistency of flour and can still be purchased in many outdoor markets in Mesoamerica (McNeil 2006c). Various spices may also be added to the pinole powder, which is mixed with water to produce a hearty gruel reminiscent of oatmeal. One wonders whether some sort of organic lid, long decayed, protected the deer vessel's contents when it was first placed in the tomb.

Two vessels out of the eleven positive for cacao contained animal bones. Chamber 2 of the Margarita tomb held a ring-based bowl (Vessel 8, 1/6/215-2) with the remains of small sardine-like fish bones and scales (Fig. 3). Residue from this vessel contained the chemical signature for cacao. The idea of chocolate covered fish tends to make today's people cringe. As mentioned above, limits on chemical analysis make it impossible to determine whether this vessel contained a sauce of the seeds or of the fruity pulp, which sounds more palatable. Offering 93-16, a stone-lined cache found just outside the Margarita Tomb, contained a large vessel with mammiform supports (Vessel 2, 1/6/206-2) which had another plain ceramic vessel placed over it like a lid (Fig. 4). This vessel held turkey bones (Davis-Salazar and Bell 2000), and tested positive for theobromine, but not caffeine, indicating that it may have held *T. bicolor*, rather than *T. cacao*. *T. bicolor* has hearty light-colored seeds with a flavor similar to that of almonds. A Teotihuacan-imported thin orange ring-based vessel (V. 18, 1/6/481-1) found in Chamber 1 of the Margarita Tomb also tested positive for theobromine, but negative for caffeine (McNeil et al. 2006; Reents-Budet et al. 2004) (Fig. 3).

The Sub Jaguar Tomb contained four vessels with the chemical signature for *T. cacao* – the largest number of vessels with cacao found in a single chamber (Fig. 5). One of these was a tamale platter. There are a number of reasons why a cacao signature would be present in a tamale platter: cacao could have been used inside the tamales along with some sort of meat; or cacao could have been mixed into the *masa* (ground maize dough) of which the tamales were produced; or lastly, a sauce containing cacao might have been placed over the tamales. Guatemalan festival tamales are still sometimes made with cacao (McNeil 2006c). Images of tamales with a brown sauce or a dot, possibly indicating savory or sweet contents, can be found on numerous Classic period painted Maya vases (see Reents-Budet 1994) (Fig. 8).

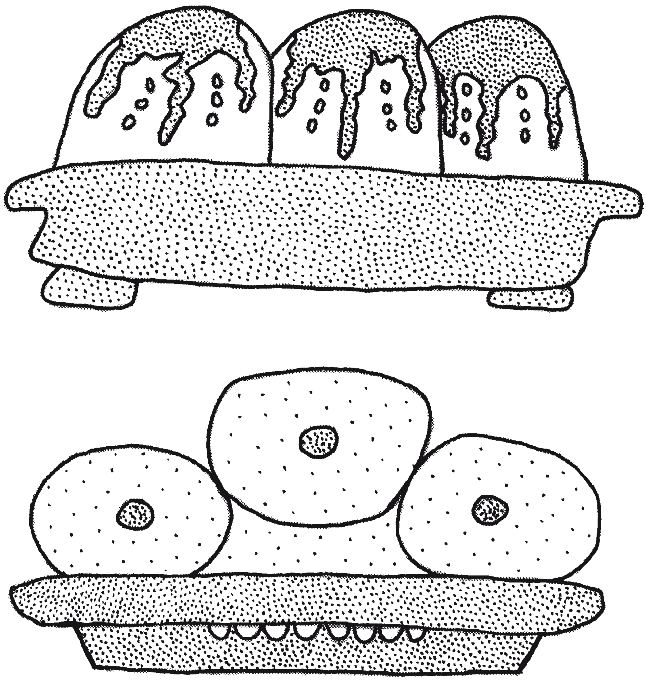

Fig. 8 Platters containing tamales are depicted on many Classic period Maya vessels. Sometimes they bear dots which may indicate animal flesh or sauces inside them. At other times, they are covered in dark sauces. Drawing by C. McNeil

Producing Foods Worthy of Revered Ancestors and Gods

Food may be offered in ritual contexts for a variety of reasons: to appease an angry spirit or god, as an expression of esteem, or in the hope that the receiver will grant a wish or favor to the giver (Eichinger Ferro-Luzzi 1977:508). Regardless of the intent, food produced for ritual purposes is frequently created under different circumstances than that made for consumption in the domestic sphere. The process of concocting food offerings for revered ancestors, a form of ritual performance, may have been more important than the product. The rules which frequently govern the act of ritual food production imbue the producers with the feeling that they are creating something special, a dish that transcends everyday comestibles even if most of the contents are the same as those consumed on a daily basis.

Over the last 100 years, ethnographers have documented prohibitions throughout Maya communities that shape the production of ritual foods, and it is likely that such strictures existed in the Pre-Columbian period. While some aspects of these traditions are widespread (such as rules which require ritual producers to abstain from sex), many are modified within different communities.

The act of creating a ritual dish begins with the choice of what that dish will be, and is followed by the choice of who will gather the necessary raw ingredients, and who will prepare it. In some ceremonies, the food eventually will be consumed by the participants, while in others it will be left somewhere as an offering, burned, or dispensed down a ritual spring.

In recorded Maya traditions, great importance is attached to collecting the water for the production of ritual foods (Landa 1941 [1566]; Redfield and Villa 1934; Wisdom 1940). As many Maya ceremonies are designed as pleas for water to ensure fruitful crops, this is an essential ingredient in ritual meals. Ritual water is frequently described as "virgin" and it is generally specially chosen virgins who acquire it.

Other raw materials must be acquired to produce ceremonial dishes whether through tribute or trade, or milpas and groves controlled by elites. Given the preponderance of luxury items in ritual contexts at Copan, we can assume that ritual foods would also have been made of the best ingredients. Agricultural producers are extremely knowledgeable about their crops, and differentiate between them at various stages in the growing process. Both maize and cacao have different flavors depending when they are harvested. For example, the best cacao pulp is acquired from pods at their earliest point of maturation, but the best seeds may come from late harvested pods (McNeil 2006c). Ancient Mesoamericans undoubtedly had an epicurean appreciation of cacao's varieties and prepared forms. We know from limited accounts (particularly from Highland Mexico) that there was a diversity of cacao varieties in the Pre-Columbian world with some valued more highly for consumption than others (Varey 2000). Cacao trees grow well in the low areas of the Copan Valley and the ancient inhabitants of the valley would have been able to meet the elite needs.

While food in Mesoamerica is generally prepared by women, among some Maya ethnic groups, men prepare dishes for ritual occasions (Faust 1998; Pugh 2006; Redfield and Villa 1934). With the exception of men mixing beverage components pre-prepared by women in one part of a rain ceremony (Kufer and Heinrich 2006), this is not true of the Ch'orti' Maya (the purported descendants of Copan's inhabitants) and seems to be a tradition particularly linked with the Yucatan and groups that have strong attachments with that area. However, sexual, bathing, and food taboos often exist for people involved in the preparation and offering of ritual foods (Kufer 2005; Wisdom 1940).

The choice of the food offered might sometimes have been tied to the vessel in which it was placed. Many of the vessels in the Copan tombs were imported, some from as far away as Teotihuacan and others from the Guatemalan Highlands (Reents-Budet et al. 2004). Vessels imported from far distances would have been highly valued. They might have been personal possessions of the deceased and filled with a favored meal and left following death. Evidence from Chamber 2 of the Margarita Tomb demonstrates that vessels of food, once offered, were not disposed of at a later date when the food had decayed, but appear to have been moved to the side and nested into older offerings. This was the case with Vessel 8, the small bowl containing fish and cacao. It is possible that some vessels were removed to be cleaned and have new offerings placed in them, but there is no evidence of this. The food dedicated to the Classic Maya dynasty's ancestors, does not appear to have been shared with the living after it was offered. Vessels in some contexts held well preserved contents, while the food in others was destroyed. All of the contents of Offering 93-16 were burned before the cache was ceiled perhaps to ensure that the smoke or 'essence' of the offerings reached the deities for whom they were intended. This practice is still found among some modern Maya ethnic groups (Fisher and Hendrickson 2003).

For the Copan Maya, the final touch to ritually prepared foods appears to have been the addition of cinnabar or hematite. All of the residues processed by the author for pollen analysis contained either cinnabar or hematite, or both, including the two which were from lidded containers: Vessel 1 from Chamber 2 of the Margarita Tomb and the cache vessel containing the turkey bones in Offering 93-16. Cinnabar, in particular, was sprinkled throughout the ritual spaces and over the bodies of the rulers. Its bright red color undoubtedly recalls the importance of blood as an offering to ensure agricultural and community success. The presence of these minerals in lidded vessels implies that they were treated as ingredients in the ritual food preparation process. One hopes that living ruler's meals did not contain such additives as cinnabar, in particular, contains mercury, which can cause a large range of health problems, including madness. In addition, both the cinnabar and hematite found in the vessels have a granular consistency and would be unpleasant for a living person to consume. Thus, the Maya appear to have differentiated between meals created for the living and those created for their revered ancestors.

Food, Cacao, Religion, and Meaning

Cacao was found in one third of the sampled vessels, implying that it was an important offering in tombs and caches. As noted earlier, some of the finest vessels found in the ritual contexts, and which were imported from great distances, contained cacao and this may be a reflection of cacao's association with wealth and the feasting stratagems of chiefdoms. However, perhaps more important is what cacao meant to the ancient Copan Maya. The plants and animals of ancient Mesoamerica were woven into a complex mythological fabric. While no cacao iconography remains at the site to provide hints of what the tree's associations were during the Early Classic period, it abounds on Late Classic period stone and clay artifacts (McNeil et al. 2006), sometimes in the form of trees (particularly World Trees) and at other times depicted as pods.

World Trees, whether they are abstract, cacao, maize, or ceiba (all common at Copan) are represented in a variety of metaphorical forms.[2] Such trees are sometimes designated by a cross form as can be seen in a cacao pod-adorned censer which bears a womanly shape with a stone cross at its top (Fig. 9). Cacao pods

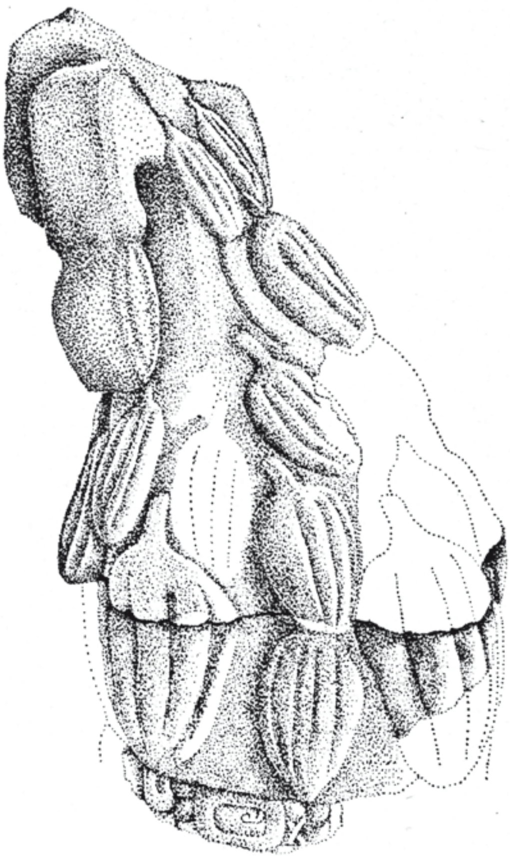

Fig. 9 Stone censer with a womanly form. The cross at the top marks it as a World Tree or *Axis Mundi*. Late classic period, Copan, Honduras. Collection of the Instituto Hondureño de Antropología e Historia. Drawing by Edgar Zelaya

[2]For the Maya and people of other Mesoamerican cultures, maize (an herb) is also commonly represented as one of the "World Trees."

drip off of the skirt of the censer with a large pod in the stomach area of the sculpture and two pods for breasts. The use of crosses to represent trees may have roots in the tendency of the ceiba tree (*Ceiba pentandra* L.), one type of tree frequently designated as a Maya World Tree, to send out its limbs in the form of a cross. There are several large stone censers or "saklaktuns" at Copan that depict cacao trees as laden with pods, the embodiment of fertility (see Figure 9) (McNeil et al. 2006).

The Maya also designate trees by placing the *pax* glyph at their bases (Fig. 10). At Copan a censer lid takes the form of a contorted figure (a form commonly referred to as an 'acrobat' or 'diving god') with cacao pods growing from his sides.

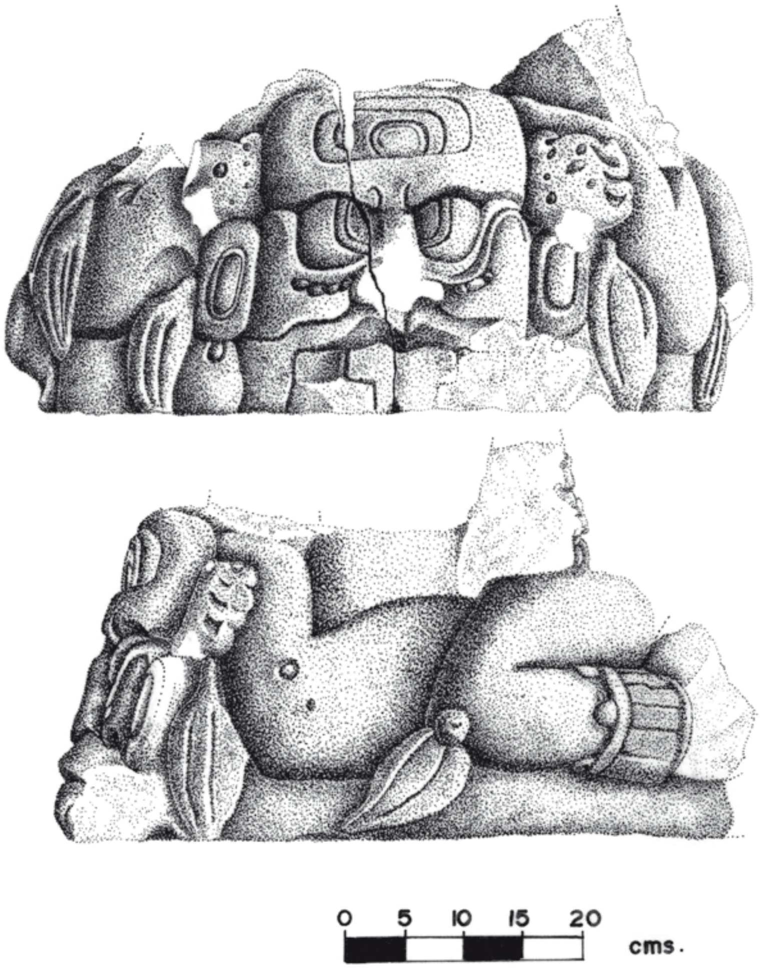

Fig. 10 This censer lid bears a *pax* glyph at the base which designates it as a tree. Cacao pods grow off of the body of a figure who Simon Martin (2006) theorizes is the Maize God. Late Classic period, Copan, Honduras. Collection of the Instituto Hondureño de Antropología e Historia. Drawing by Edgar Zelaya

Fig. 11 Three ceramic cache (or censer) vessels. The right and center vessels are believed to represent ancestors reborn as cacao trees. The vessel on the left depicts the Jaguar God of the Underworld in the form of a cacao tree (note that he is in the acrobat form which denotes a tree). Late Classic period, Copan, Honduras. Collection of the Instituto Hondureño de Antropología e Historia. Photograph by C. McNeil

On his backside he bears a *pax* glyph, which signifies "tree". Unfortunately, his head has been lost, but Simon Martin (2006) has convincingly argued that he represents the Maize God. Martin (2006) proposes that cacao is the first fruit that grows off of the Maize God in the Underworld. This figure is doubly marked as a tree, because not only does it bear a *pax* glyph, but Taube (2005) has noted that acrobat figures in Maya iconography represent trees.

The most common form of cacao iconography at Copan can be found in the form of ceramic vessels that represent cacao trees. The clay 'cacao trees' take three forms: ceramic cache or offering vessels with a human face floating on their surface, which likely represents an ancestor, and cacao pod adornments on their upper edges and sometimes on their lids (Fig. 11), simpler forms of these vessels without depictions of ancestors (Fig. 12), and acrobat figures with cacao pods growing from their sides or one on their head (Fig. 11).

For the Maya, trees not only bore the fruits of important food resources, but ancestors are frequently depicted as various trees or maize plants (Martin 2006; McNeil 2006b; McNeil et al. 2006; Schele and Mathews 1998). In the famed Temple of the Inscriptions at the ancient Maya site of Palenque, the seventh century A.D. ruler Pakal's ancestors are carved into the walls of his great stone coffin, each represented as a different tree species. His mother, Lady Sak' K'uk', is depicted born anew as a cacao tree (Schele and Mathews 1998) (Fig. 13).

The representation of ancestors as cacao trees appears to tie into ideas which continue to be found among some Maya groups, that, "the soul of the dead is reborn to a new life" (Christenson 2001:206). In the modern Maya community of Santiago Atitlán a tree is planted on each grave "representing the rebirth of the individual" (Christenson 2001: Fig. 6.37). Maude Oakes (1951:212) documented a similar practice during the 1950s in Todos Santos, Guatemala, where a maize plant was grown on the top of new burials.

Fig. 12 Cache (or censer) vessel with cacao pods adorning its lip and lid. Late Classic period, Copan, Honduras. Collection of the Instituto Hondureño de Antropología e Historia. Photograph by C. McNeil

An interesting Pre-Columbian version of this practice was discovered by archaeo-logist Keith Prufer. Prufer excavated the burial of a male individual in a cave who he proposes may be a shaman (Prufer and Hurst 2007). A bowl was inverted over the pelvic area of the individual and under the bowl were discovered 5 seeds which W. Jeffrey Hurst determined to be cacao. While the practice of placing seeds over burials may have been common in the Pre-Columbian period, it is extremely rare for uncarbonized seeds to survive in the Maya Lowlands, making Prufer and Hurst's discovery an important one. The number 5 may be particularly associated with cacao as a cross section of the majority of cacao pods reveals an arrangement of five seeds (Pugh 2006). Cacao and other goods are commonly offered in sets of five in Maya ceremonies as the number 5 is tied to the concept of the quincunx, where offerings placed in a square represent the four corners of the Maya world and an offering placed in the center represents the axis mundi, which joins the world of the living with that of the Underworld and the heavens. It seems likely that cacao seeds were placed over the dead individual to help his soul to be reborn.

Fig. 13 Lady Sak' K'uk', who ruled Palenque briefly and was the mother of its king Pakal, is represented twice on the walls of his sarcophagus reborn in the form of a cacao tree. Drawing by E. Guerra after Schele and Mathews (1998: 121)

Conclusions

Ceremonies involving the placement of cacao offerings mixed with minerals in areas devoted to revered rulers were most certainly perceived of as avenues for communicating with these ancestral beings. The presence of minerals in the Copan vessels demonstrates that the Maya conceived of offerings for the deceased as separate from foods consumed by the living. These foods would have been placed in the tombs with reverential intentionality. The comestibles frequently gifted in valuable imported vessels were meant to ensure success for the living by calling on the powers of the dead.

A wealth of religious tales and associations were connected with particular foods in the Pre-Columbian Maya culture. Cacao was particularly associated with maize, fertility, the Underworld, and the rebirth of the soul of ancestors. It may be that meals with this valued substance in them were deemed necessary to awake and sustain the souls of the dead. The ideology of the ancient Maya endowed such beings with a power vital to the health of each polity.

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Feasting with Foam: Ceremonial Drinks of Cacao, Maize, and Pataxte Cacao

Judith Strupp Green

Five hundred years ago, Spanish cleric Diego de Landa recorded that his Maya informants enjoyed foamy beverages of cacao and maize for major celebrations. Landa (1941[1566]:90) remarked on the high value the Maya placed on the buttery foam crowning these beverages. His words elicit two questions that will be considered in this analysis: How could stable foam be created on a beverage of maize gruel (*atole*) and chocolate, and why was the foam so highly valued? My fieldwork in the Yucatán, Tabasco, and Oaxaca provided some answers, as did replication experiments in my California kitchen using ingredients gathered while in the field. The work of previous investigators was also invaluable. But local people like Don Isaac Vásquez and his family in Oaxaca expressed a strong interest in preserving significant indigenous customs in danger of disappearance and these ethnographic sources were most important. The Canul family in Xocen, Yucatan, was equally committed to providing insight, especially Fátimo Canul Noh and his mother, Doña Jacinta Noh Pech. Not to be underestimated were the personal culinary demonstrations and help given to me by women and men whose names appear in the acknowledgments.

The drinks in this study combine *atole* (cooked ground maize and water) with chocolate, a product of ground cacao nibs. This is an auspicious combination considering the importance of these two ingredients. *Atole* is the daily breakfast in indigenous Mesoamerica, as it was in the Pre-Columbian past. Maize, from which *atole* is made, is according to their epic, the Popol Vuh, the stuff of which the Maya themselves were created. And cacao was one of the first delights that the gods provided for humankind from the Tree of Sustenance (Christenson 2003:193–195). Chocolate, made from the seeds of the cacao fruit and served in beautifully painted vessels, has been strongly associated with Mesoamerican elites and their feasts for over 2,000 years.[1]

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[1] In the Florentine Codex, Sahagun (1950–1982 [1590] Bk.1, 1970:44) reports that an unblemished, healthy woman slave or captive destined for sacrifice at the Aztec Panquetzaliztli feast could be spared or even selected for an elite marriage if she knew how to make good chocolate.

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One proof of the importance of cacao and maize beverages lies in the hieroglyphic texts and iconography on the vessels themselves. Beginning in the early Classic Period, these invaluable ceramic paintings relate narratives from Maya mythology and the life of the elites. Modern epigraphers have reported that a specialized text around the vessels' rims had another message. It described whether the vessel was painted or carved, what type of food or drink it held and, in some cases, for whom it was made. The decipherments, particularly for specialized terms identifying specific cacao drinks, continue to challenge scholars (Stuart 2006:200–201) although progress is being made (Beliaev et al. this volume).

The artists who painted courtly feasting scenes on the ceramics portrayed food being served in cacao vases, *atole* bowls, globular serving vessels, and tamale plates. A few even display the chocolate colored foam bubbling over the brim of the cacao vase, directing the viewer's attention to this precious feature.[2]

How was the foam, reported by Landa, actually made on the mixed cacao and *atole* drinks he described? Contemporary cacao and *atole* drinks, such as *posol* in Tabasco, *tan uk'ul* in Yucatan, and *champurrado* in Oaxaca, are not foamy. My replication studies have shown that stable foam cannot be produced by continuous beating of these mixtures of *atole* and chocolate.

However, in the Zapotec Valley of Oaxaca, the quintessential fiesta beverage *chocolateatole* is just such a drink. Its basic ingredients are *atole* and chocolate. It has a thick layer of foam that remains stable for a considerable time. For special celebrations groups of Zapotec women gather to grind the ingredients in a communal hall filled with *metate*s (grinding stones). They tell me that the secret ingredient for stable foam is a ritually treated *pataxte* cacao (*Theobroma bicolor*). My research indicates that the beating techniques and time-honored order of preparation and serving (what a recipe would label "instructions" and "serving suggestions") are equally significant. The last minute layering of the thick cool chocolate foam on the hot *atole* by the Zapotec hostess is a gracious performance in itself, worthy of the celebration.

Atole and Creation: The Goddess Xmukane Creates Human Life

The story of Maya creation in the Popol Vuh features Xmukane (*She who has borne children*) at her grinding stone, the *metate*. She is pulverizing white and yellow maize that the Mountain of Sustenance provided. She grinds the maize nine times and adds water to give man strength and health (Christenson 2003:195). Water and

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[2] The "K number" here refers to a vessel listed in the popular and accessible photographic database created by Justin Kerr for Maya decorated ceramics, many with hieroglyphic inscriptions. The website is: *www.mayavase.com*.

maize are the ingredients of *atole* and *masa* (maize dough). In fact, nine grindings would be three times finer than that required for *atole* (Coe 1994:136–138).

Atole: Liquid Breakfast

Mexico has some edibles that straddle the border between food and drink. The ubiquitous *atole* (from Nahuatl *atolli*, Maya *sa'*) fits this description. The Spanish called it a type of gruel or porridge. The Maya still drink this nutritious boiled maize and water beverage daily, usually for breakfast. In fact the phrase in Yucatec Maya for eating the morning meal is "*Ko'ox uk'ul sa'*" (Let us drink *atole*) or simply, "*Ko'ox uk'ul*" (Let us drink [breakfast]).

Plain *atole*, often called *atole blanco*, is a simple recipe in Yucatan, Tabasco, and Oaxaca. The ingredients are lime-treated (*nixtamalized*[3]) maize and water. The dried maize and lime (*cal*) water are left out in pails to soften the kernels the night before the drink is needed. The indigenous woman, up before dawn, rinses, strains, and grinds her maize on a *metate* or in a metal grinder to a smooth consistency. Then she boils it in water, adding a little salt or sugar, depending on her family's taste.

In the season(s) when the newly harvested maize is available,[4] a Maya woman can use fresh maize (*elote*) and save the step of *nixtamalization*. This special *atole* is called *sa' is ul* (Everton 1991:81). Maya farmers (*milperos*) of central Yucatan perform ceremonies (called *jo'olbesaj*) to celebrate the first fruits of their maize fields (Fig. 1). Because farmers plant the seed at various times, depending on the rains, the harvest date and ceremony can differ slightly. Most occur in September,

[3] For most of the year, indigenous people in Mesoamerica eat dried maize that they *nixtamalize*. This post-harvest alkaline treatment literally transforms maize into a significantly more healthful food (Katz et al.1974). It also softens the outer skin (pericarp) of the maize kernels for grinding on the traditional stone *metate* or in a hand grinder. First the dried maize is shucked and boiled briefly in an alkaline solution of lime water (calcium hydroxide) or wood ashes. Women soak the kernels for hours, often overnight, till the softened maize is ready to strain and grind into the finely textured dough for *atole*, tortillas, and tamales. *Nixtamalized* maize dough (*masa*) is also used as a thickener in meat stews such as the *chilmole* of Yucatan and *saquic* of Guatemala. The alkaline treated *masa* improves the protein value of the maize (Coe 1994:14) and releases bound niacin so the body can absorb it (McGee 2004: 478). It may also reduce mycotoxins present in maize (Burns et al. 2008). The culinary equipment for the *nixtamalization* process was found archaeologically, suggesting its use in south coastal Guatemala between 1500 BC and 1200 BC . This technology has been proposed as causative in the rise of civilization in Mesoamerica (Coe 1994:14) and the development of Mississippian culture in prehistoric southeastern North America (Myers 2006:517–518).

[4] Redfield and Villa Rojas (1962:143–144) reported such a festival in Chan Kom, Yucatan in the 1930s called *hol-che* for which the women prepared green maize *atole* (*iz ul* or *ahza).* The words *ul, sa' and sakha/saka'* were found on inscriptions on Classic Period Maya ceramics to describe the intended contents of these vessels as *atole* (Stuart 2006:187, 191). Colonial documents show that "*ul* or *"sa' ul"* were terms used in Yucatec for green maize *atole* (Barrera Vásquez 1995:899) and *sa*' (Barrera Vásquez 1995:707) the general term for the common *atole* made from dried [and usually *nixtamalized*] maize available all year.

Fig. 1 Procession of young Maya men offering ears of maize tied to a rack during Jo'olbesaj, the first fruits ceremony in 2008 in Xocen, Yucatan (Photograph courtesy of Fátimo Canul Noh)

according to Fátimo Canul of Xocen, whose relatives are *milperos*. During this time only, green maize *atole* (*tumben sa'* or *is ul sa'*) and roasted green maize cobs (*pibinal*) are consumed. For the *atole* the fresh kernels are not soaked in lime water since the maize is very tender. Instead, they are simply ground and boiled with water. The Zapotec women prepare this too, and the delicate flavor of savory hot *atole* offered to me in Oaxaca on a cold night in late October during the *Dia de Muertos* festivities brings back fond memories. Elsie Clews Parsons (1936:279) reports that this green maize *(atole elote)* was made at harvest festivals.

Cacao: Gift from the Tree of Sustenance

The mention of chocolate has tantalized the taste buds, evoked romance, and challenged creative chefs for hundreds of years since the Europeans discovered this New World delight. What is not as well known is the role chocolate and its fruit, cacao, played in pre-Columbian America 2,000 years earlier. It is generally accepted that the cacao tree's sweet white fruit was consumed long before anyone thought of making chocolate from it (McNeil 2006a:7). In 2006, I sampled cacao juice in a Bribri home in Yorkin, Costa Rica (Fig. 2). It was mildly sweet and refreshing and revealed no chocolate flavor. It is a cacao fruit drink, but it is not chocolate since it is not made from the seeds. Henderson and Joyce (2006:140) call

Fig. 2 Drinking cacao fruit juice in a Bribri home in Yorkin, Costa Rica 2006 (Photograph courtesy of Dean Strupp)

such a beverage, cacao *chicha* when it is fermented to the alcohol stage.[5] They propose that this type of drink may well have been the predecessor of chocolate beverages and furthered the development of fermentation of the seeds for improved flavor in chocolate (Henderson et al. 2007:18939).

Chocolate is the processed product, liquid or solid, of the seeds of the fruit of the cacao tree (*Theobroma cacao* L.) (Coe and Coe 1996:18). Chocolate does not describe the fruit juice mentioned previously, although the popular media often confuse the two (i.e. the incorrect use of terms like 'chocolate wine' or 'chocolate

[5] Fermentation is a comprehensive and sometimes confusing term. It covers many ancient and modern techniques of preserving foods by using desirable microorganisms or their enzymes on food products to make biochemical changes that extend the life of these foods. Yoghurt, wine, soy sauce, pickles, beer, and leavened bread are all fermented. Cacao pulp ferments naturally when piled in a container (for the Maya sometimes a canoe) and the juice that drains off can be made into a beverage. This human-managed fermentation lasts 3–7 days. It also affects the beans/seeds and changes the flavor of chocolate made from them, as does the drying and roasting process. It is *not* alcoholic. Fermentation to make wine from the fruit (not the seeds) requires further steps to turn its sugars to alcohol (Green 2008; Ribeiro Diaz et al. 2007).

beer' for fermented cacao fruit juice). There can also be confusion with a similar word "cocoa." This term in English specifically refers to the invention in 1828 by Coenraad Van Houten of an easily dissolved low-fat chocolate powder that, mixed with milk, became the comfort food for children all over the world (Coe 1994:50–51).

Sometime before 600 BC, some adventurous Mesoamerican, a cook or perhaps a brewer (Henderson and Joyce 2006:152–153), invented the process of making chocolate from the seeds of the cacao fruit. This process required significant ingenuity as the cacao seeds must go through time-critical steps after they are released from the split fruit pods. They naturally ferment in the fruit's juice (Fig. 3) in wooden containers and dry in the sun in a centuries-old process. However, among present day farmers in Tabasco if it is raining or overcast, they can be dried over a gas powered heater (called a *samoa*) at a community center (*acopio*). At this point the seeds (called beans in English) are bagged and sold to traders.

For sale in certain areas such as Oaxaca, the community center's staff just washes and dries the beans (*bañados*) in the sun instead of fermenting them in wooden bins because these buyers prefer it. There will be some natural fermentation, however, that occurs before the beans leave the farm. Two young engineers, Reynol Chamec Cruz and Mario Pérez Córdova, who were managing the *acopio* explained that there were three types of cacao sold in the cacao processing center in the Comalcalco district: *bañado* (washed only), *beneficiado* (partially fermented), and *fermentado* (fully fermented), depending on the buyers tastes and needs. My ethnographic research indicates that some cacao growers believe that the fermented beans develop the best flavor and some believe that fully fermented cacao is too acidic (Green 2006, 2008).

The Maya woman from Yucatan buys cacao seeds/beans from traders bringing them from Chiapas or Tabasco and later toasts them on her griddle (*comal*) (Fig. 4). Then family members sit on small wooden chairs around the circular low kitchen table shelling them. The peeling of the crusty hull reveals the softer cacao nib, the

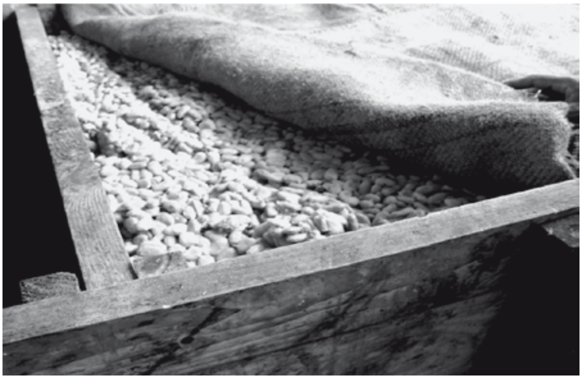

Fig. 3 Cacao beans (seeds) with white fruit pulp adhering to them, fermenting in wooden bins, Comalcalco community center (*acopio*), Tabasco (2006) (Photograph by Judith Strupp Green)

Fig. 4 Doña Jacinta Noh Pech toasting cacao beans at her hearth in Xocen, Yucatan (Photograph courtesy of Alexander Green, 1998)

cacao "heart," now ready for the transformation into chocolate. After the toasting and peeling, she energetically grinds the cacao nibs with a rolling wrist motion on the *metate* (or a hand grinder). Toasted and ground cinnamon and allspice can be added. The chocolate liquor (nonalcoholic satiny syrup) emerges slowly and smoothly. While the liquor is still warm, she drops small amounts on butcher paper where the discs (*tortitas* in Yucatan) naturally harden during the cooler night. In the morning she slips a few of these into hot water and stirs it in a wooden vessel and beater to create drinking chocolate (Fig. 5). This is the method my son, Alex, and I observed in Xocen, Yucatan with the Canul family during *Janal Pixan* (Days of the Dead) in 1998 (Green 2003a). In Mesoamerica; nearly all chocolate was served as a hot beverage, not eaten as a solid snack or dessert. The millennium ushered in a plethora of chocolate candy bars and confections that I had never seen in decades of traveling in Mesoamerica.

Origin of Cacao in the Popol Vuh

According to the sacred book of the Maya, cacao (paired with *pataxte cacao*) was second to be mentioned in the Popol Vuh after maize, in a list of "delicious things" provided for the world from the Paxil Mountain of Sustenance. This is the "excellent mountain" from which the pair of yellow and white maize ears was taken to make the first humans (Christenson 2003:193–195). The "cacao pair" appears again as a bribe that The Hero Twins agree to give the rodent that tells them where their dead father's ballgame equipment is hidden. The rat's food turns out to be cacao and *pataxte* as well as maize, chilies, beans, squash seeds, and any other fallen food refuse he could find (Christenson 2003:151), as he and his kin do to this day.

Fig. 5 Pascuala Canul mixing chocolate with the traditional Yucatec Maya wooden vessel and beater (Photo by Judith Strupp Green, 1998)

A Cacao Goddess has a cameo reference in the sacred book as Lady Cacao (*Xkakaw*), one of the guardians of food, when the desperate mother-to-be of the Hero Twins invokes her help (Christenson 2003:137). Some versions of cacao supernaturals are in the fine collection of the Popol Vuh Museum in Guatemala (Chinchilla Mazariegos 2005:Fig. 1, 11–14).

Precious Narratives: Inscriptions on Cacao Drinking Cups

By the Early Classic Period, elites had highly skilled painters and engravers create cacao vases, which are essentially works of art. They designed them as gifts to honored guests at major feasts. These priceless vessels often displayed mythical scenes and hieroglyphic inscriptions that recognized the noble recipients by title and name. Their shape was cylindrical, sometimes with slab legs and pointy lids. They varied in size from two-handed multi-liter vases to small delicate ones holding no more than a teacup-full. The valued vessels even followed their owners to the tomb, to be unearthed later by archaeologists or grave poachers.

The scribes who painted hieroglyphic inscriptions on the cacao vases had even more information to relay. They often indicated whether the vase was painted or engraved, the type of drink it held and for whom. When they wrote about cacao they often characterized the type of beverage, although the "recipes" are difficult to interpret (Stuart 2005: 133–144).[6]

A few texts on Maya vessels' spell out maize and cacao mixed drinks. Stuart (2006:Fig. 9.7) translated the inscription of a low wide bowl ($6 \times 17 \times 49$ cm^3), on Kerr catalog number K2777, as a "drinking vessel for chocolaty *atole*" (Kerr n.d.; Beliaev et al. this volume). In this case, the artist emphasized the fact that the bowl was for *atole* with chocolate added. This correlates with the finding that vessels with *atole* inscribed on the rim were usually bowls rather than the cylindrical forms used for cacao. This bowl was labeled as an elite woman's vessel for drinking chocolaty *atole* (*kakawal 'ul*). It displays a painting on the outside surface of repeated clusters, possibly of cacao fruits, in a quincunx pattern with a cross-cut pod as the center. Beliaev, Davletshin, and Tokovinine (this volume) offer a comparative interpretation of a vessel holding *atole gruel*-ish or *atole*-y cacao (*sa'al kakaw)* in which the cacao is emphasized with *atole* added. They identify this text on three unprovenanced vessels (K7529, K6813, and a Tikal example MT003) (Kerr n.d.).

Most Maya drank *atole* from gourd bowls. These light bowls made of the scraped and cleaned half hulls of the calabash tree (*Crescentia cujete* L.) are widely used today for *atole* or chocolate. Some elite *atole* drinking vessels in the past were made of clay and a few resemble gourds. The inscription engraved into the clay rim

Fig. 6 Classic Period bowl for *atole*, Chocholá style (Photograph courtesy of Linda Fisk, 1997)

[6] A case in point is the decipherment for "foamy" chocolate (*om? kakaw*) that consists of a "fish" glyph with multiple bubbles emerging from its mouth. This collocation is no longer accepted as indicating foam by Barbara MacLeod [MacLeod personal communication (2008) and Michel Quenon personal communication (2008)].

of a small unprovenanced bowl (Fig. 6) in the Chocholá style proclaims its intended use was for *atole*, "*ul*" in Maya, for a lord, *sahal,* [named] *Cho?lom*. The "cho" decipherment is still disputed. This individual's name appears on other vessels presumably from Northern Yucatan (Green 1997:93, Fig. 3a–c, Fig. 6 for comparison of vessel texts).

These atole bowls appear in several shapes, but always wider than their height, unless they are larger serving bowls. Another glyph combination referring to maize and chocolate has been deciphered as *sakhá* on what is probably a serving vessel (K4995) (Stuart 2006:187). A variation of this word, *zacá* was described in the sixteenth-to-seventeenth-century Maya Spanish dictionary, (Motul 1930:216) as *atole*, sometimes mixed with cacao, as it is today in Yucatan. Faust and Hirose-Lopez (2006:412) described *saká* for ritual use, but sakhá/saká/zacá may have been used for other beverages as well, citing Stuart's (2006:187) comment on the "handful of vessels" extant with this collocation.

Ritual Importance of Cacao

Since *Theobroma cacao* has recently blossomed as a serious anthropological theme, so has the study of its role in ritual in Mesoamerica. Articles in the comprehensive *Chocolate in Mesoamerica* volume have summarized the latest information, especially on the life cycle ceremonies involving cacao and birth, puberty, marriage, and death (McNeil 2006b:355–365).

My earlier research focused on the Days of the Dead in Oaxaca (Fig. 7) and later in Yucatan (Fig. 8) where chocolate is frequently found on the altars for the deceased. Shortly after the chocolate is placed on the altar and when the ancestors have consumed its essence, the living family partakes. This souls' feast expresses reverence and remembrance even to the fine point of including a deceased person's favorite drinks, including chocolate and *atole* beverages, on the altar display (Green 2003a, b).

Pataxte, the Cousin of Cacao

We have already seen the pairing of cacao and *pataxte* in the Popol Vuh. Other examples of ritual use are found in the *Chilam Balam of Chumayel* and the *Rabinal Achi* (Kufer and McNeil 2006:97, 99). Pataxte was disputably labeled as an "inferior" cacao, compared to *Theobroma cacao* in ethnohistorical sources, especially from central Mexico; but the Popol Vuh and documents mentioned above give it equal weight with cacao (Roys 1967:111; Tedlock 2003:49). It remains today an important part of many cacao and maize beverages, especially in Guatemala, Tabasco (Fig. 9), and Oaxaca (Kufer and McNeil 2006). My informants in Tabasco (Green 2006) explained that people added *pataxte* (washed and dried but not fermented) to their *posol* to enrich the flavor but not to make foam, as this drink is not a foamy beverage.

Fig. 7 Maria del Carmen Mendoza Mendez placing black *mole* flavored with chocolate for the souls on Día de Muertos. San Martin Tilcajete, Oaxaca (Photograph courtesy of Grace Johnson, 2001)

Fig. 8 Gourd bowls of chocolate on Janal Pixan altar at Xocen, Yucatan of Fátimo, Don Teodoro, and Tomas Canul (Photograph by Judith Strupp Green, 1998)

The Oaxaca Valley Zapotecs and a few scholars believe that *pataxte* has an essential role in making the foam stable in *chocolateatole* (Green 2008, 2006; Grace Personal Communication, 2007; Martinez 1997:281) and cacao drinks in general (Coe 1994:144).

Fig. 9 Split *pataxte* fruit (*T. bicolor*) Tabasco (Photograph by Judith Green, 2006)

Blending Divine Liquids: Maize and Chocolate

> Simon Martin (2006:177–178) has written eloquently about the religious significance of cacao and maize beverages. In reference to the term "Maize Tree Cacao" he states: "*We know that maize was commonly added to Mesoamerican chocolate drinks* (see Landa 1941 [1566]:90], *and this could help explain the Maize God portrait here* [on numerous cacao vessel inscriptions]... *Yet the mythological entwining of maize and cacao we have established thus far points in another direction – to 'Maize Tree Cacao' as more of a compound term. If so, the cacao they are talking about was directly compared to the magical bounty that grew from the flesh of the Maize God – with the traditional mixing with maize no doubt having symbolic as well as culinary significance*."

Although foamy drinks made with maize and chocolate may have disappeared in Yucatan, Colonial sources tell us they were once very important. Indigenous informants literate in their native language and Spanish reporting to Landa and Sahagún for the Maya and Aztecs during the Contact Period reveal an important fact on how they were made. The Aztec cacao seller separated out the chocolate foam from the drink and if it started to dry, added water. The Maya, said Landa, valued the buttery foam highly and separated it from the maize drink and used it in creating another drink. This indicates that separate creation of stable chocolate foam is a key to the drink. And this is the way the Zapotec prepare *chocolateatole* today.

The pre-Columbian Aztec and Maya foamed their chocolate in a different way (Fig. 10a–c) than they do now. Aztec women raised foam by pouring the chocolate back and forth from one wide-mouthed vessel to the other from a standing position, using gravity. The "gravity" method gave way in the early years of the Colonial Period[7] to

[7] In Comalcalco, Tabasco people use a method of pouring energetically from one container to another to raise foam called *bombeando* (pumping) (Green 2008).

using a wooden beater called a *molinillo* to create foam. Anderson and Dibble translate the Nahuatl: "[The seller of fine chocolate] grinds cacao [beans]; she crushes, breaks, pulverizes them. She chooses, selects, and separates them. She drenches, soaks, steeps them. She adds water sparingly, conservatively; aerates it; she makes it form a head, makes it foam; she *removes the head*, [emphasis mine] makes it thicken, makes it dry, pours water in, stirs water into it" (Sahagún 1950–1982 [1590]:FC: Bk.10, 93, Fig. 144a). The drawing of the two women from the Florentine Codex (Fig. 10a.) illustrates the quoted text in Sahagún's Florentine Codex. While the smaller figure below grinds chocolate on the metate, the standing woman doing the aerating is essentially making what the Zapotec and Chinantec do today, which is to separately prepare chocolate foam with more stability than simple froth. Note that there are three wide-mouthed vessels in the drawing. The third one is likely for the foam. The foam or "head" can be used, as Landa implies, for supping as a separate treat as the Chinantec do (a cup of *popo* is all chocolate foam) or to add to another drink, as the Zapotec do today. The translation of Landa by Tozzer on Maya foaming drinks is:

> "*They make of ground maize and cacao a kind of foaming drink which is very savory, and with which they celebrate their feasts. And they get from the cacao grease which resembles butter and from this* [grease] *and maize they make another beverage which is very savory and highly thought of*" (Landa 1941[1566]:90).

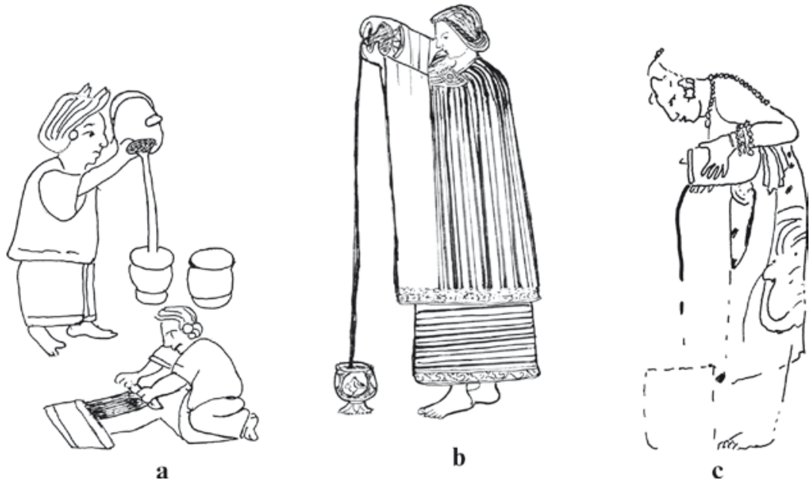

Fig. 10 (**a**–**c**) Aztec and Maya women making foam on cacao using gravity to aerate the drink; (**a**) is a merchant chocolate seller accompanied by a woman grinding chocolate on the *metate* (**b**) is an elite woman in an elegant garment (*huipil*) and (**c**) is a goddess painted on the Princeton Vase. Drawing after (**a**). Florentine Codex Bk. 10: Fig. 144 (**b**) Codex Tudela (Museo de America, Madrid) and (**c**) from Justin Kerr photograph K511, (Princeton Art Museum), (**b**) and (**c**) as reproduced in Dreiss and Greenhill (2008: Figs. 4.2 and 4.3)

Maize and Cacao Drinks of the Contemporary Maya and Zapotec

Given two such ritually powerful substances as maize and cacao, one would expect to find myriad drinks that mixed the two. The combination in a beverage married the Maya basic staple food, maize, and their greatest luxury drink, chocolate, for the most elaborate celebrations. But some groups made their own local varieties of these drinks for more mundane use, depending on the availability of chocolate.

In a comprehensive synthesis on current cacao research Cameron McNeil identifies many beverages in Mesoamerica combining maize and cacao (2006b:341–366). These include *atole de cacao, pinol, posol*, and *saká*, which are widespread in Mesoamerica; as well as other maize cacao drinks of more limited distribution such as *tiste* and *chilate*.[8]

The following four examples illustrate the concepts presented here: *tan uk'ul* of the Maya of the Lowlands of Yucatán, *posol* and its variations from the Chontal Maya area of Tabasco, and c*hampurrado* and *chocolateatole* of the Zapotec in the Valley of Oaxaca.

Tan uk'ul, Cacao and Atole Drink of the Yucatec Maya

Three of the beverages studied in the field, *posol* from Tabasco, *tan uk'u*l from Yucatan, and *champurrado* from Oaxaca have similar ingredients: *nixtamalize*d maize flour or maize dough and water for the *atole*, which is boiled and stirred. The cook adds a little salt or sugar to taste. Then the toasted and ground chocolate is added. The chocolate for these three recipes is composed of ground cacao beans (hybrid types of *Theobroma cacao* from Tabasco) with sugar, cinnamon, and sometimes allspice. These three drinks are not foamy. In my experience, lengthy beating with the traditional wooden beater (*molinillo*) or electric blender does not create stable foam once the chocolate and maize are mixed.

The Canul family of the village of Xocen described *tan* uk'ul as a beverage they make for normal celebrations, but rarely for Days of the Dead (*Janal Pixan* in Maya). This is because it takes more time than ordinary chocolate and they have seven ritual meals to prepare in their Janal Pixan cycle. They stated that making this beverage is an old tradition that is vanishing (personal communication 2006). In order to make *tan uk'ul,* which translates as maize dough for the chocolate drink, the toasted cacao is peeled and ground with *nixtamalize*d maize. Toasted cinnamon is added before other spices, and then large allspice (Maya *xpool*) is included with

[8] A drink that I sampled in Chiapas not mentioned in the list is *tascalate.* Don Manuel Valenzuela compared it with *posol,* but said it was made with ground tortillas and achiote/annatto (*Bixa orellana*) as well as a little cacao. This delectable drink has a magenta color from the annatto's red seeds. Francisco de Oviedo observed its use in cacao drinks when noticed a red froth on women's faces that looked to him like blood (Chinchilla 2005:17).

anise seed to form dough (*masa*). This dough is crumbled into water and heated to make the chocolate flavored *atole*. It can be drunk warm or cool.

Tan uk'ul, like the *posol*, is reserved for special occasions like weddings, birthdays, and other festive events. When the young Maya women (*vaqueras*) participate in the *Jo'olbesaj* (first harvest) ceremony they carry the maize and cacao drink *tan uk'ul*. To my knowledge, there is no attempt to raise foam on the drink, nor is it possible to do so. The wooden chocolate stirrer is used only for mixing the chocolate into the *atole*.

Posol from the Chontal Maya and Mestizos of Tabasco

Posol (from the Nahuatl *posolli)* is the maize and chocolate drink favored by the people of Tabasco on the Gulf of Mexico, ancient home of the Olmec and Putun Maya. The two biologists in the *cacaoatal* (cacao grove) that colleague Ana Urizar and I visited near Comalcalco, Tabasco, stated that *posol* is the real drink of the gods. One said if he started his day with *posol* he did not need to eat again until late afternoon (Green 2006).

In Tabasco, *posol* is considered a special breakfast and basic energy food. This drink is not to be confused with *pozole* (which is a type of stew with hominy) in other parts of Mexico. Again the basic ingredients are maize and water (basic *atole*) with chocolate (processed cacao) added.

During our visit to the cacao grove and the home of Ingeniero Reynol Chamec Cruz, we sampled the *posol* prepared by his wife, Patricia Gómez Cornelio. She had a large ball of light brown *posol* dough already made (Fig. 11). She had soaked the maize the night before with slaked lime to soften the hulls (*nixtamalization*) for grinding in the morning. Since the maize and chocolate were already ground and formed into a ball of brownish masa, she broke some off into boiling water. She let it cool before we drank it together. Each of us swirled our glasses as we neared the bottom to allow the remaining grains of maize and cacao to lift into the liquid. It is a pleasant drink, slightly grainy, with a hint of chocolate.

Posol is more like an everyday energizer than a ceremonial drink. My informants stated that people drink sodas now on special occasions, although formerly the celebratory drink was *posol*. Posol was also left as an offering and consumed on Days of the Dead altars and the May 15 Festival of San Ysidro Labrador in Comalcalco. During this feast day people fill the streets with carts decorated with cacao pods and women mix the *posol* in clay vats to feed the crowds (Dreiss and Mitchell 2005).

While in Tabasco in 2008, Don Manuel Valenzuela and his wife Marina Riveroll Vizcaíno introduced me to another version of cacao and maize drink, *posol agrio* (sour *posol*). For this specialty, it is maize that ferments after the *posol* ball is made. Women make the ball (*bola*) of maize dough with ground chocolate and leave it exposed to the air. In two or three days, it starts to sour. A white mould covers the ball that is then blended with ice, mould and all, with a little sugar. It is considered

Fig. 11 Patricia Gómez Cornelio with a ball of *masa* with chocolate for making *posol*, the popular local beverage Comalcalco, Tabasco (2006)

not only a delectable treat, but also a medicine, especially for the digestion. Later Doña Marina points out a plant growing at the edge of the cacao grove. She uses the green leaves to wrap the ball to encourage mould to grow on it. The plant is called *toh* (scientific name unknown), but others use banana leaves. Beliaev, Davletshin, and Tokovinine this volume discovered a Classic Maya version of sour *atole* (*pah ul*) on several pre-Columbian vessels. The contemporary Maya also enjoy this beverage at harvest time as "sour *atole* of new maize"(*paj sa'il tumben xi'im*) or just *paj sa'*, but the latter term serves for the sour *atole* made from stored dried maize as well. For this acidic *atole* of new maize, the kernels and tender ears are ground fresh (not *nixtamalize*d) and the dough remains for a night in hot water to sour. In the morning it is strained and boiled with sugar, salt, or honey.

Champurrado of the Oaxaca Valley Zapotecs

The third drink, *champurrado*, is known from many parts of Mexico as a classic maize and chocolate combination and is usually served hot, unlike the previous two that can be either hot or cold. It is the simplest of the aforementioned three non-foamy beverages of maize and chocolate. The ingredients are maize flour and water prepared as *atole blanco* (white *atole*) with a partial tablet of Mexican chocolate dissolved in the prepared *atole*. In Oaxaca this is a more commonplace beverage, compared to the coveted and complex *chocolateatole*.

Chocolateatole of the Valley of Oaxaca Zapotecs

The epitome of celebratory drinks, *chocolateatole*, comes from Oaxaca where it attains the category of liquid refreshment of the highest order. My field studies in these areas over several years combined with kitchen experiments using ingredients and equipment from the region have brought me the joy of learning how to actually prepare it. It also explains my belief that the traditional Oaxacan chocolate foam preparation techniques still in use in the present day may provide a basis for understanding how the pre-Columbian Maya could have combined *atole* and chocolate to make a foamy beverage.

Zapotec women prepare the hot *atole* and the cool chocolate foam separately (Fig. 12). This is a crucial factor in creating an *atole* drink with intact chocolate foam. Some ground seeds are added – usually ground wheat berries, though some recipes call for ground rice. These are pulverized separately and combined with toasted or untoasted "calcified" *pataxte* and red *cacao*. Many of my informants say that the secret to good foam is the use of ritually buried *pataxte* (which they

Fig.12 Zapotec women apply their expertise in making chocolate foam with a *molinillo*, a Colonial period wooden beater with rings (Photograph courtesy of Grace Johnson)

describe as "calcified") and a good foam is one that is two or three fingers thick in the bowl and lasts for a half hour or more (Green 2008). Such a bowl of foam was expertly demonstrated (Fig. 13) by Sra. Lila Luis Bautista, the wife of Don Isaac Vásquez' son Dr. Hipólito Vasquez. I carried out replication experiments for each recipe that I observed indigenous women making with authentic ingredients. *Posol, tan uk'ul*, and *champurra*do are relatively simple to prepare compared to *chocolateatole*. For this drink, Zapotec women in the Valley of Oaxaca use two types of cacao seeds, red cacao (*Theobroma cacao*) and white cacao (*Theobroma bicolor*, *pataxte*). Both are actually a medium brown color when dried. The *pataxte* is slightly larger and flatter. This drink requires hours of preparation.

One must obtain an ingredient unknown in the United States, calcified *pataxte*. Only certain Zapotec women know how to prepare the *pataxte* by burying it, unearthing it, and washing it over a period of months. This procedure blackens the hull and opens the seed to reveal a white swollen nib. The ultimate product has a rather startling appearance, like a swollen white eye inside a black eyelid. Some say the ritual takes 6 full moons to complete (Dreiss and Greenhill 2008:111).

Fig. 13 Lila Luis Bautista with her bowl of foam for Chocolateatole. Teotitlan del Valle, Oaxaca (Photograph courtesy of Grace Johnson, 2008)

My observations of the making of *chocolateatole* took place in 2005 and again in another household in 2008, where Zapotec women from Teotitlan del Valle known for their culinary skill carried out these demonstrations.

Ingredients for the chocolate foam are, raw cacao beans, raw rice, raw wheat berries, sugar, freshly ground cinnamon, water, and the calcified *pataxte*. The second household did not use rice. The raw ingredients and the *pataxte* are toasted on a griddle (*comal*) before grinding. I later found out that not all families toast the calcified *patax*te. Although rice and wheat are not pre-Columbian, there are a variety of other seeds that were available and could have been used in the past, including pumpkin seeds (*pepitas*) and *pochote (ceiba* seeds*)*.

Warmed *atole* forms the bottom portion of this layered drink, with the cool foam on top. This hot/cold layering may relate to the idea that the Maya believed in maintaining health by providing a balance of hot and cold foods (Houston et al. 2006:108). The already prepared white *atole* is gently simmering on the fire while women are grinding toasted cacao and *pataxte* beans. Finally the beans, ground rice, and wheat berries are mixed with water in a large open mixing bowl (*apaste/apastle*). A woman beats this mixture about 15 min with some sugar and ground cinnamon, using a ringed wooden beater called a *molinillo.* As the foam forms on top, she skims only the foam into a second large bowl, repeating the process until bowl two is completely filled with thick chocolate foam. Only then does she float it gently upon the waiting maize *atole* drink in the cups of the delighted guests. They may taste the foam or stir the drink gently with small hand-carved wooden sticks called *alcahuetes*.

Essence of Foam: Crown of Chocolateatole

The oldest depiction of the process of foaming chocolate is on the renowned Classic Period Princeton Vase (see Fig. 10c). What is portrayed is the “gravity method” previously mentioned. Sahagún’s informants in Central Mexico described the same method for the sixteenth-century Aztecs. In this illustration from the Florentine Codex, the woman in the top section is a commoner, a chocolate seller (Fig. 10a), while in a more European depiction an elegantly dressed Aztec woman uses the same method to foam chocolate (Fig. 10b). Early in the Colonial Period a wooden whisk called the *molinillo*, a European introduction, replaced the gravity method (Coe and Coe 1996:87–88, 120,160).

Why was foam important? The ancient Zapotecs of Oaxaca believed the foam on chocolate was alive with a vital force called *pée,* present in all living things, and therefore had to be approached ritually (Marcus and Flannery 1996:19). When my Zapotec informant was asked about “*pée*” today, he interpreted it as “fe” (faith).

Dorie Reents Budet (2006:215) extols the aesthetic aspects of tasting foam, including aroma and color. Virginia Davis (1978:213–214) identified cacao as sacred to the Lacandon Maya. The raising of foam with a chocolate beater for rituals was a performance that allowed the sponsor’s wife to enter the main god house usually forbidden to women. She notes the woman, "*sits in the god house and twirls* … the stick back and forth between the palms of her hands. When the cacao is frothy, the sponsor pours it into the cups of *balche* drink or *corn drink, and the chocolate floats on top*" (Davis 1978:213–214) [emphasis mine]. This keeps foam separate from the maize drink as in the making of *chocolateatole*. Per Davis, the source of the foam is a grass or vine called *ajsukir* or *yits ajkukeh aak*'. The scientific name of this vine is unknown.

Pugh (2006:381–383) reports that foam was associated with transformation to a fertile liquid. "Like the foam of *balche* [a beer-like draft], the liquid cacao beverage was intermingled with air to produce an anomalous intermediate state. The process of frothing the cacao was likely associated with sex." He mentions that they removed the "venomous" foam from the *balche* and replaced it with the "fertile cacao foam" on top of the liquor. He argues that cacao frothing by women was "a significant performance." Pugh (2006:379) cites Betty Faust in saying, "Among the Maya of Yucatan, the cacao beater connotes a penis and the foaming process is analogous to sexual intercourse." It appears that chocolate and its foam has been and will be inextricably linked to women and procreation.

A Secret Ritual Treatment of Pataxte

Several decades ago, while exploring the myriad recipe ingredients in the old city market with long-time Oaxaca resident Anita Jones, she drew my attention to a pile of strange split-open black beans filled with a white powdery substance. She called it *pataxte*; a Zapotec drink ingredient that she said deserved further study. These beans obtained a high price because they were so labor-intensive to prepare and so ritually important. Recently*, pataxte* came into my attention again, this time in a short film clip from a DVD on cacao (Dreiss and Mitchell 2005). It showed women burying and washing the beans in a lengthy ritualistic preparation for use in *chocolateatole*.[9] Information provided by Sharon Edgar Greenhill led me to where the film was made, in the weaving village of Teotitlan del Valle (personal communication 2007).

The unusual ritual and process piqued my curiosity and while in Oaxaca in April, 2008 (not long after Anita Jones' death) her daughter-in-law, Elsa Jones Moreno and her brother Jose (Pepe) Moreno Solís located a Zapotec master weaver who knew about the process. The mother and grandmother of Don Isaac Vásquez García had, as their special craft, the processing of the *pataxte* cacao. They buried and washed it in the elaborate procedure described below, and subsequently they prepared the beans for sale in the Ocotlan, Tlacolula, Zaachila, and Oaxaca City markets. In those days, they belonged to one of the four or five families who

[9] Three illustrations of the burying, washing, and selling of calcified pataxte are in Dreiss and Greenhill (2008:Fig. 4.4).

prepared the *pataxte* this way. Starting in early childhood, this man helped with the work of digging the pit and burying and washing the beans. Don Isaac is currently recognized as one of the most renowned Oaxaca weavers.

Don Isaac considers "calcifying the pataxte" as a type of fermentation rather than a ritual. He stated that he was unaware of the fermentation process as having a ritual association or significance, nor of this being carried out only during a full moon. Digging pits and hauling large sacks of wet *Theobroma bicolor* beans, he said, was not women's work. In fact, in his time, men and women both participated day or night. He said the custom is very old and dates back in his family at least to his great grandparents. The calcified *pataxte* is only used for one drink, *chocolateatole*. Zapotec women prepare it for the most important festivals: the patron saint's day, the four *mayordomias*, weddings, and the Christmas *Posadas*. "This drink is very important, and Teotitlan is the only town that prepares *pataxte* cacao. It is from the pre-Columbian epoch. My grandparents and great grandparents told me about it. My mother, who died at 84, also prepared the *pataxte*." He said she learned to prepare it at the house of Don Isaac's grandparent Serafín Hipólito.

The lengthy process starts by purchasing the *pataxte* beans from vendors from Chiapas or Tabasco. These are dried but not fermented, as is *Theobroma cacao*. Don Isaac described the process of washing and burying the beans: "They wash them, bury them for two months and put a lot of water on them daily. It has to be mud.

The cacao beans are buried about a meter deep. Fifty or a hundred kilos of *pataxte* requires a hole of a square meter that will not be disturbed. It is watered daily. Then the cacao beans are buried. After two months they are washed very well in water. The skins become darker. Then they are buried again. This is done with more care. They put the *pataxte* beans in the hole with a fiber sack underneath them." I tried to confirm if he sees the process as a type of fermentation and he said, "It is a special class of fermentation." In answer to my question about the way the beans were processed before the Zapotecs purchased them, he confirmed that they bought them dried but not fermented. Family friend Pepe offered that the way they fermented the pataxte cacao was "*un secreto zapoteco*" (a Zapotec secret).

Don Isaac continued the story.

> "After two months the beans start to 'flower' in good soil. They are like sponges, but they really smell awful. Men and women work to prepare the washing. It is hard work. They use clean water from the faucet or the creek. Then the cacao beans go back for another two months. The *pataxte* cacao has a thick skin and doubles in size [during the process]. That is why they can last so long in the earth, for four months. No, it's not like red cacao. One can't use any other cacao. Then after four months, it is washed really, really well, sometimes up to four or five times to get rid of the bad odor. Then it is dried in the sun. It [the seed] opens more, only in the sun. If it doesn't open, a person opens it with a needle or a nail. It has to be open to be sold" (Green 2008).

Don Isaac shared another Zapotec secret. Before selling the *pataxte*, some of the (calcified) white nibs are taken from the shell and ground with corn starch (*almidón)*,

Fig. 14 Don Isaac Vásquez displays the first class calcified pataxte beans that have been buried for 4 months and washed and carefully removed from the black shells. Teotitlan del Valle, Oaxaca (2008)

about 25%, so that there is more product – called second class *pataxte*. First class *pataxte*, on the other hand, is authentic and pure (Fig. 14). Second class is not, though the maize starch makes the seeds appear like the real stuff. He added: "That is the secret of the people who sell it, but for your book you should know how to prepare the real first class *pataxte*.[10]"

Don Isaac stated that the cornstarch is the same color as the *pataxte* cacao, so people do not notice the difference. Sahagún (1950–1982 [1590] Bk. 10:65) reported about a cacao seller who counterfeited cacao beans by substituting chalk, amaranth seed dough, wax, or avocado pits for the nibs requiring the tedious task of opening each one, stuffing, and closing it.

Can one tell the difference by tasting? Don Isaac said yes; "The authentic tastes better than the second class. And if the person sponsoring the fiesta has a lot of money he will buy the first class *pataxte*. He will get more foam. If he wants second class there will be less foam, very little foam." Pepe said that *chocolateatole* without *pataxte* is not good.

[10] Don Isaac gave me some first class *pataxt*e to use in making *chocolateatole* at home.

Raising Foam in a Zapotec Kitchen

We were invited to observe and participate in two *chocolateatole* demonstrations in Teotitlan del Valle. They were three years apart, but complemented each other nicely. The one in 2005 started from the very beginning, with the *nixtamalization* of the maize for the *atole* and grinding of all of the ingredients and ending with a tasty family lunch. The other in 2008 started one day with the story behind the calcified *pataxte*. And we were invited back in three days to see the preparation of the drink. At that time we viewed and participated in a modernized preparation from pre-ground ingredients (that still required the hard labor of grinding these ingredients at the *metate*) and ended in a celebratory brunch of *higaditos* (a traditional chicken and egg dish) and *chocolateatole* with the family.

Don Isaac's daughter-in-law Lila Luis Bautista began with large 7–10 cm chunks (*trozo*s) of *chocolateatole* ingredients that she identifies as ground wheat, cinnamon, red cacao, and *pataxte* cacao. She immersed the nut-brown pieces into a pail of water to soften them for grinding on her *metate*. Sugar, she said, is added when it is served. The *atole* is naturally slightly sweet so only a teaspoon is added to each bowl. Lila explained the difference between *chocolateatole* and *champurrado*. She said that *champurrado* has only red cacao, vanilla, *atole*, and sugar. Pepe said that the recipe is to boil the white *atole* and put in prepared chocolate. Don Isaac added that it does not have foam. It occurred to me that the foam called *espuma* to them must be a more stable formation than a few bubbles or even a light froth that disappears quickly.

Although the Zapotecs I interviewed in Oaxaca said that the *pataxte* made good foam on the drink, it is not the only foaming agent known to Mesoamericans. Another foam-producing additive for a celebratory non-alcoholic drink is a vine called *popozocamecatl* (McNeil 2006b:354), currently being investigated by botanist Nisao Ogata (personal communication 2007). He said the vine was in the family *Asclepiadaceae* with just 250 genera and 2,000 species! In my opinion this is the same plant that is called the *colcameca* vine in the tropical region of Tuxtepec in Northern Oaxaca and *cocolmecatl* in Yalalag, Oaxaca (De La Fuente 1949:371). The Chinantec people of the Tuxtepec region use it to make the festive drink *popo* (Trilling 1999:166–167). The drink is purely chocolate foam and I can confirm its delicious taste since I was able to sample a cup at a Chinantec festival in Oaxaca in April 2008. An indisputable botanical identity for the vine is pending.

California Kitchen Experiments

Authentic ingredients from Oaxaca are required to replicate the recipes. My ingredients for *posol* came from Tabasco and from Yucatán for *tan uk'ul* and *champurrado*. Fortunately, a friend and colleague, Leslie Grace, who was in Oaxaca last year found the calcified *pataxte* to use in my first experiments in making *chocolateatole* in 2007. The results showed that *posol* and *tan uk'ul*, like *champurrado*, are non-foamy maize and chocolate beverages. Beating them with hand or electric devices does not result in stable foam. Traditionally, the ground ingredients are mixed with water, not milk, at the beginning of the process. Handmade wooden beaters or spoons were used for mixing, not making foam.

Chocolateatole is very different. It is a closer match to the drinks Landa described for the Maya. It has more ingredients and one that is not available in the United States – calcified *pataxte*. I made chocolate*atole* three times in 2007 using Zoyla Mendoza's recipe [as adapted by Zarela Martinez (1997:381–383)] with additional clues from my personal observation of the preparation by three of Doña Zoyla's older relatives. After some practice, I was finally able to produce thick stable foam before my *pataxte* supply was exhausted. Using my *molinillo* I beat the mixture for 15 minutes at a time for about 1 hour. The expert Zapotec women can do it more efficiently, but even so the recipe calls for stopping periodically to remove the foam as it forms into a separate large ceramic bowl (*apaste*).

My first experiment was to make the original recipe with the calcified *pataxte* and pour it into a goblet, and then make a modified recipe with normal red cacao *Theobroma cacao* only. The results were that the *T. cacao* did not foam and merely dropped into the *atole* (Fig. 15) whereas the goblet with the calcified pataxte had stable foam that lasted for hours. An analysis by W. Jeffrey Hurst at the Hershey Technical Center Laboratories using my samples of calcified and non-calcified *T. bicolor* (*pataxte*) cacao was done to compare fermented *pataxte* cacao and anaerobically fermented "calcified" cacao (Table 1). The biochemical analysis provides direct evidence of a significant increase in fat with the calcified *T. bicolor* sample, compared to naturally fermented *T. bicolor* and roasted *T. bicolor.* Hurst's analysis (below) of the fatty acids in *T. bicolor* and calcified *T. bicolor* shows that the anaerobic burial technique used by the Zapotecs to "calcify" the *T. bicolor* beans/seeds

Fig. 15 One of the Author's Kitchen Experiments: One goblet of Chocolateatole with calcified pataxte and the other without pataxte

Table 1 Comparisons of "calcified" (anaerobically fermented) *T. bicolor* (*pataxte*) with: noncalcified *T.bicolor* (normal fermentation) and roasted *T.bicolor*, fermented *T. cacao* and raw and fermented *T. grandiflorum*

Sample	Caffeine (%)	Theobromine (%)	ORAC[a] (μmol TE/g)	TP[b] (mg/g GAE)	Cat[c] (mg/g)	Epi[d] (mg/g)	Fat (%)
Gran. raw	–	0	99	–	0	0.23	40
Gran. fermented	0.033	0.003	175	–	0.015	0.36	50
Bicolor fermented	30	0.18	300	–	0.3	1.5	38
Bicolor calcified	–	–	12	1.59	nd	0.001	54
Bicolor roasted	–	–	47	1.72	0.0740	0.066	45
Cacao fermented	0.2	2	700	60	1	4	54

Analysis by W. Jeffrey Hurst
[a]Radical absorbance capacity
[b]Total polyphenols
[c]Catechins
[d]Epicatechins

resulted in an increase in the palmitic acid and a decrease in the oleic and linoleic acid in the beans so treated.

Fatty acid	T.Bicolor	Calc.T.Bicolor
16:0 palmitic	6.3	35
18:1 oleic	38.4	7.7
18:2 linoleic	3.5	0.3

According to an article by Jee (1984:61: 751) the raw uncalcified *T. bicolor* was found to be "unlike cocoa butter, which contains 80% symmetrical monounsaturated triglycerides, this fat [T.bicolor] contained only 44% symmetrical monounsaturated triglycerides." Hurst (personal communication 2009) hypothesized,

> "We know that the SUS content of cocoa butter leads to a beta crystal habit. Perhaps the fat in *T. bicolor* adopts a beta-prime crystal habit because of the lower level of symmetrical triglycerides (half as much). It is well known that Beta-prime crystals are "required" for optimal aeration (e.g. bakery shortenings etc. so perhaps bicolor can yield a foam (unlike cocoa butter) because of its crystal habit."

An article by Pueyo et al.(1995) proposed that the height of foam on cavas wine was due to the high level of palmitic acid and the stability of foam was due to a high level of linoleic acid. As the indigenous recipe for the chocolate foam (for *chocolateatole*) includes both calcified *T. bicolor* and *T. cacao*, the high level of both of these fatty acids might increase both height and stability of the foam, presuming that the wine experiment would be applicable. The study is ongoing, but these data do indicate that such biochemical changes may be related, at least in part, to why calcified pataxte affects the density and size of foam in cacao drinks.

Conclusion

Replication experiments have provided some evidence that calcified *pataxte* (with other ground seeds) does increase the stability of the foam, using the methods practiced by Zapotec women in making *chocolateatole*. The procedure of making the cacao foam separately and in layers is essential. It precedes the final ceremonial step when the women dip out the thick light brown foam into each guest's bowl and presents each one with the wooden stirring stick (*alcahuete*) to mix the two. This entire process takes at least four hours and several women working, not including the previous night's preparation of the maize in slaked lime. Both specialized ingredients and culinary procedures lead to success in making thick foam. With a few substitutions (other seeds for wheat or rice) and one change in procedure ("gravity" method in raising foam) they might describe what Landa reported.

But why was stable foam so important? Besides the sensory pleasure from the taste of chocolate foam layered on a comforting daily food, *atole*, there may be, at a deeper level, the spiritual identification of the Maize God with cacao in the juxtaposition and final mingling of the two (Martin 2006). People had a pragmatic reason for stabilizing the foam too. Celebrations last for hours and the drink must be presented with foam. There is a performance aspect to making and serving the drink properly, with its stirring stick and the requisite and impressive head of chocolaty foam, to each guest. According to one contemporary Zapotec, the foam represents the faith of the community in its health, strength, and hope for the future. The Zapotecs believed foam was the life of the drink. So making foam must have symbolized creating and preserving life.

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Corn, Colanders, and Cooking: Early Maize Processing in the Maya Lowlands and Its Implications

David Cheetham

Introduction

One of the least-explored areas in the analysis of prehistoric ceramics is how pottery vessels were actually used; that is, the particular purpose they served (Rice 1996:139). Such insights are often thwarted or ignored in classification schemes tailored primarily to deduce temporal frameworks and patterns of ceramic interaction, and most type-variety studies of prehistoric Maya pottery are no exception. Treating pots as tools designed to meet a specific need (Braun 1983) provides valuable insight into prehistoric behavior well beyond what is achievable through typological analysis alone.

My intent in this study is to demonstrate the value of the "pots as tools" perspective by examining the utilitarian vessels used by the earliest fully sedentary Maya villagers (ca. 1000–800 BC) to prepare lime-pretreated maize, or nixtamal, most likely for tamales or other gruel-based foods.[1] I begin by outlining the technology and implements required to make nixtamal, the nutritional advantages of preparing maize in this manner, and ethnographic examples of its application. I then summarize available data concerning the productivity of early maize in the Maya Lowlands in order to generate probable crop sizes and corresponding caloric values for the period in question. The volume of ceramic vessels used to process maize in two separate areas of the lowlands, the Belize Valley and central Petén, are presented and linked with estimated household supplies of maize. I conclude that the amount of maize required to make nixtamal at this early date necessitated a multi-household effort in both areas, and that consumer groups in the central Petén were probably larger than in the Belize Valley. The cooperative nature of maize processing indicates extended household social organization from the outset of village life in the Maya

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[1] All dates in this chapter are presented in uncalibrated radiocarbon years BC.

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Lowlands and hints that during the preceding Late Preceramic period consumer groups were organized in a similar manner.

Making Nixtamal: Motivation, Materials, and Methods

The practice of boiling maize in lime water was the cornerstone of ancient cuisine in Mesoamerica. Called *nextamalli* by the Aztecs (Hispanicized nixtamal), lime-pretreated maize is still made throughout Central America. Why has this curious culinary technique endured? There are two benefits to processing maize with lime. First, it effectively removes the tough outer shell (pericarp) of the kernel, which certainly makes maize more palatable. Second, it provides a major nutritional advantage over untreated maize by improving the accessibility of niacin (vitamin B) and six amino acids (protein) and supplying an excellent source of calcium to the diet (Bressani and Scrimshaw 1958; Bressani et al. 1958; Katz et al. 1974). Both factors surely contributed to the method's longevity, but I suspect the removal of stubborn shells was the impetus for the diffusion of lime processing.

The lime required to make nixtamal is obtainable from three sources: hardwood, marine and freshwater shells, or limestone. In rare cases, where shells are used, they are cooked on a fire for several hours, then transferred to containers and sprinkled with water to induce slaking. The end result is a fine caustic powder. This practice was common among Lacandon Maya families in the tropical lowlands of eastern Chiapas, who, in a typical production episode, would make about 25 gallons of lime, enough for 9–12 months of nixtamal (Baer and Merrifield 1971:152–153; Nations 1979). In earlier times the Lacandon also used mahogany bark, which yields strong lye when burned (Tozzer 1907:51). In cases where limestone is used, chunks of this soft stone are placed on a hot fire for several days. After removal the stones are slaked by adding a small amount of water, again yielding a caustic powder. This powder is stored dry, or more water is added to form pieces for storage. In the highlands of Chiapas, chunks of slaked limestone are stored underground near households to maintain alkaline strength until needed (Vogt 1969:57; see also Pennington 1969:101–102).

The raw material used to make lye in most of the Maya Lowlands during Prehispanic times was certainly limestone. This karst region has a virtually infinite supply of limestone and, in the Belize Valley and adjacent central Petén areas, it yields some of the "best lye for steeping shelled maize" (Thompson 1965:355). In fact, the limestone in this area is of such high quality that small-scale lime making for nixtamal and other purposes (e.g. mortar) is still very common (e.g. MacKinnon and May 1990:200). Exactly where slaked lime to make nixtamal would have been stored in prehistoric times is unknown, though the enigmatic subterranean storage chambers (*chultunob*) frequently encountered near household patio groups may have been used for this purpose.

Other uses for slaked lime include mixing it with tobacco to make *pilco*, a stimulant that was chewed (Redfield and Villa Rojas 1939:111; Thompson 1970:112), for tanning skins (La Barre 1948:130), for temper in pottery (Hughes-Hallett 1972), and possibly for medicinal purposes. The Chorti Maya mixed slaked lime with water and coated stored maize with this paste to prevent infestations of weevils and other pests (Wisdom 1940:108). They also boiled lime with plants to produce dyes and added lime to finished dyes to lighten their color (Wisdom 1940:101). All of these applications, and likely many others, were probably common in the Maya Lowlands during Prehispanic times. Of course, enormous quantities of lime were also consumed in the form of plaster to cover masonry buildings, plazas, and other architectural features.

The Lacandon Maya provide one of the most thoroughly documented cases of nixtamal-making. As early as the 1890s, there are eyewitness accounts that maize was boiled and soaked overnight in lime to remove the outer shells, after which the nixtamal was rinsed and milled (Maler 1901:31; Tozzer 1907:51). By the late 1960s, five-gallon metal tins had replaced ceramic cooking vessels (Baer and Merrifield 1971:145–149, 161), but the basic cooking process had not changed.

> *The five-gallon tin is ... put on the fire ... in the afternoon ... filled about half full of water ... about a cup of lime [is added]. When the water and lime begin to boil, the tin is removed from the fire ... corn is ladled in with a gourd ... the tin is filled [with corn] to within an inch of the rim ... stirred ... [and] placed back on the fire to cook until the shell begins to separate from the inner kernel. [The] tin is removed from the fire ... [and] the corn is covered ... until morning ... [when the] woman removes ... the shells ... from ... the top of the water. She then ... ladles [the corn] into a basket ... and takes it to the river to wash.* (Baer and Merrifield 1971:186, emphasis mine)

Photographs make it clear that during the 1960s nixtamal was also rinsed near domestic structures (see Baer and Merrifield 1971:189).

In anticipation of the modeling presented later in this study, it is important to underscore the fact that in the Lacandon case cooking vessels were filled to, or near to, capacity. In fact, every detailed account of nixtamal preparation I am aware of uses a roughly 1:1 ratio of water and maize. With minor variations, accounts like the Lacandon case cited above occur in the ethnographic and ethnohistoric of several Maya regions, including the highlands of Chiapas and Guatemala (Vogt 1969:57, Fig. 21), the Yucatan Peninsula or northern Maya Lowlands (Gann 1918:21; Smyth 1989:118; Tozzer 1907:51), and east-central Guatemala (Wisdom 1940:88). This method of making nixtamal also was closely replicated in northern Mexico (Bennett and Zingg 1935:33; Pennington 1963:78–79, 1983:281, Fig. 3), and lime-soaked maize was common in the American Southwest (Crown and Wills 1995:178; Russell 1908:73; Stevenson 1915:74, 76; cf. Woodbury and Zubrow 1979:47) and as far north as the western Great Lakes region of Minnesota, Wisconsin, and western Ontario (Densmore 1928:319).

After maize is boiled in an alkaline solution, it must be rinsed in clean water. The tool of choice in most documented cases is a ceramic colander, perforated gourd, or basket, but nixtamal can also be rinsed in jars. Although some scholars (e.g. Arnold 1985:17; Skibo and Blinman 1999:172–173) claim that perishable strainers would not be used because lye causes deterioration, ethnographic examples suggest otherwise. In the Maya area, for example, reed baskets were used in the Guatemalan Highlands (Ricketson 1937:253), and in lowland Chiapas both baskets and gourds were common as recently as the 1960s (Baer and Merrifield 1971:148–149, 161, 185). At about the same time, baskets were being used by some northern Mexican peoples (Pennington 1969:101–102).

The best account of modern ceramic colanders in the Maya area is provided by Reina and Hill (1978), who aptly conclude that presence of these vessels throughout the Guatemalan Highlands is the result of a traditional diet and specific way of preparing maize (Reina and Hill 1978:209). Indeed, the occasional mention of colanders and their function by earlier investigators (Blom and LaFarge 1926:332, 338–339, 345; Ricketson 1937:253) confirm the longevity of nixtamal preparation in the region. Most modern specimens are unslipped medium-size jars with handles and numerous perforations throughout the base and lower body walls (Fig. 1), although hemispherical bowls with perforated bases are also made (Reina and Hill 1978:Pls. 108–111). The Lacandon Maya used ceramic colanders at the turn of the last century (Maler 1901:31; Tozzer 1907:51) and presumably up to the point when metal containers were introduced.

Simply transferring nixtamal to a pot of clean water for rinsing is the least recorded procedure in the ethnographic literature (but see note 7 and Vogt 1969:57 for a rare instance in highland Chiapas). Of course, this method would leave no telltale sign in the archaeological record. I suspect that in archaeological cases where nixtamal was likely made and colanders are lacking (e.g. Classic Maya) jar rinsing was common or strainers were made of perishable materials.

Finally, no summary of nixtamal-making in Mesoamerica would be complete without a brief mention of the intended food. In antiquity, as in modern times, this invariably was tortillas or tamales, although a nutritious drink (*atole*) or gruel (*pozole*) can also be made. In the case of tortillas and tamales, the nixtamal is milled when moist and water added to achieve the desired consistency. At this point the paste or dough is called *masa*. For tortillas, pieces of masa are pressed into thin, flat cakes and toasted on a flat ceramic or steel griddle (*comal*). Tamales are elongated

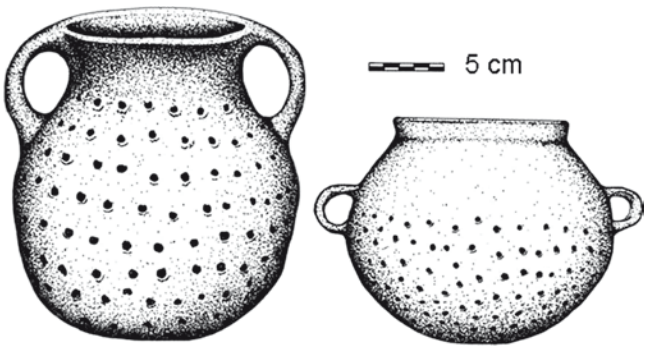

Fig. 1 Modern *pichanchas* (colanders) of the Guatemalan Highlands (redrawn from Reina and Hill 1978:Figs. 32e, 26c)

or round pieces of *masa* that are thicker than tortillas and usually wrapped around an interior filling of vegetal matter, meat, beans, or any combination of these items. The whole is then wrapped in wet corn leaves or husks (in modern times banana leaves are often used), and many tamales are boiled or steamed in a ceramic jar or suitable modern container. The origin of these foods is a mystery, but tortilla making is usually detectable in the archaeological record by the presence of flat ceramic griddles (e.g. Grove 2000:141). The lowland Maya did not make tortillas during the Preclassic or Classic periods, although tamales are depicted on Classic period polychrome pots and other objects (Taube 1989). As we shall see, current evidence suggests that tamales were enjoyed at a much earlier date.

Early Maize in the Maya Lowlands: History and Estimated Productivity

Pollen extracted from deep cores below several lakes in northern Belize and the central Petén (Figs. 2 and 3) indicates that maize debuted in the Maya Lowlands about 3000 BC, some 20 centuries before pottery. The pollen record also points to deforestation and repeated burning during this lengthy preceramic era, conditions

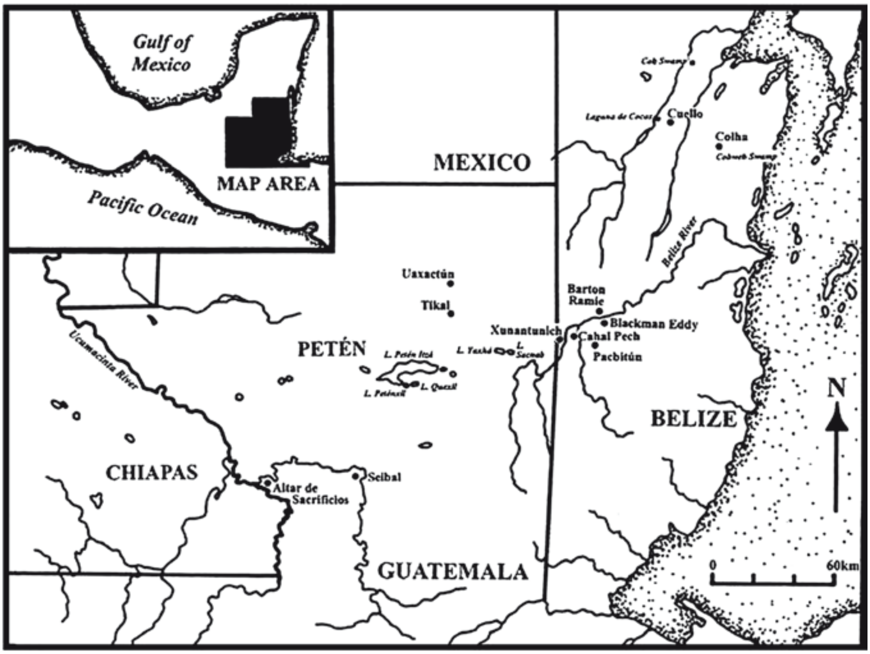

Fig. 2 Map of the Maya Lowlands locating water bodies and key archaeological sites discussed in this study

location	initial forest clearing	maize introduction
Northern Belize		
Cob Swamp[a]	2500 B.C.	3400-3000 B.C.
Cobweb Swamp[b]	2500-2400 B.C.	2500 B.C.
Laguna de Cocos[c]	3000 B.C.	2000-1500 B.C.
Petén, Guatemal a		
Lake Petén-Itza[d]	3600 B.C.	–
Lake Petenxil[e]	n/a (savanna)	2000 B.C.
Lake Quexil[f]	1500 B.C.	3000 B.C.[†]
Lake Sacnab[g]	1800-1500 B.C.	3000 B.C.[†]

[a]Pohl et al. (1996:362-363).
[b]Jones (1994:205-206, 208).
[c]B. Hansen (1990:169, 180).
[d]Islebe et al. (1996:265, 269).
[e]Cowgill and Hutchinson (1966:122); Tsukada (1966).
[f]Deevey (1978); Deevey et al. (1979:298).
[g]Deevey et al. (1979:298).
[†]Crop unspecified (reported by Deevey et al. [1979:302] as "agricultural disturbance").

Fig. 3 Locations and dates of early forest disturbance and maize cultivation in the Maya Lowlands (see Fig. 2 for locations)

attributable to frequent swidden field preparation (slash-and-burn or *milpa*) and hence a significant time commitment to land – clearing, planting, weeding, and reaping. The necessity of tending milpas coupled with unfettered access to the numerous terrestrial and aquatic food sources in this tropical setting raises the possibility that many, if not most, preceramic groups were sedentary in particular sites for years at a time.

The proposed link between Preceramic period swidden labor requirements and a pattern of semi-permanent residency needs clarification. A *milpa* cut from primary tropical forest, although yielding relatively large harvests, requires about five times as much effort to clear as an identical size plot in secondary growth (Nations and Nigh 1980:8).[2] Appreciating this fact, one would be inclined to repeatedly

[2]Clearing land with stone tools, which requires about twice the labor input as steel machetes and axes (see Hester 1952), may also have discouraged the unnecessary clearing of primary forest. However, large trees also can be killed by "girdling" the trunk – removing an encircling strip of bark and wood – thus inducing defoliation and allowing sunlight to reach the ground. This strategy, which is greatly aided with the use of fire, has the potential to reduce the requisite labor to clear primary forest (see Piperno and Pearsall 1998:180), although to what extent is unknown in the absence of quantified ethnographic data.

cultivate nearby, previously felled primary forest (mature fallow lands) before resorting to increasingly distant stands of virgin forest, especially when population pressure is minimal. For example, before the 1970s, the isolated Lacandon Maya of eastern Chiapas, Mexico, had virtually unlimited access to primary forest, yet routinely cut milpas in secondary growth near their communities (Nations and Nigh 1980). This labor-saving strategy was so common that on occasions when communities did relocate, previously abandoned villages were chosen to ensure access to mature stands of secondary growth (Baer and Merrifield 1971; Tozzer 1907:38). Although we currently lack the settlement pattern data necessary to demonstrate this or any other residency pattern for the Preceramic period, I believe the Lacandon strategy is fitting, at least for groups that occupied choice lands near lakes or rivers, faced little or no population pressure (i.e. no land shortage), and had abundant resources at their disposal. At the very least, the lengthy pollen record of forest clearing, burning, and maize cultivation in the Maya Lowlands suggests a level of sedentism and social organization exceeding that of band level societies (see Clark and Cheetham 2002).

Unfortunately, pollen is no help in identifying the ultimate origin of early maize in this region. Nevertheless, local hybridization is doubtful since the wild progenitor of maize, teosinte, does not grow naturally below about 900 m in elevation (see Kempton and Popenoe 1937), an altitude exceeding most of the Maya Lowlands. Genetic data indicate that domesticated maize originated in the central Río Balsas drainage region of Guerrero, Mexico, as a result of mutations in annual teosinte (*Zea mays* ssp. *parviglumis*) (Matsuoka et al. 2002; see also Benz 1999; Doebley 1990; Piperno and Pearsall 1998; Smith 1995). Based on direct AMS dating, maize was domesticated no later than 3500 BC, and spread throughout most of Middle America during the ensuing millennium (Blake 2006; Freitas et al. 2003). Given the time lag involved, *Zea mays* probably arrived in the Maya Lowlands already domesticated, the seeds either carried by immigrants from an adjacent region or regions or obtained through exchange by indigenous groups.

It is not until the advent of permanent villages and ceramic technology, however, that carbonized maize fragments appear in the archaeological record. Several small cupule[3] fragments were found on and below Cunil phase (ca. 1000–800 BC) architecture at Cahal Pech (Lawlor et al. 1995), but size prevents an assessment of overall cob morphology. A larger sample of small cob fragments and kernels is reported from slightly later Swasey phase deposits at Cuello (Miksicek 1991:71–73; Miksicek et al. 1981), together with a ^{14}C date of 770 ± 130 BC from maize kernels found in the initial occupation level (1A) above the paleosol (Hammond et al. 1991:Table 1). Metric measurements (Table 1) indicate that a “typical” intact cob would have had about 12 rows of kernels, a rachis (stem) width of 0.6–0.9 cm, and a complete width in excess of about 2.2 cm. Miksicek and his colleagues (1981:58) note similarities with several maize types from South America and Mesoamerica, to which I would

[3] The fibrous cup-like depression or socket from which a maize kernel grows and becomes imbedded.

Table 1 Summary metric data for Swasey phase (ca. 850–750 BC) maize remains from Cuello, Belize (after Miksicek et al. 1981:Table 1; Miksicek 1991:Table 4.3)

Cultural/ stratigraphic phase	No. of frags	Mean No. of rows	Mean rachis dia. (mm)	Percentage of Cuello maize types		
				SW I	SW II	SW III
Swasey IIb–c	10	11.6	6.3	73	9	18
Swasey IIa	22	12.5	7.8	14	77	9
Swasey I	10	13.5	7.8	70	30	0
Swasey 0 (paleosol)	–	–	–	–	–	–
Maize types	**No. of frags**	**Mean No.of rows**	**Mean rachis dia. (mm)**	**Mean kernel wd. (mm)**	**Mean kernel th. (mm)**	**Est. wd. of intact cob**
SW I (850–350 BC)	12	12.8 (10–16)	6.5	5.3	4.0	22
SW II (850 BC–AD 100)	49	12.9 (10–16)	7.8	7.0	5.3	–
SW III (850 BC–AD 100)	44	11.5 (8–16)	9.0	7.8	6.0	–

Rachis diameter and kernel length/width corrected for shrinkage (carbonized size × 1.25)

Table 2 Estimated morphology and productivity of maize in the Maya Lowlands, 1000–800 BC

	Lower limit	Average	Upper limit
Cob length (cm)[a]	5.0	6.5	8.0
Average number of rows (kernels)	12	12	12
Average kernel width (mm)	5	5	5
Number of kernels per cob	120	156	192
Yield per hectare (kg dried seed)[†]	*170*	*330*	*500*

[a]After Kirkby (1973:Fig. 48)

add that many measurements are consistent with roughly coeval (1150–1000 BC) maize impressions in mud at the Pacific Coast site of Salinas La Blanca, Guatemala, attributed to the Nal-Tel–Chapalote race originally of the central Mexican Highlands (Mangelsdorf 1967:Table 14; see also Mangelsdorf 1974:174, Mangelsdorf et al. 1967:188–189). Of course, exact classification of early maize in the Maya Lowlands must await a more robust data set, particularly whole cobs.

In spite of this drawback, it is possible to provide a rough estimate of the productivity of maize in this area ca. 1000 BC (Table 2) using diachronic cob length data for the Tehuacán Valley (Kirkby 1973:Fig. 48a; also see Mangelsdorf et al. 1964) and crop yield/cob size correlation data for the Valley of Oaxaca (Kirkby 1973:Fig. 48b). While admittedly imperfect when applied to a region as distant and climatically different as the Maya Lowlands, these data suggest that a typical cob was 6.5-cm long, a size compatible with the metric measurements of the Cuello fragments. Considering that modern first-year milpas in the Maya Lowlands average 878 kg of shelled maize per hectare (Cowgill 1962:276–277), the estimated average yield of 330 kg of dried seed per hectare seems appropriate; both ancient yield and cob size estimates are slightly less than one-third of modern counterparts. Of course, this assumes that the number of ears per plant remained relatively stable for some 3,000 years.[4]

What does this tell us about modern and ancient patterns of consumption? On the basis of interview data, Cowgill (1962:277; see also Reina 1967:14) estimates that the average modern (ca. 1959) Maya family (5 people, 1 dog) in the Petén Lakes area consumes 1,730 kg of shelled maize per year, or 770 g per day per person. However, where actual daily intake of maize is carefully measured (Stuart 1990) a much lower average of 370 g is reported. This more realistic level of consumption provides 1,350 calories per person per day, about 61% of recommended caloric intake (Stuart 1990:136, 139). To meet this demand, a family of six requires 812 kg of shelled maize per annum. Spoilage, infestations, seed for the subsequent crop, and animal feed increase this figure to at least 1,000 kg, requiring about 1.1 ha of arable land.

To reach this level of consumption between 1000 BC and 800 BC, a similar size family would need to harvest maize from slightly more than three hectares. Given the small size of maize cobs, however, there would have been little incentive to do so; the return per unit of labor was small, other protein-rich foods were plentiful, and competition for those foods was surely minimal. I suspect that, on average, maize comprised about 20% of daily caloric intake at this time, levels requiring a manageable 1.0 ha of milpa land per residential unit (Table 3). This consumption

Table 3 Productivity and nutritional value of maize (average 6.5 cm cobs) per hectarage of milpa in the Maya Lowlands, 1000–800 BC

Cultivated milpa land (ha)	0.25	0.50	0.75	1.0	1.25	1.5	1.75	2.0	2.25	2.50	2.75	3.0
Estimated yield (kg of dried seed)	83	165	248	330	413	495	578	660	743	825	908	990
Net yield (estimated kg–20%)	66	132	198	264	330	396	462	528	594	660	726	792
Daily grams of maize per person[a]	30	60	90	120	151	181	211	241	271	301	331	361
Daily caloric value per person[b]	108	217	325	433	545	653	762	870	978	1087	1195	1303
Percentage of required daily calories[c]	5	10	15	20	25	29	34	39	44	49	54	59

[a]Based on net yield and a residential unit of six people
[b]Based on 3.61 calories per gram of dry seed (10.6% moisture content; see Stuart 1990:137–138)
[c]Based on intake of 2,216 calories (see Stuart 1990:136)

[4]Although various preserved portions of prehistoric maize plants are reported for the central Mexican Highlands (see Mangelsdorf et al. 1967:184–187, 190–194), the number of ears per plant through time is unknown.

rate, which ostensibly relegates maize to a supplementary food standing, is supported by the low maize (C_4 plant) values obtained from isotopic analyses of late Middle Preclassic period human bone collagen (Powis et al. 1999:372–373; Tykot et al. 1996) and the likelihood that consumption did not radically change during the intervening 300–500 years. In short, the estimated net annual yield of about 264 kg from 1.0 ha of milpa land would be large enough to provide a reliable food source for the average household, but not its main source of caloric intake.

While the proposed consumption rate for the period 1000–800 BC is low relative to later periods of Maya prehistory (see Schwarcz 2006; Tykot et al. 1996:Figs. 1 and 2), it is not insignificant. If maize was regularly eaten in small amounts, for example, it may have been prepared as gruel or included in soups or stews. If eaten every few days it may have constituted a large portion of main dishes, for instance, tamales. Such patterns of consumption, singly or in combination, would yield the "low" isotopic values noted for slightly later skeletal material. Because maize was probably used to its full potential at this time and during the preceding 20 centuries, strict comparison with the relatively high consumption rates of much later periods, especially the Classic and Postclassic, would be somewhat misleading. Dependency on this crop increased through time relative to yield and cob size, dwindling natural food sources, and rising population. By Classic period times, if not slightly earlier, these factors had coalesced and the era of maize dependency had begun.

Maize Processing and the Cunil Horizon

During the two centuries spanning 1000–800 BC, particularly the latter half, the long-lived tradition of semi-permanent residency in the Maya Lowlands was replaced or abandoned in favor of permanent village life (Fig. 4). The industrious founders of these new settlements leveled hilltops to make way for plazas and durable lime-plastered building platforms, produced the region's first ceramic vessels and artifacts, and engaged in long-distance interaction with neighboring Mesoamerican cultures to obtain exotic objects, raw materials, and knowledge. The precise cause or causes of this fundamental shift is unknown, but it is clear that over the course of a few decades the region had entered the Mesoamerican fold.

Who were these people and what, if any, was their connection to the inhabitants of the Preceramic period? The earliest pottery provides persuasive evidence that they were indigenous to the region. The overall uniqueness of ceramic vessel traits (e.g. form, slip, surface treatment), for example, excludes derivative scenarios involving immigration from one or more bordering regions (Cheetham 1998:27–28; cf. Andrews et al. 1990). And some of the most salient traits of the initial ceramic assemblages (e.g. slip color preferences and frequencies) persisted well after 800 BC, an era of indisputable Maya occupation. Cultural continuity is also indicated by the persistent styling of other artifact classes, such as baked clay human and animal figurines (Cheetham 2007). If I am correct in asserting that the first permanent villages in this region were founded by indigenous Maya people, then the forest clearing

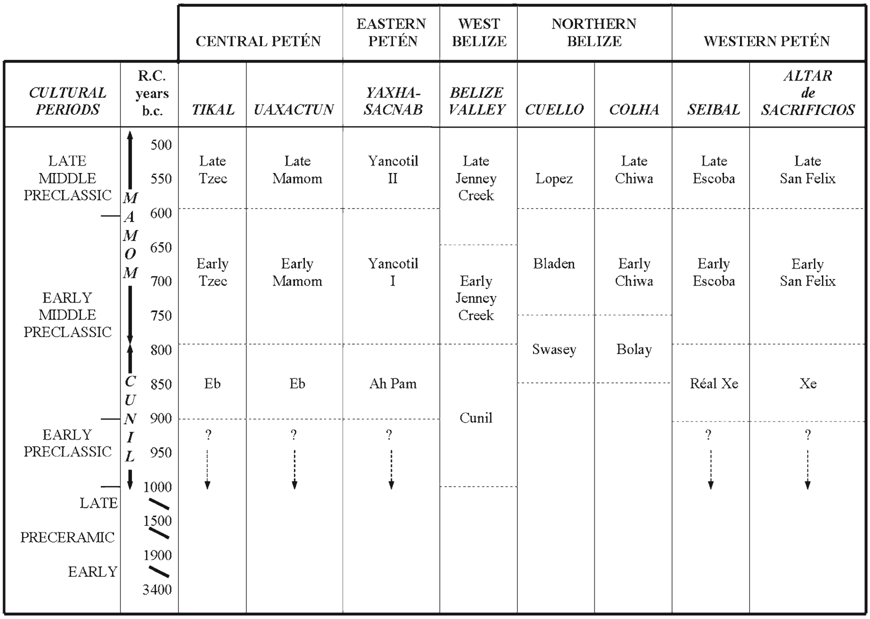

Fig. 4 Uncalibrated Early and Middle Formative period chronological sequences for select sites in the Maya Lowlands

and maize cultivation of the preceding era is probably attributable to them as well (see also Clark and Cheetham 2002; Iceland 1997).

The most remarkable aspect of the earliest Maya pottery is the similarity of collections across the region (Fig. 5). Generic and odd ritual and serving vessel forms are ubiquitous, particularly dull slips dominate, and slip color frequencies correspond to within a few percentage points or less. The manner, content, and frequency of additional decoration are equally similar. Four percent of sherds (predominantly from serving vessels) in all quantified collections, for instance, received fine-line incisions after they were slipped and fired. Etched decoration of this sort varies in complexity from simple rim-encircling lines to abstract Olmec style and indigenous supernatural creatures of mythological or religious nature. The consistency and distribution of these traits indicate frequent inter-village contact, a common ceramic technology and religious substrate, and, I suspect, a single Maya language or series of mutually intelligible dialects. On the basis of these data, I have argued that the region's first widespread horizon style occurred from roughly 1000–800 BC (Cheetham 2005). Dubbed the Cunil horizon after the ceramic complex of the same name from the site of Cahal Pech, Belize (Cheetham and Awe 1996, n.d.), this era witnessed a unified pattern of material culture much like that of the subsequent Mamom horizon.

To date, sites in three areas of the Maya Lowlands have yielded deposits containing Cunil horizon pottery (see Fig. 2). In the Belize Valley, this material is associated with residential architecture and other features across the central plaza

Fig. 5 Reconstruction of Cunil horizon pottery vessels from Cahal Pech, Belize (*top*), and Tikal, Guatemala. Drawings by Ayax Moreno, courtesy of the New World Archaeological Foundation

at Cahal Pech (Awe 1992; Cheetham 1995, 1996; Healy et al. 2004). At the nearby site of Xunantunich, a sheet midden below the largest temple pyramid yielded a pure sample of Cunil sherds (Strelow and LeCount 2001), and Cunil and slightly later material occur together above bedrock at Barton Ramie, Pacbitun, Blackman Eddy, and several peripheral sites at Cahal Pech (personal observations of collections, 1994–1995, 2000). In the Petén District of Guatemala, Eb ceramic complex sherds (the local manifestation of the Cunil horizon) occur in several middens at Tikal (Culbert n.d.; Cheetham et al. 2003; Laporte and Fialko 1993), above bedrock at Uaxactún, and at several sites near Lakes Yaxha-Sacnab (personal observations of collections, 1999–2000). In the Pasión drainage area, the Xe and Réal Xe ceramic complexes at the sites of Altar de Sacrificios (Adams 1971) and Seibal (Willey 1970) are also part of the Cunil horizon. A notable exception to this pattern is the Swasey ceramic complex of northern Belize, touted as the oldest pottery in the region for over two decades (Hammond et al. 1979; Kosakowsky and Pring 1998; Pring 1979). Examination of this material by the author and Donald Forsyth revealed a few Cunil horizon ties, but traits typical of the subsequent Mamom horizon (e.g. waxy slips, composite silhouette forms) were found to be common, indicating that the Swasey phase began no earlier than late Cunil times (see Clark and Cheetham 2002:Appendix 3[4]).

The most noteworthy indicator of maize preparation during the Cunil horizon is the colander. These distinctive vessels (Fig. 6) were an integral part of the utilitarian pottery repertoire at sites in the Belize Valley, central Petén, and the intervening zone. Perforated sherds are lacking in ceramic assemblages from the Pasión (Xe, Réal Xe) and northern Belize (Swasey) areas, hinting that colander use was limited to this east–west Belize–Petén corridor.[5] All known sherds are from small to medium size hemispherical bowls with a rounded base. Rims are direct, and closely spaced

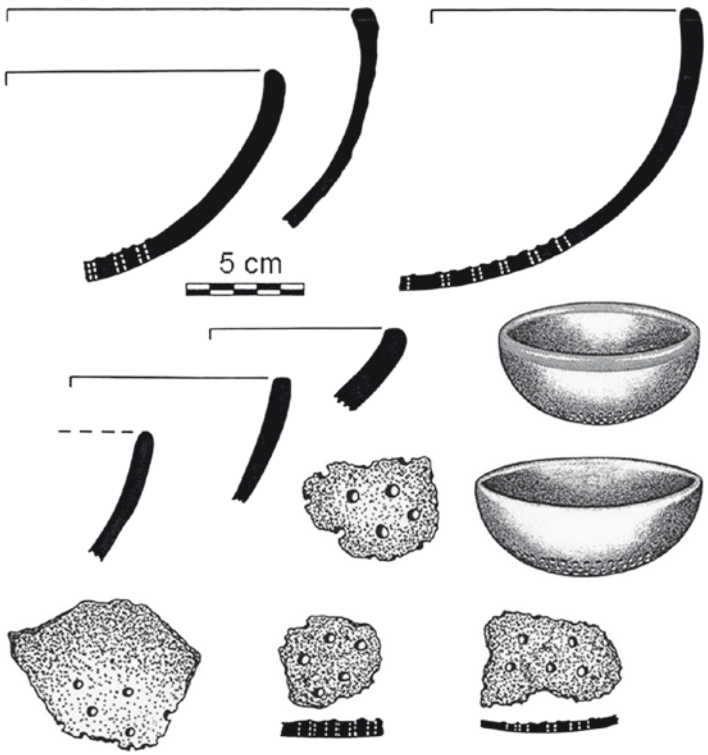

Fig. 6 Colander rim and base sherds from the central Petén and Belize Valley (whole vessels 2× graphic scale)

[5] The lack of colanders in northern Belize is not surprising. Swasey material dates to late Cunil horizon times and by 800 BC colander production ceased in all areas. However, their absence in the Pasión area is odd given the considerable ties between serving vessels in this area, the central Petén, and Belize Valley. Either colanders were used and simply not found during excavations, or other methods of rinsing corn were prevalent in the area.

holes (average diameter four millimeters) were poked through vessel bases from the exterior when the clay was wet. Most specimens have coarsely smoothed, soot-free unslipped surfaces that are commonly pitted, and some specimens have traces of white residue – presumably lime – on the interior surface. Central Petén potters often applied a dull red slip to the rim exterior, but on most specimens it is very eroded.

The culinary counterparts of colanders are relatively large unslipped jars and *tecomates* (neckless jars), both of which were used for cooking and storage (see Fig. 5). These globular vessels occur in all Cunil horizon ceramic complexes, but my descriptions are limited to areas where colanders are present. In the Belize Valley, the majority of these vessels are medium to medium-coarse tempered, with unslipped brown or black–brown surfaces burnished to a slip-like consistency on the upper shoulder and neck. Jars generally have rounded bottoms, short vertical necks, and wide vertical strap-handles. Most tecomates were finished in a similar manner, although the rims are usually thickened. As is evident from the dimensions presented in Table 4, the orifice of most of these vessels is too small to allow a colander to be inserted, indicating that maize was removed by some other means, such as a ladle. Ethnographic analogy suggests that wooden stands may have been used to support the colander for initial draining (Fig. 7), the nixtamal then carried to a clean water source and thoroughly rinsed.[6] Early Maya jar and tecomate

Table 4 Descriptive statistics for early Maya (1000–800 BC) cooking vessels used to produce nixtamal

	Central Petén			Belize Valley	
	Colander	Jar	Tecomate	Jar	Tecomate
Rim diameter (range)	22–30 cm	16–47 cm	17–40 cm	10–24 cm	8–27 cm
Rim diameter (mean)	24.5 cm	27 cm	32 cm	17 cm	19 cm
Capacity (liters)[a]	3.3	42.5 (37 cm dia.)	52.2 (35 cm dia.)	ca. 27	ca. 31
capacity ± 20% (min. to max.)	–	34–51	41.8–62.6	21.6–32.4	24.8–37.2
1/2 min. to max. capacity	–	17–25.5	20.9–31.3	10.8–16.2	12.4–18.6
kg maize required[b]		*12.8–19.1*	*15.7–23.5*	*8.1–12.2*	*9.3–13.9*

[a]Jar and tecomate estimates based on partially intact vessels (Central Petén), vessel wall curvature and complete height (base to neck/shoulder junction), and "summed cylinders" capacity calculation (see Rice 1987:221–222)
[b]Based on 1/2 min. to max capacity values (1 L = 0.75 kg dry maize)

[6] James Stuart (letter to author, January 10, 2002), who has made extensive observations of Nahua nixtamal production in Veracruz, states that rinsing in a stream or other moving body of water is preferred, since the frequent replenishment of clean water while the nixtamal is rubbed and kneaded is the most effective means of removing the lime and pericarp pieces. Where access to such a water source is inconvenient, water is periodically brought in and the nixtamal washed in buckets.

Fig. 7 Reconstruction scene of a Cunil Maya mother and daughter rinsing lime from maize in the center of the Cahal Pech village about 850 BC (note wooden colander stand and the gourd dipper in the woman's left hand). Drawing by Ayax Moreno, courtesy of the New World Archaeological Foundation

capacities range from about 21–37 L. In the central Petén these vessels are larger, with capacities in the 34–63 L range. Temper is medium-coarse, and the light brown to gray–brown unslipped surfaces are dull. Jars typically have medium–tall outcurved necks and a narrow flat base, whereas most tecomates have thickened rims like their counterparts in the Belize Valley. Handles are rare, the few examples being narrow and loop-shaped.

Using cooking vessel capacities, and assuming a 1:1 ratio of water to maize, it is possible to estimate the quantity of grain needed to produce a batch of nixtamal during the Cunil horizon (see Table 4). With these data in hand, and using the earlier estimate of 1.0 ha for milpas, the amount of maize available to one or more households (i.e. pooled) can be charted in daily increments and compared with the maize requirements per batch of nixtamal (Fig. 8). When all lines of data are

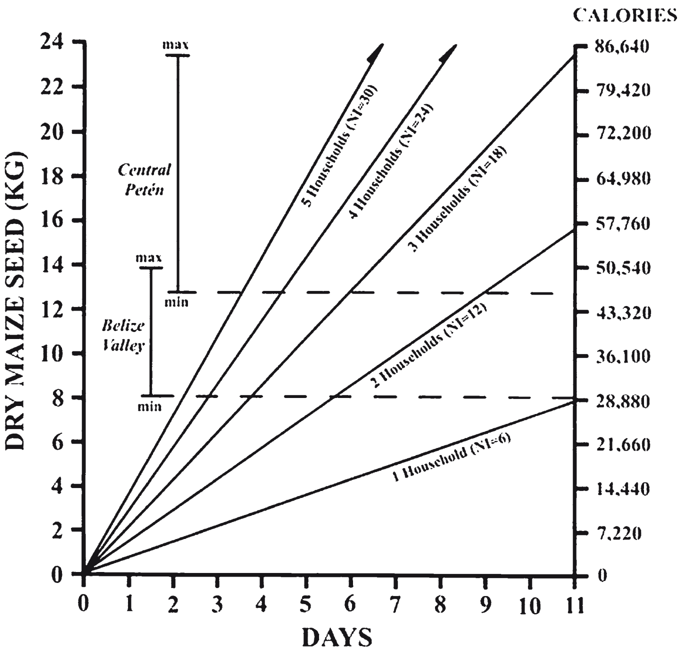

Fig. 8 Cumulative maize supply and caloric value for one to five households plotted against required maize for cooking vessels in the Belize Valley and central Petén (based on annual 1 ha milpa per household and 6.5 cm cobs)

presented in this manner, independent household production and consumption seems very unlikely. A batch of nixtamal in the Belize Valley, for example, would require *at least* 11 days of a household's maize reserves. In the central Petén, it would take an 18 day supply. On a more basic level, it is inconceivable that a household of six individuals could consume this much maize in isolation (1.3 kg/4,764 cal. per person in the Belize Valley, 2.2 kg/7,797 cal. in the Petén), and any leftovers would quickly spoil in the tropical climate. In short, cooking vessels size, estimated available maize supply, spoilage, and overall efficiency suggest that the production and consumption of nixtamal-based foods were cooperative events involving two or more households, with cooking duties rotating between them.

With further scrutiny of Fig. 8 it is possible to estimate how frequent these events were and the number of households involved. My interpretations are based on approximately two-thirds of calories from maize *on days nixtamal was made* (i.e. with per annum [average daily] caloric intake remaining at 20%). This amount is in keeping with (1) the modern daily maize intake introduced earlier; (2) the premise that nixtamal would not be eaten alone, but milled and consumed with other foods (e.g. in the form of tamales), and (3) the likelihood that leftover nixtamal or milled dough (*masa*) would rapidly spoil if not consumed within a 24-h period. With these limitations in mind, an interesting pattern emerges.

Based on one harvest a year, a two household consumer group in the Belize Valley would have the estimated minimum amount of maize for a batch of nixtamal (8.1 kg) every 5.6 days. On average, this would provide 109% of the day's caloric intake per person, an amount in excess of a typical day's caloric intake that would leave little or no room for supplementary foods. When the consumer group is expanded to three households, the time interval drops to 3.7 days, at which point about 73% of the day's caloric intake would come from maize. At this level of pooling, maize could be eaten regularly with other foods and spoilage would not be a factor. Larger consumer groups, although possible, seem unlikely given diminishing returns. A four household group, for instance, would have the requisite maize for a batch of nixtamal about a day earlier (2.8 days) than a three household group, but the caloric value per person drops to 55%. With five households pooling maize, the disadvantages are more pronounced (2.2 days, 44%).

Given relatively large cooking vessels, the central Petén Maya required considerably more seed (158–169%) to prepare a batch of nixtamal than their Belize Valley neighbors. A two household consumer group, for example, would need 8.9 days of supply to meet the estimated minimum vessel requirement (12.8 kg). This amount of maize, however, would vastly exceed the group's needs (174% of caloric intake per person). A three household consumer group – the suggested optimal grouping for the Belize Valley – would require 5.9 days of pooled maize reserves, but still exceed per person caloric intake (115%) and leave no room for additional foods. The most efficient consumer group size would appear to be four to five households. Under these conditions, collective maize reserves would be available every 4.4–3.6 days, and would provide 86–70% of caloric needs. At this level of pooling, caloric intakes and time intervals approximate those of the three household consumer group proposed for the Belize Valley.

Conclusions

Ceramic colanders produced during the first two centuries of fully sedentary village life in the Belize Valley and central Petén areas of the Maya Lowlands were used to wash maize after the outer shells (pericarp) were removed in an alkaline solution of boiling water and lime. This interpretation is supported by occasional traces of white substance on colander interiors, the lack of soot on these vessels, and analogous ethnographic examples of the containers and procedures used to make nixtamal. Of subsequent preparation I am less sure, but the presence of grinding implements suggests that nixtamal was milled into masa dough, and the absence of flat ceramic griddles (*comales*) eliminates tortillas as the end product. Steaming or baking seems most likely, in which case the food would have been tamales. If true, this basic food of the Classic period Maya (see Taube 1989) originated at least 1,300 years earlier.

Considering their relatively late shift to fully sedentary village life and pottery making – some 500–600 years after neighboring regions – it is curious that the lowland Maya provide the earliest tangible evidence of nixtamal technology in Mesoamerica and beyond. A single colander is reported for the 1000–800 BC era in the distant Valley of Mexico (Niederberger 1976:Pl. 41[13]), but contemporary and earlier cultures in regions surrounding the Maya Lowlands did not make these vessels. As one of the many unique ceramic traits defining the Cunil horizon, colanders are thus a good indicator that the founders of Maya villages were not immigrants, but indigenous peoples who embraced ceramic technology and fashioned their pots according to local practical and stylistic demands. In a more fundamental sense, a causal relationship between agricultural pursuits and ceramics is unlikely (see Brown 1989:205) given centuries of maize cultivation before the introduction of pottery. Rather, the production of pottery was probably the inevitable by-product of permanent village life and heightened contact with distant cultures that already had vigorous ceramic traditions.

Like colanders, the lime pre-treatment of maize may have been a Maya initiative, but it is entirely possible that the general practice was adopted from neighboring cultures that used some means other than ceramic colanders to rinse maize.[7] In any case, the fact that colanders were made from the outset of fully sedentary village life in the Maya Lowlands suggests that the practice of soaking dry maize in caustic water – with or without boiling – began sometime during the preceding Preceramic period. If so, ceramic colanders may have replaced or supplemented perforated wooden or gourd prototypes.

When cooking vessel sizes, estimated maize yields, and caloric intake data are considered together, independent nixtamal processing and consumption by individual Maya households during the Cunil horizon is not a viable interpretation. Even when filled to 80% of average capacity, as I have modeled their handling in this chapter, cooking vessels simply yielded too much maize for individual families. Spoilage and the sporadic preparation intervals dictated by limited maize supplies further reduce the prospect of single family production and consumer groups. Apparently, extended households (i.e. multi-building residential clusters) were the norm and, based on area-specific cooking pot sizes, I suspect these fundamental social units were slightly larger in central Petén villages like Tikal and Uaxactún (four to five residences) than in Belize Valley villages like Cahal Pech and Xunantunich (three residences). The important point is that cooking vessel sizes in this case are a mute indicator of basic consumer group size, not the relative consumption of maize or large-scale consumption events, such as feasts. Potential links between culinary implements and basic consumer group size should be a launching pad for studies of consumptive behavior and social organization, especially where data on residential composition are scarce or lacking.

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[7] Mixe-Zoquean speaking groups of the greater Isthmian area to the west (Chiapas, southern Veracruz, and eastern Oaxaca) are a possible source of inspiration for this tradition. The reconstructed Mixe-Zoquean vocabulary includes a word for nixtamal (*pici*) and numerous other maize-related loan words (Campbell and Kaufman 1976:85, 87) that diffused to distant regions of Mesoamerica, including the Maya Lowlands, most likely during the final two centuries of the second millennium BC.

Very little is known about the physical arrangement of residential structures during the Cunil horizon, but what we do know supports the idea of extended household consumer groups. For example, two closely spaced residential building platforms dated to about 850 BC were found below the southeast corner of the central plaza at Cahal Pech (Cheetham 1995). Because excavations failed to expose much of the adjoining area, it is possible that one or more additional residential buildings once stood in close proximity. In general, the frequency of Cunil phase structures below the central plaza at Cahal Pech indicate a village of tightly clustered household units (Cheetham 1996). Architectural data of this sort are currently unknown in the central Petén, though two enormous and closely spaced Eb phase middens at Tikal (Laporte and Fialko 1993:Fig. 6b–c) suggest several households in the immediate area. The clustering of three or more Swasey phase residential structures at Cuello (Hammond et al. 1991:Figs. 3.2–3.4) is a very strong candidate for an extended household consumer group.

In a particularly relevant study, Mills (1999) argues that increasing cooking vessel size in the Four Corners area of the American Southwest ca. AD 1100–1300 reflects larger consumer groups rather than greater per capita maize consumption. In support of this persuasive argument, Mills notes a shift toward larger extended households evidenced by increasingly agglomerated residential architecture. A comparable increase in cooking vessel size is lacking in the Belize Valley and central Petén for the Cunil horizon, suggesting that early Maya extended household size remained steady in both areas during this roughly 200-year period.

Given the apparent link between cooking vessels and consumer group size, it would be interesting to know if, and to what extent, the capacity of cooking pots made after 800 BC departed from Cunil horizon norms. Detailed analyses of Middle and Late Preclassic period vessels will, of course, be required to determine this, but having handled a great deal of this material it is my impression that capacities did not change, at least not appreciably. If this proves true, extended household consumer groups of Cunil horizon times persisted as maize yields steadily increased relative to cob size. Increasing supplies would have gradually reduced the interval between preparations, thus allowing maize to be eaten more frequently even though batch size (i.e. vessel size) remained about constant. Interestingly, increased maize consumption during the Middle and Late Preclassic periods is indicated by isotopic studies of human bone collagen (e.g. Powis et al. 1999), and groups of three to five residential structures are characteristic of these and all subsequent periods (Ashmore 1981:Figs. 3.2–3.3; Powis 1996). The fundamental unit of lowland Maya social organization, it would appear, was in place from the outset of settled village life.

Perhaps the most puzzling aspect of early Maya maize processing is the cessation of colander production at the end of the Cunil horizon. It is tempting to suggest that nixtamal-making was discontinued along with colanders about 800 BC, but it is unlikely that the practical – and possibly nutritional – benefits of boiling maize with lime would be ignored once known. It is more likely that the rinsing procedure itself changed. New and perhaps more efficient methods to remove lime from boiled maize may have included rinsing and draining in the same cooking pot, transferring boiled corn to a pot of clean water, or rinsing with perishable containers like perforated gourds or baskets. Whatever transpired, it is clear that the Cunil horizon practice of extended-household maize preparation and consumption was an enduring legacy.

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Potographies and Biographies: The Role of Food in Ritual and Identity as Seen Through Life Histories of Selected Maya Pots and People

Linda Howie, Christine D. White, and Fred J. Longstaffe

Introduction

The centrality of food, drink and feasting in religious and ceremonial activities of the Lowland Maya, especially the nobility, is well recognized, and has also been tied to political economies (see Foias 2007). Numerous representations of drinking, serving and storage vessels appear in historical and mythological scenes depicted on figure-painted polychrome vessels and other media. These depictions testify to the integral role of consumption, offering and sharing of food and drink in religious and ceremonial proceedings. These ritual acts and forms of reciprocity signified, solidified, symbolized and reinforced conventional and appropriate social practices – proper and a distinctly Maya way of conducting affairs. Such practices, however, were not confined to the face-to-face interactions of the living but also played an important role in funerary and mortuary rites, and in ancestor veneration, when they would symbolize and reinforce relationships between the living and the dead, and among the ancestors and their descendents.

The interment of serving and drinking vessels along with the deceased appears to have been one of the few universal characteristics of Maya mortuary practice until at least the Terminal Classic period (Welsh 1988). The presence of these items in burials is most often thought of as incidental, and their functions may have varied. As containers for food and/or drink offerings, pots are thought to have been placed with the deceased as a final commemorative act or as necessary sustenance for the journey to the underworld. Burial vessels have also been perceived as personal belongings of the deceased and as objects that characterize office, status, age or sex (Ruz 1965). It has also been suggested that they might have served as a "metaphor for *pibs*, "earth ovens" where the gods, like food, were transformed or conjured" (Mock 1998:7; see also Freidel et al. 1993; Houston 1993).

Although the occurrence of pottery in burials is a widespread and long-lived practice among the Lowland Maya, assemblage composition (stylistic and functional

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types and quantities) and depositional patterns (specific placement and condition of vessels) can vary greatly. Furthermore, not all burials contain pottery. This variation strongly suggests that there were no standard or prescribed customs with regard to: (1) specific details of the rites and ceremonies involving food and drink (or simply their containers), (2) the kinds, quality and quantity of vessels to be interred, and (3) location of placement within the burial. This study explores factors contributing to variation in the use and deposition of ceramic containers for food and drink within the context of mortuary ceremonies.

Understanding individual identities is the key to moving from the incomplete physical remnants of what is really a complex series of acts, to understanding the performance of these acts. Differences in biological identity created by age and sex are relatively easily deduced from skeletal remains, but the "social persona" (*sensu* Goodenough 1965) as identified through characteristics such as relative position in a social unit, socioeconomic status, and affiliation of the deceased with other social groups is most often inferred from indirect evidence. This evidence can vary in form, but conventionally has included characteristics such as: the position and orientation of the body, the expense of grave preparation, grave location, and the quantity and quality of grave goods (e.g., Carr 1995). As discussed recently by Gillespie (2001:77–78), however, the assumption that burial treatment can be considered to reflect the "terminal status" of the individual interred is problematic because it ignores the fact that mortuary rituals have as much to do with "the relationships negotiated by the survivors between themselves and the dead and/or the ancestors the dead will become." She argues further that mortuary rituals also reflect "the relationships within and among the social units that were involved with the deceased, including political and economic relationships" (2001:78), using as an example child burials, which are more often accorded treatments more commonly given to high status adults. Although few would deny the possibility that the political and economic aspects of social identity might shape mortuary treatment in individual cases, how does one go about recovering this level of information about the individual from the evidence available in burials, and is it even possible to do so?

We frame our understanding of Maya food and ritual using Barrett's (2001) argument that less visible aspects of social identity can be brought to light through the study of execution of ritual, its historical context and the physical remains it produces. Accordingly, we reconstruct the materially invisible lives of pots and the people with whom they were interred. Just as the social biographies of deceased individuals are encrypted in the biology of their skeletons, pots also have their own identities conferred upon them by the choices of their makers and then by their users from their initial creation to their final deposition. Looking beyond the observable characteristics of mortuary treatment and skeletal remains, we use the composition of human tissues and ceramic fabrics along with their forms (body modification and ceramic styles) to investigate the geographic origins of the deceased. This approach enables the application of practice theory to understand the behavior of the deceased and actions of the living funerary participants that lay outside of the actual mortuary ritual. We show how food (as a biological entity), and pottery vessels (as material creations) signal forms of social identity in

Terminal Classic to Early Postclassic period burials, using four residential complexes at the Maya city center of Lamanai to illustrate this approach.

Historical Context: Lamanai During the Terminal Classic to Early Postclassic Period

The Maya city center of Lamanai is situated on the northwest bank of the New River Lagoon in the interior of northern Belize (Fig. 1). The site is perhaps best known for its lengthy and continuous history of occupation, spanning the Middle Preclassic to Spanish Colonial periods (Graham 2004, 2008; Pendergast 1981a:31, 1988). A robust and well-preserved record has emerged from the Terminal Classic (A.D. 770 to 960/1000) to Early Postclassic period (A.D. 960/1000(circa. AD 770 to AD 1200/1250) (Graham 2008), the earlier end of 1200), which coincides with the Classic Maya collapse. Material evidence of this time period is particularly rich, being represented by extensive artifact and architectural assemblages, and numerous burials and offerings. A large body of evidence on the construction history, use and maintenance of different residential and public areas has revealed that the Terminal Classic to Early Postclassic community at Lamanai experienced continued prosperity and a degree of stability, marked by construction projects that varied in scale at a time when many other Maya city centers were undergoing economic

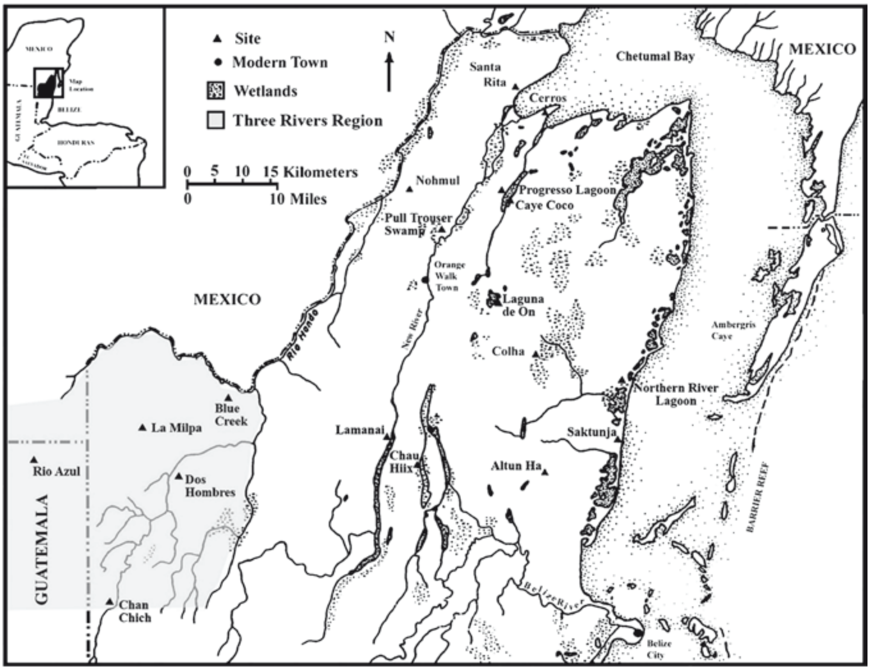


Fig. 1 Map of northern Belize showing sites mentioned in the text

decline and socio-political upheaval on an unprecedented scale. Accompanying these changes to the built environment, are equally conspicuous shifts in burial patterns, mortuary and offertory practices and in material culture inventories, particularly pottery. These highly visible instances of change did not occur simultaneously, but appear to have emerged over at least three centuries amidst an undercurrent of continuity in socio-political and economic organization and infrastructure, as well as religious and ceremonial practices (Graham 2004, 2006; Pendergast 1986).

This pervasive dynamic of stability and change appears to have been integral to the community's ability to survive in the face of changing world conditions on the regional level. In considering cultural developmental processes that contributed to the evolution of material manifestations of Classic versus Postclassic period Maya culture, it appears that this dynamism was instrumental in shaping a complex and fluid community history in which earlier traditions were retained, sometimes in a slightly modified form, alongside shifts in direction and obvious instances of innovation. Some of the changes that can be observed in the material record (such as presence of a 'Yucatecan style' columned building, Str. N10-2, similar to examples found in the northern Yucatan Peninsula, two elite residential and administrative buildings and the dramatic shift in pottery styles) appear to be based on new ideas, which originated either from local innovations or other geographic areas (Pendergast 1981a). Others (such as approaches to building construction and ceramic manufacturing technologies) appear, however, to result from the merging of new ideas with established conventions (1986; Graham 1987). It is this blending of the "new" with the "old" that provides the potential for understanding patterns of variability across time and space in community-based activities such as the interment of the deceased.

There are at least two underlying factors that appear to have contributed to the continued well-being at Lamanai: (1) the site's lake side location within a major river system, and (2) the nature and qualities of community leadership Pendergast (1981a, 1992, 1990:171–172). The New River Lagoon would have provided an abundant source of protein from fish and other aquatic species and an ample supply of water to fulfill a range of community needs, including the possible use of the raised field system situated to the north of the site. Studies of paleodiet and dental pathology provide direct evidence of the good health of the population during the Terminal Classic and Postclassic periods, and indicate a uniform mixed diet that became more dominantly maize-based during the Postclassic period (White and Schwarcz 1989). The New River would have enabled trade and communication with sites in both the southern and northern lowlands (Fig. 1). The Peten and northern Yucatecan influences observed in Classic and Terminal Classic to Early Postclassic architecture, respectively, provide evidence of the flow of ideas from these areas into the local community (Pendergast 1981a, 1985, 1986). Likewise, the occurrence of nonlocal material items, such as marine shell deriving from coastal regions and ground-stone implements of granite from the Maya Mountains, attest to economic links to different areas within the lowland region. Participation in long distance exchange networks is suggested by the presence of material culture created from distant raw materials from Mexico and the highlands of Guatemala and Honduras, such as liquid mercury (Pendergast 1982) and items made of jade, obsidian, copper, gold and metal alloys (Pendergast 1990:173, 1992). Although interaction with communities situated to the north of Lamanai were well established by at least Late Classic times (Howie 2005), it would appear that Lamanai strengthened ties to the northern lowlands during the Postclassic period, probably because the collapse caused the loss of southern lowland trading partners.

It would seem that continued resilience of the community was due, in no small part, to the stability and effectiveness of community leadership. Community leaders at Lamanai were still able to complete large-scale communal construction projects during the Terminal Classic and Early Postclassic periods, as demonstrated by the major reshaping of the Ottawa Group elite residential and administrative complex (N10[3]), the construction of new ceremonial structures in the N10-9 and N10-2 plazas groups (Fig. 2), and new, presumably, nonelite residences (Pendergast 1981a:40, 1986:229–233, 1992:74). In addition, considering the effort expended by elites to provide appropriate living quarters and settings for religious, ceremonial and administrative activities, it would seem that they continued to receive the full support of the community. The community's ongoing support of the local nobility could have derived from a reduced demand of labor tax in comparison to other centers. Pendergast (1992:73) has noted that the tendency to modify the front of major ceremonial structures, rather than completely transform them, started in Late Classic times, and may reflect a scaling down of public work projects requiring labour tribute. He also observes that the comparatively small number of structures that conform to the "Palace" building type at Lamanai might imply the presence of fewer elites (Pendergast 1992:66–67). Accordingly, the ongoing stability of the site from Late Classic times onwards might be due, at least in part, to the fact that the community was not plagued by the internal factional conflicts and associated interelite competition that contributed to the instability and rapid decline of other southern lowland centers.

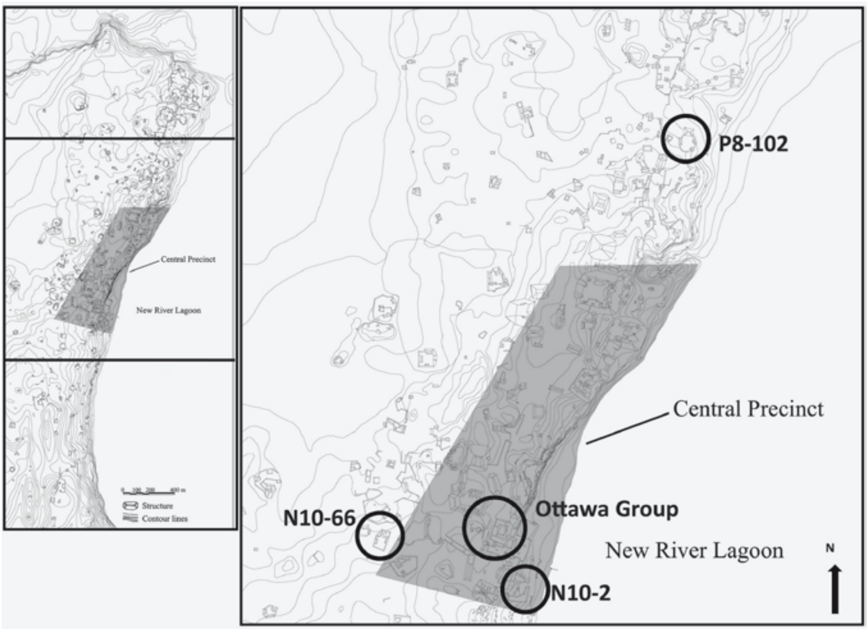


Fig. 2 Map of Lamanai showing building groups mentioned in the text

There is abundant evidence that the community leaders at Lamanai actively sought to maintain and preserve the central place of ceremonial and religious activities in community life, as well as their traditional role at the head of these activities (Pendergast 1992:77). For instance, the general focus of construction activities appears to have been predicated on the establishment and maintenance of physical links between the past and present, as well as the affirmation of traditional religious beliefs. The placement of new ceremonial structures and facilities, including a ball court, literally in the shadows of buildings that were major sites of ceremonial activity in the Classic period and earlier, would give a strong physical and psychological sense of continuity in the built setting of religious and ceremonial events.

In the face of this conservatism rises the issue of whether individuals from other communities played a part in the Lamanai polity in Terminal Classic or Early Postclassic times. The current evidence of outsiders (i.e. immigrants) is ambiguous. is ambiguous. The construction of new residential structures on the periphery of the central precinct starting in the Terminal Classic might suggest their acceptance, as has been the case of other sites in northern Belize (e.g., Hammond and Tourtellot 2004; Sullivan 2002). At Lamanai, however. there is little corroborating evidence from architecture, construction approach or pottery styles to identify the inhabitants of these new residences specifically as immigrants (Pendergast 1992:77).

Terminal Classic to Early Postclassic Burials in Residential Complexes

The burials that are the focus of this study, excavated during David Pendergast's investigations at the site between 1974 to 1987, were found in four building complexes: groups P8-102, N10-66, N10[3] (also known as the "Ottawa group"), and N10-2 (Fig. 2). All of these building groups comprise a central plaza (or courtyard in the case of the Ottawa group) around which different structures are arranged, at least one of which is presumed to have served as a residence (Pendergast, 1975, Pendergast, 1981a, b, 1985, 1986). Groups P8-102 and N10-66 were constructed during the Terminal Classic period in residential areas that border the central precinct on the north and west, respectively. The P8-102 group was built in an area that was previously abandoned during the Preclassic period, whereas no earlier buildings were detected in the vicinity of the N10-66 group (Pendergast 1981a:40, 1986:227–229). The Ottawa group has been interpreted as an elite residential and administrative complex at Lamanai, first established during Preclassic times (Pendergast 1985:93–95, 1986:232–233; Graham 2004:18–21). This building group underwent a major reshaping during the Terminal Classic period. Given the central and prominent location of this building group, as well as the considerable and on-going effort dedicated to modifying its architectural and design features, it can be concluded that the elite group who occupied it most likely had an important role and status within the community. The N10-2 plaza group is situated just to the east of the plaza group onto which the Ottawa Group fronts (N10-9 plaza group). The earliest phases of at least some of the buildings in this group (e.g., N10-2) date to the Preclassic period (Pendergast 1975, 1981a:44). The largest structures, N10-2 and N10-4, underwent several episodes of modification and rebuilding until the Early to Middle Postclassic period. Based on their architectural features, N10-2 appears to have functioned as a ceremonial structure, whereas N10-4 appears to have served as an elite residential and administrative building (Pendergast 1981a:44–51, 1986).

These four building groups conform to the "typical" Maya residential grouping i.e., a domestic compound that would have housed an extended family of relations over multiple generations (e.g., Ashmore 1981; Gillespie 2001). The household members shared living arrangements and economic and ritual activities, and consequently would have maintained a collective identity (Hendon 1999). Burials encountered within these contexts are presumed to represent family members, who, for reasons unknown, were interred within the physical space of the household as opposed to some other location. The comparatively small number of burials found within residential complexes up until the Terminal Classic at Lamanai, and elsewhere (c.f. Welsh 1988), indicates that only certain family members were accorded this special treatment. The evidence for continued ritual activity at these locations (e.g., incense burning) suggests that these deceased family members remained important in the day-to-day lives of the living (Chase and Chase 1994).

Terminal Classic to Early Postclassic Burial Patterns

Although a detailed synthesis of community level patterns in mortuary treatment at Lamanai is yet to emerge, some general observations of Classic vs. Terminal Classic and Postclassic patterns can still be made. Burials dating to the Terminal Classic and Postclassic periods constitute the predominant portion of the burials documented during Pendergast's excavations of various structures and building groups, including the four residential complexes that are the focus of this study. (White 1997). Nevertheless, since Classic period construction phases of these structures and building groups were as intensively investigated as later phases, the greater number of Terminal Classic and Postclassic burials would seem to imply that the interment of deceased members of the community within building cores and foundations became a more common practice in these later time periods. For example, ceremonial structures built in the Terminal Classic and Early Postclassic periods such as N10-7, N10-2 and N10-1 were found to contain a large number of burials (in some cases more than fifty), while those built in the Classic period or earlier such as N9-56, N10-43, N10-27 and N10-9 contained comparatively few (Pendergast 1981a). The prevalence of interments dating to the Terminal Classic and Postclassic periods also suggest a broadening of the function of some ceremonial buildings, which in effect, took on an additional role as burial repositories. Our sample was selected from residential complexes occupied during the Terminal Classic to Early Postclassic period not only because they provided a large number of skeletons and ceramics, but also because the people who lived in these complexes were involved in a range of ritual activity.

Other characteristics of the mortuary pattern that appear to represent a clear departure from earlier practices include the types of objects included as grave goods, and possibly the positioning of body within the burial. Terminal Classic and Early Postclassic burial accompaniments comprise a range of items similar to those in Classic period burials including pottery vessels and objects of worked stone, marine shell and bone (Pendergast 1978, 1981a, 1988), but obsidian artifacts diminish (Pendergast 1986:241) and metal artifacts appear (Pendergast 1975, 1981a). The metal artifacts, imported as finished products are significant because they provide evidence of distant trade contacts at a time when the central precincts at many other Maya centers in the southern lowland region had been long since abandoned (Pendergast 1986; Graham 2004). Perhaps more importantly, they also reflect the emergence of new forms of material wealth and prestige within the community.

The Terminal Classic period also marks a significant change in the depositional pattern of ceramics in the context of burials. During the Classic period and earlier, pottery vessels are used in the burial as grave accompaniments for the corpse and, at least in some cases, as containers for food, drink and other perishable and nonperishable substances (Pendergast 1981a). With the emergence of Early Postclassic pottery styles, the production of which was well established by least A.D. 1050 (Graham 2008), the ceramics within burials exhibit patterns of preinterment breakage – i.e. whole vessels are usually entirely absent, and the fragments of broken vessels are placed alongside and scattered over the corpse. Given the specific placement of the pottery fragments within these burials, and since they are largely restorable into complete forms, it would appear that the original vessels were intentionally smashed just prior to interment as part of funerary rites. In addition, in every instance where smashed vessels were interred, pieces of each of the vessels recovered from the burial are missing, suggesting that the fragments were retained by participants in the burial ceremony, perhaps as a memento of the occasion or for some other purpose such as maintaining ancestral connections. By the end of the Terminal Classic period, therefore, changes are evident in: (1) the nature and kinds of grave goods that were included in burials, (2) the established form of funerary ceremonies, which come to incorporate new forms of ritual behaviour, and (3) the patterns of use of pottery vessels. These changes, including the interment of smashed pottery, become standard practise during the Early Postclassic period. The implication of such changes is that beliefs about the function and appropriate treatment of pottery within the context of mortuary rites had changed.

In considering Lamanai burial patterns within their broader historical context, the main questions that emerge are: (1) how are new ideas about appropriate mortuary rites translated into "common practice," and, (2) is change the result of the flow of new ideas or new people (i.e. immigrants) into the community? Because local community development was contingent upon both external and internal economic, social, political, and ideological influences, understanding these processes depends on historically contextualizing the material record of funerary activities and reconstructing the identity of the participants. Burials present material remains of these activities in their historical and social contexts. They also offer some evidence of the conditions, beliefs and values that underlie ceremonial practices. If we consider mortuary practice to reflect equally the identity of both the deceased and participants (direct and indirect), then we can understand the identities of the social and economic groups involved with the deceased.

Pottery-Based Reconstruction of Identity

Differences in identity among residential burials were investigated through a comparative study of the stylistic (morphology and surface treatment) and provenance (origin of manufacture) characteristics of vessels interred within individual burials and in different household contexts. Within burial contexts, vessel styles reflect the choices of living participants in mortuary events, and are indicative of group values, tastes and consumption practices.

Vessel provenance relates specifically to the compositional characteristics of ceramic bodies, particularly the characteristics of raw materials (e.g., clays, rocks and minerals) used in their manufacture, which vary across the landscape because of differences in natural geological processes of formation and alteration. Ceramic bodies can be analyzed under the microscope in thin section (thin section petrography) and compared to geological specimens of known origin, or geological maps and descriptions of the region under study, in order to determine where they were made (c.f. Whitbread 1995; Freestone 1991).[1] Therefore, the origin of ceramic vessels provides insight into the economic relationships and interactions of the people involved in mortuary ceremonies.

The choice of particular raw material ingredients and paste processing techniques also reflects the specific practices of particular potters/groups of potters. Potters working within the same geological zone, may or may not follow the same approach to paste making – i.e. use the same clay deposits or tempering materials and prepare them in the same way. Hence, even when vessels are stylistically equivalent it is often possible to discriminate the products of potters working in the same locale based on compositional characteristics (c.f. Day et al. 1999). Thus, *vessel composition* not only reflects pottery produced within specific resource zones, but also particular manufacturing traditions. These linkages between pots and specific geographic locales or geological deposits, and among pots that have the same or different stylistic characteristics, are used to reconstruct consumption patterns that reflect economic practices, as well as relationships with particular economic groups (groups of producers).

The provenance of a vessel produced in a distant location or from nonlocal raw materials is a measure of its perceived value, and the occurrence of "exotic" ceramics in burial contexts is often used as an index of relative wealth and/or status. Accordingly, knowing where a vessel was produced in comparison to where it was deposited can offer insight into other aspects of social identity, including the tastes and values of a

[1] The burial vessels included in this study were analysed as part of a larger project investigating the stylistic, technological and provenance characteristics of the late Late Classic to Early Postclassic ceramic assemblage at Lamanai (Howie 2005). This study examined the stylistic characteristics of over 2000 individual vessels deriving from burials, offerings and midden deposits. Over 700 of these vessels were analysed petrographically (in plane- and cross-polarized light at magnifications between 25x and 100x) and compared to fired samples of 35 different local clays and numerous rock samples. Provenances of "non-local" pottery fabrics (pastes) were ascribed using a broad range of comparative geological information, including maps, published descriptions of formations and sediments and geological specimens. For detailed descriptions of the different fabric (paste) types discussed here, as well as the regional and local geology see Howie (2005).

social group with respect to acknowledged forms of material wealth or prestige. It is assumed that such vessels were used in ritual and, when functioning as containers, an important category of ritual use must have been feasting and drinking.

Biological Reconstruction of Identity

Three lines of evidence were used to reconstruct identity from the biological record: head shaping, artificial dental modification, and stable isotope analysis. The fragmentary nature of most of the skeletons precludes full osteological analysis of morphological distinctions. Cranial and dental modification styles were categorized according to Tiesler Blos (1998) and Romero (1970), respectively. These are thought to be markers of group or regional identity, but they become embodied at different life stages. Cranial modification is done during infancy, whereas dental modification is done on permanent teeth, presumably in early adulthood. Dietary and geographic identities were derived from the carbon- and oxygen-isotope compositions of bones and teeth based on the premise that "we are what we eat and drink." Details of the theoretical basis and methodology used in isotopic analyses are provided in previous publications (White et al. 2000, 2001a, b).

A permanent record of food and drink is created in enamel during the time of its mineralization, but bone continuously remodels and, therefore, reflects a longer term, more homogenized record (10–15 years) (Parfitt 1983). Movement to a new environment will result in a reequilibration of isotopic compositions, a process that will occur more quickly in children because their remodeling rates are higher. *In vivo* relocations can be identified by comparing the isotopic compositions of enamel and bone.

The oxygen isotope composition ($\delta^{18}O$) of bones and teeth reflects that of body water, which is derived from imbibed meteoric water which, in turn, is determined by climatic and environmental variables (Longinelli 1984; Luz et al. 1984). Intrasite variability can be caused by seasonality, use of different local water sources, consumption of imported foods with high water content, and the presence of breastfed children, who are enriched in ^{18}O because their water source is mother's milk (Wright and Schwarcz 1999; White et al. 2000). The environmental difference among sites must be distinctive enough for $\delta^{18}O$ values to be effective discriminators of geographic origins.

Isotopic variation that exists among plants and trophic levels is the basis of paleodietary reconstruction (for a more detailed review of the principles and interpretation of paleodietary isotopic analysis, see Ambrose 1993). Briefly, there are three photosynthetic categories (C_3, C_4, CAM) each with different $\delta^{13}C$ values for all plants. C_3 plants have the most negative values (modern average is $-26.5^0/_{00}$, O'Leary 1988), and comprise most wild plants, trees, nuts, fruits and vegetable cultigens. C_4 plants have less negative $\delta^{13}C$ values (modern average is $-12.5^0/_{00}$, O'Leary 1988). The only C_4 staple in Mesoamerica was maize. To provide the most complete dietary reconstruction, we have analysed both collagen and structural carbonate in our samples. Normally, collagen reflects the protein component of the diet as it is derived from plants, and structural carbonate reflects whole diet (Krueger and Sullivan 1984; Ambrose 1993).

Because humans are omnivores, their isotopic compositions reflect both the plants and animals that they consume. Diets from coastal Mesoamerica include marine/reef resources, which confound dietary interpretations because they emulate C_4 plants. To deal with this problem, we use nitrogen-isotope ratios in collagen ($\delta^{15}N_{col}$) to establish the trophic level and source of dietary protein (DeNiro and Epstein 1981; Schoeninger 1985). In this food web, the highest $\delta^{15}N$ values are found in marine mammals and the lowest in legumes and blue-green algae (Schoeninger 1985). We also use the spacing between $\delta^{13}C$ collagen ($\delta^{13}C_{col}$) and structural carbonate ($\delta^{13}C_{sc}$) values because it provides a measure of the degree of carnivory versus herbivory, and marine resource consumption appears as exaggerated carnivory (Krueger and Sullivan 1984; Lee Thorp et al. 1989; White et al. 2001b). Previous isotopic analyses for Lamanai indicate that its inhabitants depended less on maize and more on marine foods than those from other regional sites, and that the C_4-based diet there included C_4-consuming animals such as dogs or deer and C_4-like marine resources (Coyston et al. 1999; White and Schwarcz 1989).

The integrity of preservation of isotopic compositions of carbonate was assessed using the CO_2 yield, calcium/phosphate (C/P) ratio, and crystallinity index (CI). We assume that $\delta^{18}O$ values were well preserved as no significant correlations were found between them and CO_2 yield (Pearson's $r=-0.14$, df=37), C/P (Pearson's $r=-0.01$, df=37), or CI (Pearson's $r=0.29$, df=37). Similarly, there were no significant differences between mean $\delta^{18}O$ values for first molar/bone pairs (27.6 ± 0.9/27.1 ± 0.4‰) or premolar/bone pairs (27.9 ± 0.8/27.6 ± 1.2‰) excluding one outlier (N10-4/9 Ind – a premolar). This is not the case, however, for the $\delta^{13}C$ values of structural carbonate. For samples that have C/P values over 0.30, there is a highly significant correlation (Pearson's $r=0.47$, df=37, $p<0.01$) in which the $\delta^{13}C_{sc}$ values are all lower than −2.0‰. We have excluded these results from our calculations and interpretation and taken the precaution of excluding all other $\delta^{13}C_{sc}$ values that are lower than −2.0‰.

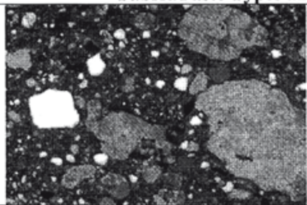
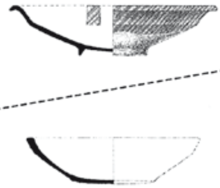
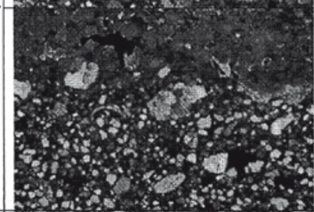
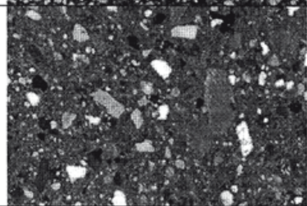
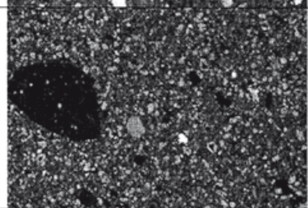
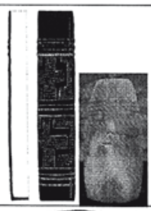
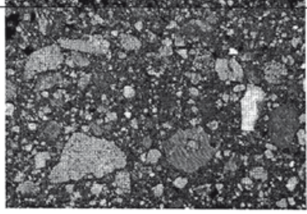
The collagen in these samples was well preserved. The mean collagen yield is high for this region of the world (6.1% ± 2.7, range = 0.6–13%) (Table 1). Only two samples (N10-7/3 and dentine collagen of N10-7/1) did not yield sufficient collagen for analysis. All other collagen samples gave C/N ratios within the acceptably defined range of 2.9–3.6 (DeNiro 1985).

Terminal Classic to Early Postclassic Burials in Residential Complexes

General Statements

The pottery – The burials within the different household complexes examined contain a striking array of stylistically different vessels, in terms of their individual morphologies and decorative treatment and this diversity is reflected in

Table 1 Isotopic data for selected building groups at Lamanai, Belize

Burial	Pottery Styles	Fabric/Paste Types and Provenance	
102/1			**'sandy sascab-tempered'** a sandy calcareous clay, tempered with sascab **Local** - clay is comparable to deposits situated at the north side of the site (outwash area); temper is comparable to cretaceous sascab outcrop southwest of the central precinct.
102/2			**'non-local calcite-tempered'** a calcareous clay containing shell fragments and rounded siliceous inclusions tempered with a white, sugary textured, (containing distinctive quartz) **Non-local** – distinctive temper; riverine clay from inland areas of northern Belize
102/3			**'grog-tempered'** calcareous clay tempered with grog and varying amounts of sascab and crystalline calcite. **Local** – comparable to clays at the site (subsurface and associated with weathering limestone)and on the north side of the site (outwash area)
102/10b			**'dolomitic marl-based'** sandy-textured marl deriving from weathered dolomite, likely untempered **Non-local** - associated with dolomite formations (Cayo Group) in east and northeast northern Belize
102/15			**'calcite and sascab-tempered'** a calcareous clay containing discrete calcite grains, and lesser quantities of other minerals, tempered with sascab and finely to medium crystalline limestone **Local** - comparable to clays at the site that are associated with weathering limestone
104/2			

their compositional characteristics, with multiple local and nonlocal fabric types represented. This pattern of variability is also consistent with the styles and compositions observed among pottery found in other Terminal Classic to Early Postclassic contexts at Lamanai, such as refuse deposits associated with domestic and ceremonial structures, and caches and offerings (Howie 2005; Graham 1987; Pendergast 1982). In the majority of burials, the styles of vessels are visually similar to established pottery types that characterize the late Late Classic through to Early Postclassic periods.[2] Therefore, it is likely that the kinds of vessels interred as part of funerary ceremonies at these building groups were not strictly produced for this purpose, but also used in a range of other activities and contexts. The range of functional categories of the vessels in the burials examined is, however, restricted. As a group, they comprise stylistic types that are generally thought of as standard decorated table wares (or fine ware) – i.e. generally used for serving, eating, and drinking in various social and ritual contexts. Conspicuously absent in these burials are utilitarian wares, such as storage jars, cooking pots and other, generally undecorated, vessel forms that were used in food preparation and other domestic activities.

The skeletal remains – The $\delta^{18}O$ values of the individuals interred in the different building groups range from 25.7 to 30.5‰ (Table 1), which is wider than the 2.0‰ range normally found in control samples at Mesoamerican sites (White et al. 2007). There are no differences in mean $\delta^{18}O$ values among the building groups, and because this range is so continuous, no foreign locations can be identified. A comparison of enamel and bone values indicates that some relocations likely occurred during childhood (Fig. 3), but it is likely that the catchment area for inhabitants of the site is also a lowland coastal region. Similarly, the cranial modification style (with one exception N10-4/9) is fronto-occipital, which is consistent with the broad regional distribution of this form of identity (Tiesler Blos 1998).

P8-102

Ceramic Evidence

A range of different Late to Terminal Classic vessel styles and fabric types is found in the P8-102 group burials (Table 2), and all vessels except 104/2 were interred whole and preserved intact. Single vessels were included in four burials (102/1, 102/3, 102/10b, and 104/2), and two were included in Burials 102/2 and 102/15. Stylistically different bowls occur in the majority of the burials containing only one vessel, and these include a red-slipped flaring bowl, a polychrome composite silhouette bowl with a ring base and a monochrome black deep bowl with out-curving sides and groove-incised decoration. Of the remaining three burials containing pot-

[2] 2 – We have purposely not used established Type:Variety designations in referring to the vessel styles that occur in the Lamanai burials to avoid any unsubstantiated interpretive implications concerning compositional equivalency and origin of manufacture.

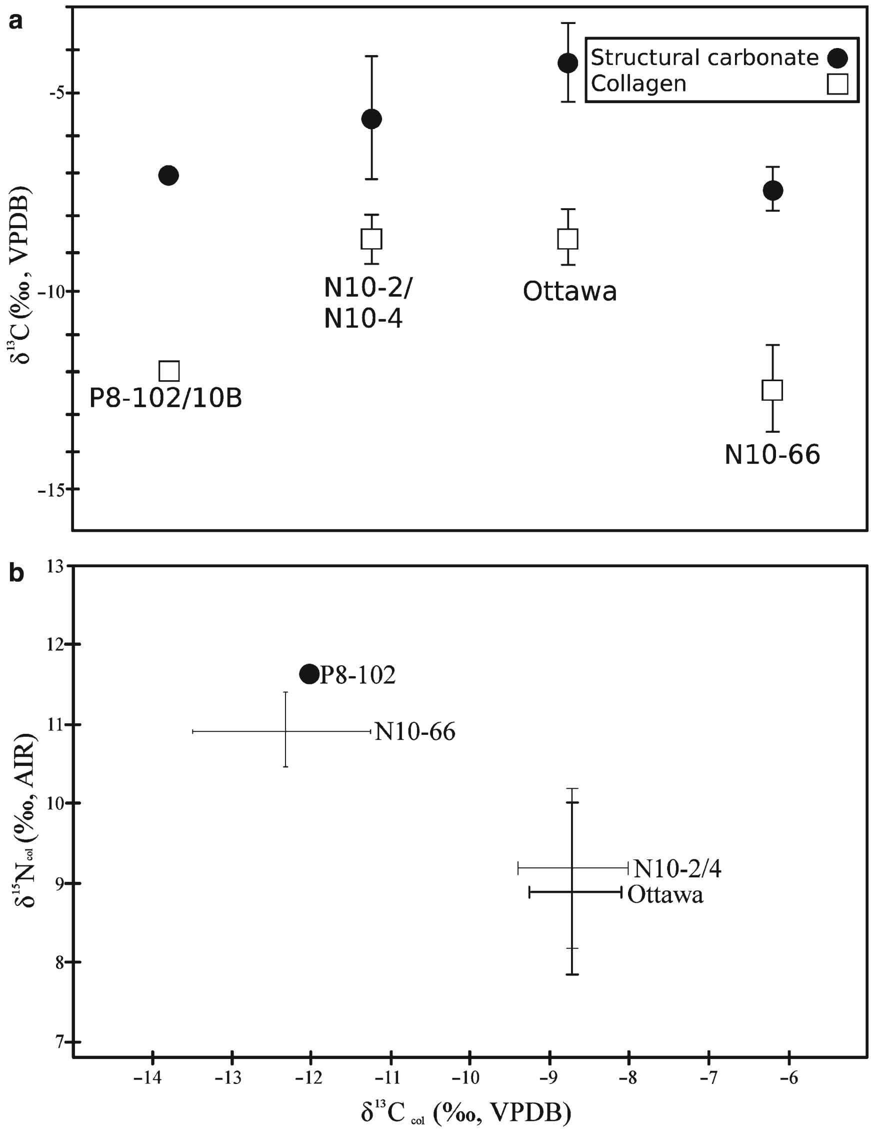


Fig. 3 Means and standard deviations for (**a**) $\delta^{13}C$ values of Lamanai collagen and bone bioapatite structural carbonate and (**b**) $\delta^{15}N$ vs. $\delta^{13}C$ values of Lamanai bone collagen

tery, Burial 102/4 contains a bi-chrome basal-break dish, Burial 102/2 contains two differently shaped orange-slipped dishes, and Burial 102/15 contains two monochrome black vases (one cylindrical and one barrel-shaped) with different decoration. In the two cases where two vessels occur, both vessels are stylistically different examples of the same general shape class and, therefore, clearly had the same

Table 2 Stylistic and fabric/paste characteristics of vessels from burials in the P8-102 building group

				Structural carbonate					Collagen				
BUR #/ individual	Sex	Age	Bone/ tooth	$\delta^{13}C^0/_{00}$	$\delta^{18}O^0/_{00}$	Yield CO_2	CP	CI^b	$\delta^{13}C^0/_{00}$	$\delta^{15}N^0/_{00}$	C/N	YIELD% col	$\Delta^{13}C_{col-sc}$
P8–102/10B	F	A		−7.4	27.7	0.6	0.34	3.1	−11.9	11.3	3.2	4.5	4.5
			PM	−6.7	28.6	0.5	0.35	2.9	−12.1	11.8	3.2	11.3	5.4
N10–66/1	M	A		−7.2	25.7	1.0	0.48	3.0	–	–	–	0.6	–
N10–66/3	?	A		−7.6	26.7	0.9	0.50	2.8	−12.2	10.7	3.2	7.0	4.6
N10–66/3			PM	−7.1	29.1	0.5	0.28	3.2	−13.1	11.5	3.2	6.4	6.0
N10–66/12	?	?		−7.6	26.7	0.8	0.45	2.8	−13.2	10.7	3.2	3.2	5.7
N10–66/12			M1	−7.7	28.8	0.9	0.37	2.9	−13.5	10.8	3.2	4.9	5.8
N10–67–1	?	A		−7.9	27.1	0.9	0.44	2.8	−11.5	10.5	3.2	5.4	3.6
N10–67–1			M1	−6.4	26.7	1.0	0.33	3.0	−10.8	11.7	3.1	7.7	4.4
Mean				−7.4	27.3				−12.4	10.9			5.0
s.d.				0.5	1.2				1.1	0.5			1.0
Ottawa Group													
N10–7/1	F	45 +		−4.2	27.9	0.9	0.52	2.7	−8.7	8.2	3.2	6.7	4.5
			PM	−4.2	26.9	0.5	0.26	3.2	–	–	–	–	–
N10–7/2	?	A		−3.3	27.0	0.8	0.42	2.9	−9.0	7.7	3.2	3.9	5.7
N10–7/3	?	A		−5.0	27.0	0.5	0.39	2.8	–	–	–	1.2	–
N10–7/3			M1	−3.4	27.1	0.5	0.30	3.0	−8.4	10.9	3.2	7.0	5.0
N10–14/1	M	A		−5.0	27.0	1.0	0.49	2.7	−8.2	8.7	3.2	4.5	3.2
N10–14/1			PM	−3.3	27.4	0.4	0.33	3.0	−7.8	9.1	3.2	8.3	4.5
N10–15/1	M	A		−5.9	27.1	0.8	0.59	2.7	−8.7	8.2	3.2	7.5	2.8
N10–15/1			M1	−2.0	28.5	0.5	0.32	3.0	−8.8	8.3	3.2	8.8	6.8
N10–17/2	M	A		−4.8	26.3	0.7	0.48	2.7	−9.7	10.3	3.2	6.1	4.9
Mean				−4.3	27.2					−8.7		8.9	4.3
s.d.				0.9	0.6					0.6		1.1	1.0
N10–2/18	M	40–50		−6.0	26.8	1.1	0.31	3.1	−7.5	8.8	3.2	3.4	1.5

(continued)

Table 2 (continued)

BUR #/ individual	Sex	Age	Bone/ tooth	Structural carbonate $\delta^{13}C^0/_{00}$	$\delta^{18}O^0/_{00}$	Yield CO_2	CP	CI^b	Collagen $\delta^{13}C^0/_{00}$	$\delta^{15}N^0/_{00}$	C/N	YIELD% col	$\Delta^{13}C_{col\text{-}sc}$
			PM	–1.4	27.7	0.4	0.23	3.6	–7.7	9.4	3.3	7.6	6.3
N10–2/49	?	14	M1	–1.8	28.6	1.1	0.30	3.1	–8.7	8.5	3.2	7.8	6.9
N10–2/49	?	child		–8.4	25.9	1.1	0.42	2.9	–9.6	8.5	3.3	3.5	1.2
N10–4/2 Ind A	?	14–18		–5.1	27.7	0.7	0.38	2.8	–9.0	8.6	3.2	3.8	3.9
N10–4/2 Ind A			M1	–2.6	27.9	0.5	0.33	2.9	–8.6	9.0	3.2	6.0	6.0
N10–4/2 Ind B	F	40+		–6.7	26.7	1.0	0.50	2.6	–8.8	9.3	3.1	6.7	2.1
N10–4/2 Ind B			M1	–4.2	26.3	0.4	0.34	3.0	–7.7	8.2	3.2	3.6	3.5
N10–4/9 Ind A	F	50+		–6.7	26.3	1.0	0.43	2.7	–8.8	9.9	3.2	4.2	2.1
N10–4/9 Ind A			PM	–1.0	30.5	0.5	0.32	3.0	–9.4	10.3	3.2	13.0	8.4
N10–4/9 Ind B	F	21		–5.1	26.8	0.8	0.50	2.7	–8.9	9.4	3.2	5.7	3.8
N10–4/12 Ind B	F	50+		–5.9	26.7	0.9	0.44	2.7	–9.4	8.9	3.2	9.6	3.5
N10–4/13	F	OA		–4.9	27.4	0.8	0.43	2.8	–9.5	8.3	3.2	5.5	4.6
N10–4/14	?	A		–4.0	26.5	1.0	0.43	2.9	–8.9	9.9	3.2	2.7	4.9
N10–4/20	?	18–20mos		–6.2	26.5	0.8	0.34	3.0	–8.1	10.8	3.2	4.4	1.9
N10–4/20			dm2	–1.9	28.4	0.6	0.34	2.9	–7.5	11.8	3.2	6.6	5.6
N10–4/30	F	50+		–6.8	26.2	1.0	0.48	2.7	–8.7	7.8	3.2	5.0	1.9
N10–4/30			PM	–1.1	27.7	0.5	0.38	2.8	–8.9	8.2	3.2	10.1	7.8
N10–4/41	F	A		–7.2	26.1	0.9	0.43	2.8	–9.6	.1	3.2	6.7	2.4
N10–4/41			PM	–4.7	28.2	0.6	0.34	2.9	–9.5	9.5	3.2	9.8	4.8
Mean				–5.6	27.2				–8.7	9.2			3.2
s.d.				1.5	1.1				0.7	1.0			1.5

Values excluded from averages because of suspected diagenesis
A adult, *OA* old adult, *M1* first molar, *PM* premolar, *dm2* deciduous second molar

intended function. The dishes in Burial 102/2 are vessels for serving food, whereas the vases in Burial 102/15 are vessels for serving liquids and drinking.

The diversity of vessel styles that occur in the P8-102 burials is mirrored in their composition, with five distinct fabric types represented. Three of these fabric types can be linked geologically to raw material resources available in the immediate vicinity of the site, providing strong evidence that the related vessels were manufactured locally. Differences between these local fabric types in terms of their mineralogy, textural properties and other compositional characteristics relate to natural geological differences in the specific local clays and tempering materials used, as well as processing techniques, and hence, can be considered to represent the paste-making approaches employed by different local potters/groups of potters. Two of the burials in the P8-102 group (102/2 and 102/10b) contain vessels that were not produced in the local area. The compositional characteristics of the orange-slipped rounded dish in Burial 102/2 link it geologically to clay deposits that generally form along waterways underlain by limestone in inland areas of northern Belize. Its provenance is certainly nonlocal since geologically comparable clays and crystalline calcite (used as temper) have not been identified in the immediate vicinity of Lamanai (Howie 2005). Similarly, the compositional characteristics of the black groove-incised bowl in Burial 102/10b also indicate a nonlocal origin in northern Belize. This fabric type is geologically connected to the northeast coast of northern Belize and southern Yucatan and adjacent areas, including the lower reaches of the New River, where sandy marls overlie dolomite and dolomitic limestone (most likely of the Tertiary Cayo Group) (see King et al. 1992 and Howie 2005 for descriptions of this formation). These vessels might come from the Altun Ha area of northern Belize as their fabrics are strikingly similar to the dominant fine ware fabric type found there during the Late Classic period (Howie et al. 2004; Howie-Langs 1999).

The compositional variation among the monochrome black burial vessels from the P8-102 group is also of particular interest. Howie's (2005) study of the technological characteristics of this stylistic group at Lamanai showed that monochrome black vessels nearly always have dolomitic fabrics identical to the "dolomitic marl-based" fabric type observed in the deep bowl in Burial 102/10b. These vessels are also distinguished by the surface treatment and firing techniques used in their manufacture. The two vases in Burial 102/15, however, are technologically different in several respects, exhibiting the characteristics of one of the most prevalent Terminal Classic technological groups at Lamanai, including a "calcite and sascab-tempered" paste. These two vessels, therefore, look like they are "nonlocal" in terms of their general style but were in fact made locally (i.e. using local raw materials and surface treatment and firing techniques).

Skeletal Evidence

The diet of the only individual available from this building group (P8-102/10B) is unlike that seen at all other building groups except N10-66 (Table 1, Fig. 4b). This woman had less maize in her diet and took her protein from a fairly high tropic level, but her collagen-carbonate isotopic spacing indicates that her diet was not coastal. The $\delta^{13}C_{sc}$ and $\delta^{18}O$ values for enamel versus bone samples also suggest that she may have relocated since age 6, but only within the region (Table 1). She appears to have had high social status as there are traces of a red powder (cinnabar or red ochre) on her teeth.

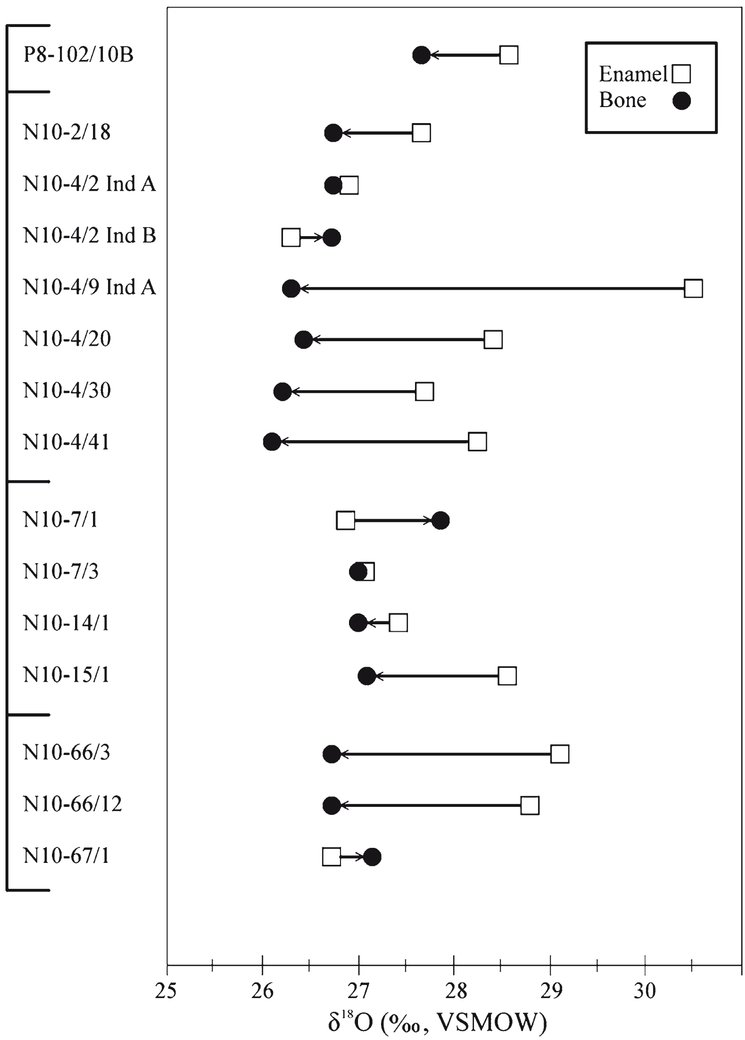


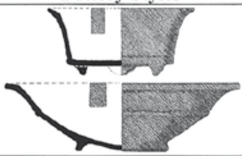
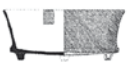
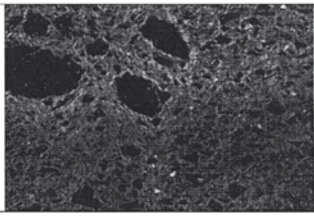
Fig. 4 Comparison of enamel and bone structural carbonate $\delta^{18}O$ values at Lamanai

N10-66

Ceramic Evidence

As with the P8-102 group, a range of stylistically different vessels were interred in burials in the N10-66 residential compound (Table 3). In all these cases, whole vessels were interred and three of the four burials contain a single vessel. The monochrome black vase and deep bowl that were included in Burials 66/3 and 66/4, respectively, have the same dolomitic marl-based fabric as the stylistically similar deep bowl interred in Burial 102/10b of the P8-102 group. Connections are,therefore, indicated to a production area situated most likely in northeastern northern Belize. Burial 67/1 also contains a vessel of nonlocal origin. The fabric is unique at Lamanai and it contains volcanic ash temper, as indicated by the presence of tough and volcanic glass fragments (Howie 2005). Provenance cannot be ascribed, however, because heavy processing of the clay resulted in a lack of sufficiently distinctive rock and mineral inclusions. Nonetheless, it probably came from outside of northern Belize and the Yucatan Peninsula; the absence of carbonate inclusions in this fabric suggests usage of raw materials from areas not underlain by limestone.

Table 3 Stylistic and fabric/paste characteristics of vessels in burials in the N10-66 building group

Burial	Pottery Styles	Fabric/Paste Type and Provenance
66/1		Local 'calcite and sascab tempered fabric' Same as found in pots from burials in P8-102 group (102/15 and 104/2)
66/3		Non-local 'dolomitic marl-based fabric' Same as found in pots from burials in P8-102 group (102/10b)
66/12		
67/1		 'volcanic ash-tempered' calcareous clay, likely heavily processed to remove rock and mineral inclusions, tempered with volcanic ash **Non-local** – unknown but from outside of northern Belize/Yucatan region

Burial 66/1 is the only burial in this residential group that contains more than one vessel (a red-slipped tripod bowl and the orange-slipped basal-break dish) and although the two vessels differ in form and surface treatment, their compositional characteristics indicate a local provenance. Both have "calcite and sascab tempered" fabrics that are compositionally identical to those observed in the black vases and bichrome dish interred in Burials 102/15 and 104/2 of the P8-102 residential compound. There is also a stylistic similarity between the tripod bowl included in Burial 66/1 and the nonlocal example in Burial 67/1. This general tripod form, with a flat bottom, a basal ridge and solid foot supports, is comparatively rare at Lamanai, suggesting that the local tripod might be interpreted as a reproduction of a nonlocal style.

Skeletal Evidence

Although the ceramics at this residential compound are composed of both local and nonlocal fabrics, all of the dietary measures for this group contrast sharply with the other building groups analysed (except P8) (Table 1, Fig. 4a, b). They were consuming significantly more C_3 resources, including animal protein, and their $\Delta^{13}C_{col\text{-}sc}$ values indicate that their diets included more plants than animals. One individual (N10-67-1) has a dental modification style not previously recorded anywhere else (Table 4). In two of three individuals analyzed, the enamel $\delta^{18}O$ values are also significantly higher than bone (Table 1, Fig. 3), which suggests that some minor relocation could have occurred since childhood, although some portion of the higher dental values could have resulted from breastfeeding.

Ottawa Group

Ceramic Evidence

The vessels interred in burials of the Ottawa residential complex are stylistically typical of the Terminal Classic to Early Postclassic period and in all cases (except Burial 14/1) the vessels were broken before interment with the deceased. All of the vessels have an orange slip and three display gouge-incised and modeled zoomorphic decorative elements that become prevalent by Early Postclassic period (Table 5). Different bowl forms, with and without foot supports, were included in four of the burials and, significantly, the vessel included in the remaining burial is a bell-chambered drum. The only other instance of a musical instrument being interred in a burial occurs in the N10-2 building group (Burial 4/5). The comparative lack of stylistic diversity among the vessels interred within this residential complex is mirrored in the compositional evidence. All of the vessels have local fabric types that can be linked geologically with raw material

Table 4 Patterns of dental modification for the individuals interred in the different building groups

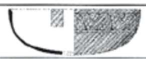
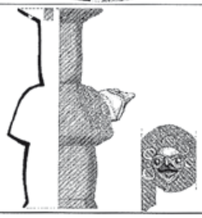
Dental Mod. Styles	N10-2/N10-4	N10-14/N10-15	N10-66
(Romero 1970)			
A4 	×	×	
B4 	×		
C2 	×	×	
C3 	×		
C4 	×		
C5 	×		
F4 	×		
unreported			
1 			×
2 			×
3 	×		
4 	×		

resources available in the immediate vicinity of the site and two distinct fabric types are represented. Both of these fabric types also occur in burials in the P8-102 residential compound.

Skeletal Evidence

Although this group does not contain distinctively foreign ceramics, there are several features of the isotopic data that are worthy of note. The combined isotopic measures of diet indicate that the inhabitants of this structure consumed a C_4-based

Table 5 Stylistic and fabric/paste characteristics of vessels in burials in the Ottawa Group

Burial	Vessel Styles	Fabric types and Provenance
14/1		Local 'sandy sascab-tempered' fabrics Same as found in pots from burials in P8-102 group (102/1 and 102/2)
15/1		
		Local 'grog-tempered' fabrics Same as found in pots from burials in P8-102 group (102/3)
14/2		
28/1		

protein (similar to the N10-2/ N10-4 Group) (Fig. 4a, b). Their whole diet, as indicated by $\delta^{13}C_{sc}$ values, again indicates strong C_4 reliance, but none of the $\Delta^{13}C_{col\text{-}sc}$ values are low enough to indicate heavy consumption of marine foods. It is possible that they were consuming maize-fed terrestrial animals, a practice that has been noticed among elites at other Maya sites (White 2005; White et al. 2001a).

The $\delta^{18}O$ values of the bone-enamel pairs indicate the greatest degree of locational stability among the groups analysed (Fig. 3). The interpretation that the members of this group lived locally all their lives is reinforced by the low variability among the other $\delta^{18}O$ values for the Ottawa individuals. They all fall within an approximate 2.0‰ range of (26.3–28.5‰), which can likely be taken as a baseline for the site.

Both the locational stability and the consumption of maize-fed animals would be consistent with the elite status of these individuals. There are, however, only two individuals who show dental modification (Table 4) and their styles are not distinctive in any way, which does not support the commonly held assumption that dental modification was a restricted elite activity.

N10-2

Ceramic Evidence

The vessels interred in burials in the N10-2 building group conform to stylistic conventions that become the standard by Early Postclassic times and all vessels were interred in a fragmentary state. A broad range of vessel forms is represented, and all of the vessels have an orange slip, which is often accompanied by gouge-incised decoration (Fig. 5, Table 6). The occurrence of different jar forms (Burials 4/3, 4/12, and 4/41) and a "stand" (a special purpose vessel of unknown function) (Burial 4/14) is of particular significance because they represent functional categories not seen in the other residential building groups.

All but three of the vessels in this building group have grog (crushed pottery) tempered fabrics that can be linked geologically to local raw material resources. The three vessels (Burials 4/14, 4/20, and 4/5) with fabrics that derive from nonlocal raw resources can be linked geologically to clays that form in association with sandy deposits, which occur along the northeast coast of northern Belize and southern Yucatan and adjacent areas. Two distinct fabric types are represented, both untempered, and the mineralogical and the textural differences between them relate to the geology and provenance of the clay used in each case. Connections to two different production loci within the same broad geographic zone are, therefore, indicated. The vessels made from these fabrics are also stylistically unusual. The tripod bowl interred in Burial 4/20 has distinctive foot supports, a form which is rare at Lamanai, and the stand and ovoid-chambered drum interred in Burials 4/14 and 4/5, respectively, represent vessel forms that are not only rare at the site, but also do not occur in any other burials.

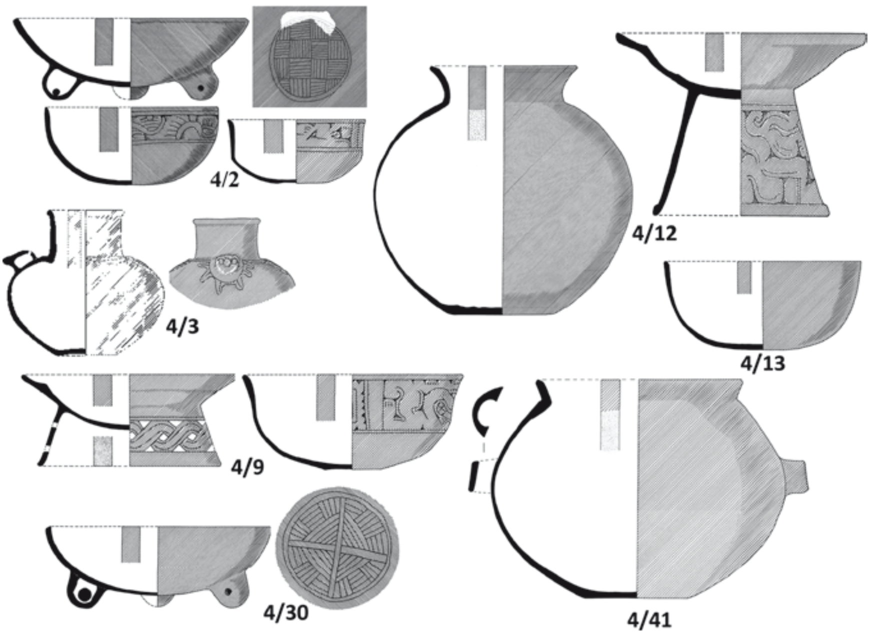
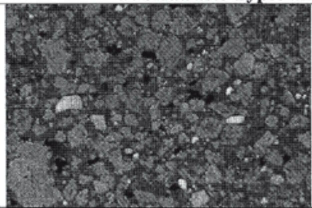
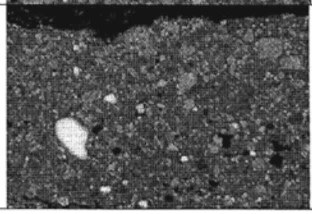
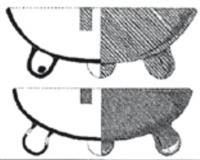


Fig. 5 Burial vessels from the N10-2 building group with local "grog-tempered" fabrics

Table 6 Stylistic and fabric/paste characteristics of the pottery in burials in the N10-2 group in cases where nonlocal vessels are present

Burial	Pottery Styles	Fabric/Paste Types and Provenance	
4/14			**'calcareous marl-based'** a sandy-textured highly calcareous marl, likely untempered **Non-local** – associated with coastal deposits containing calcareous sands(micritic grains) in northeast northern Belize, extending into southern Yucatan
4/20			
4/5			**'sandy marl-based'** sandy-textured dolomitic marl containing calcite and quartz sand, likely untempered **Non-local** - associated with coastal deposits in northeast northern Belize, extending into southern Yucatan and adjacent areas, where sandy marls overly dolomitic limestone
		Local 'grog-tempered' fabrics Same as found in pots from burials in P8-102 group (102/3) and the Ottawa group (15/1, 14/2 and 28/1)	

Skeletal Evidence

The samples from Structures N10-2 and N10/4 not only have mean $\delta^{13}C_{col}$ and $\delta^{15}N_{col}$ values that are indistinguishable from the Ottawa Group, but exhibit the same degree of variability (Table 1), which may mean that they shared sources of protein. Although the $\delta^{13}C_{sc}$ values indicate that variability in whole diets among the members of this group was greater than at any other structure (Table 1), their mean $\Delta^{13}C_{col\text{-}sc}$ value indicates that they were generally more carnivorous, and their $\delta^{13}C_{sc}$ values indicate fewer C_4 sources in the whole diet (i.e., carbohydrates, proteins and lipids combined) than in the Ottawa Group.

Of the seven individuals for whom bone-enamel comparisons were possible, five (N10-2/18, N10-4/9 Ind A, N-10-4/20, N10-4/30, and N10-4/4) had $\delta^{18}O$ values different enough to suggest some intraregional relocation (Fig. 3) (Table 1). This group also had the largest proportion of individuals with dental modification, representing eight different styles, most of which have been found elsewhere in Belize (Williams and White 2006), and two of which are shared with the Ottawa Group. Four styles used by the elderly women, N10-4/9 and N10-4/2 Ind A, have not been found elsewhere to date. Although both of these women were buried in keeping with local ceramic styles, one (N10-4/9) also has a form of cranial modification (lambdoidal flattening) not found elsewhere at the site (White 1996). Cranial modification must be done during early childhood and the timing of the process probably overlapped with the formation of the analysed premolar, which had the highest $\delta^{18}O$

value at the site. These two indicators of identity strongly suggest that this N10-4/9 was born in a foreign location. The presence of the unusual dental modification further suggests that she probably did not come to Lamanai until after adolescence, and the similarity of her diet to the others in her group indicates that she had lived locally for at least 10–15 years.

Discussion and Conclusions

Our methodological approach of combining both stylistic (pottery shapes and decorations, artificial modifications) and compositional (petrography, stable isotopes) characteristics of people and pots has enabled reconstruction of both performance and identity at Lamanai. When framed within the broader Terminal Classic to Early Postclassic context of ceramic patterns, the pottery that occurs in residential burials provides some insight into the performance of funerary rites involving food and drink. This pottery was the same as was used in other day-to-day activities, ranging from offertory rituals to communal feasting and serving daily family meals. It appears that common tablewares acquired a special or different status under specific conditions – through their use and deposition in funerary ceremonies. The fact that these rites did not involve special pottery indicates a basic congruency in pottery usage across a broad spectrum of religious and ceremonial practices and, perhaps also in performances of specific rituals and ceremonies. The temporal continuity in these conventions is striking considering that they appear to have persisted despite other changes in the enactment of funerary rites (e.g., the treatment of interred funerary vessels). The shift towards the preinterment breakage of funerary vessels and the subsequent retention of pieces of them by funeral participants is also significant because these acts transformed and extended the functions of vessels. Pieces of these vessels were intentionally kept in active use, remaining a part of daily life as material expressions of the shared experiences and interrelationships of members of the family, both living and deceased. The prevalence of this practice among the ruling elite, in particular, probably also speaks of their particular lineage-derived authority.

The apparent overlap in the vessel styles and functional categories that occur in the different residential groups is indicative of fundamental similarities in their funerary ceremonies. The predominance of container ceramics (bowls and dishes) in all of the groups might also be taken to imply that food and drink, whether consumed by funeral participants, or offered as a commemorative gift, probably played a central role in these proceedings. Nonetheless, the isotopic data provide some evidence of specific differences among the households in this respect. We cannot determine, however, whether the foods consumed by funeral participants during these ceremonies were the same as those consumed by the deceased in day-to-day life.

The vessel compositions provide insight into the economic relationships between specific households and specific pottery producers or production areas.

Group P8-102 shows the greatest number of ties to different pottery producers, with connections to three different local manufacturers and two different production localities within northern Belize. One of these localities was situated in the interior region of northern Belize, possibly on one of the major rivers, and the other was likely situated to the east or northeast of Lamanai in areas adjacent to the coastal region. Although we have only one individual from this group, she also appears to have had a nonlocal diet characteristic of inland resource consumption. This particular production locality is also connected both petrographically and isotopically to the people who lived in N10-66 building group. The diets of the P8-102 and N10-66 groups are similar and indicate the most restricted consumption of coastal resources at the site. Unlike the P8-102 group, however, the N10-66 group also had ties to a ceramic production locality situated outside of northern Belize and to only one local producer.

The N10-2 group also has connections to both local and nonlocal producers, but the nonlocal producers are clearly different from those associated with the other household groups. Both of these production localities were situated in the broad geographic region encompassing coastal regions to the northeast of the site, extending into southern Yucatan. This interpretation of origins is supported by the isotopic data, which indicate the presence of a number of individuals who have coastal diets.

The Ottawa group is the only residential group that appears to have obtained burial vessels solely from local producers. Considering that this building group likely served as the residence of the Lamanai ruling family, the absence of foreign or "exotic" pottery, which is normally viewed as a reflection of material wealth or prestige, is most unusual. Furthermore, the fact that foreign pottery was obtained and used in ceremonies by other households indicates that access to such items was not restricted to the upper echelons of society, despite what has often been suggested (e.g., Masson and Freidel 2002). The distinctively localized consumption pattern evident in the Ottawa group might also be viewed as reflecting active attempts on the part of community leaders to maintain and reinforce their higher socio-economic position through support of local producers, and the creation of strong economic ties to them. Similarly, their isotopic compositions are the most uniform among the groups examined. They ate the same foods and lived locally throughout their lives. One might speculate that this kind of stability and form of political economy may have contributed significantly to the unusual long-term survival of the site.

Differences among the economic and food consumption practices of individual households reflect differential access not only to resources and material goods, but also to economic relationships with other specific social groups. Although the oxygen-isotope values provide some evidence for movement of people, it occurred within a restricted region, and the geographic resolution is insufficient to reconstruct areas of origin. Dietary distinction among residential groups at neighboring Altun Ha has previously been interpreted as a reflection of social identity, perhaps derived from lineages (White et al. 2001a), but the ceramic evidence and historical context at Lamanai would suggest that the dietary differences seen here are a reflection of immigration. In both cases where the individual has distinctive dental modification, the associated pottery is nonlocal (Burials P8-102/10b and N10-67/1). The question now is whether these individuals can be considered as immigrants – i.e. “household founders” who brought their local pottery with them? If so, then the local imitations of “foreign” vessel styles that occur in both the P8-102 and N10-66 groups (Burials 102/15 and 66/1, respectively) might be as viewed active attempts on the part of the household/funeral organizers to maintain homeland traditions by interring vessels that conform to vessel styles used in funerals in their area of origin. Their apparent maintenance of a homeland diet would also support a strong “doxa” or conservative identity behavior. Thus, the life histories of people and pots involved in mortuary rituals where food and feasting were important components have given us a glimpse into more than just performance of the living and identities of the dead, but the social structure and political economy too of this ancient Maya site.

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Dietary Diversity in the Upper Belize River Valley: A Zooarchaeological and Isotopic Perspective

Carolyn R. Freiwald

Introduction

Paleobotanical and faunal evidence suggests that Maya polities across the lowlands followed broadly similar dietary regimes. Maize is generally accepted as the main dietary staple, supplemented by beans and squash, along with a variety of wild and partially cultivated plants (Lentz 1999). Terrestrial wild game, especially whitetail deer, supplied an important protein and lipid source that complemented the mainly carbohydrate calories in the diet. Bone chemistry studies, however, provide greater insight into the variability present in Maya diet. While maize supplied less than half of a day's calories for individuals at some centers, it accounted for as much as 75% of the daily diet at others (Gerry and Krueger 1997). The contribution of animal protein and legumes also varies: individuals in some regions consumed a nearly vegetarian diet while others had regular access to wild game (Gerry 1993; Reed 1999). Variability also exists within populations, and dietary differences exist by sex, age, status, and location. However, no universal pattern is present, and researchers attribute dietary variability to population size, level of agricultural intensification, the social organization of food consumption, and local environmental heterogeneity (Chase et al. 2001; Gerry 1993; Gerry and Krueger 1997; Reed 1999; White et al. 1993; Wright 1997).

The following study explores one aspect of Maya dietary variability – environmental diversity – during the Late and Terminal Classic (A.D. 600–900) in the upper Belize River valley. Dietary differences in human populations at many sites in this region remain unexplained, and this study suggests that diverse sources of food contribute to dietary variability as much as distinct menus. Zooarchaeological analysis demonstrates the varying ways in which inhabitants of the Xunantunich polity chose to use – or not to use – available resources. Chemical analyses of animal bones and teeth show how use of diverse catchments may contribute to dietary variability

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in the human population. An introduction to the dietary studies in the region is followed by a contextual analysis of zooarchaeological data from the Xunantunich polity, with an emphasis on the site of Xunantunich. These results are discussed in combination with strontium and carbon isotope analyses to show how diverse animal acquisition strategies have the potential to affect isotope measures in humans and interpretations of Late and Terminal Classic Maya dietary variability.

The Belize River Valley Diet: An Overview

Extensive research in the Belize River valley during the past two decades provides substantial information on diet in the region. Studies on soil potential and agricultural terracing (e.g., Fedick 1994; Fedick and Ford 1990; Wyatt 2007) supplement small paleobotanical datasets that provide information on farming. However, more information on diet is available from isotopic and zooarchaeological studies. Published faunal analyses show a reliance on mammals, especially whitetail deer. For example, analysis of 8,142 bone fragments at Buenavista identified primarily mammal bone in all contexts, whitetail deer (Clowery 2005). Large numbers of deer also were identified at household contexts at the Chan site (Blackmore 2007, personal communication) and were present in most excavation units at Barton Ramie (Willey et al. 1965.) However, despite rich datasets from Cahal Pech, Caracol, Lamanai, Pacbitun, and Tipu, most collections relate to earlier or later periods or remain only partially analyzed (Emery 1990; Teeter-Giddens 2001; Powis et al. 2005; Simmons et al. 2005; Stanchly 1994, 1999, 2005).

Bone chemistry provides more direct evidence on dietary composition and comes mainly from research on seven sites (Fig. 1), including Baking Pot, Barton Ramie, Blackman Eddy, Cahal Pech, Esperanza, Floral Park, and Saturday Creek (Gerry 1993, 1997; Gerry and Krueger 1997; Piehl 2005). Diet in the Belize River valley differed from other Maya Lowland regions in two important ways. First, individuals in the sample population consumed less maize than elsewhere in the Maya Lowlands (Fig. 2). For example, Gerry and Krueger estimate that maize consumption comprised nearly 66% of the diet at Petén and Copán Valley sites, but less than half the diet in the Belize Valley. Differences in protein sources were less marked. Petén populations consumed more terrestrial animal protein than those in the Belize River valley, and diet in both regions included more animal protein than at Copán (Gerry and Krueger 1997; Reed 1999).

Second, these studies show that the Belize Valley region exhibits more internal diversity than other regions, without exhibiting significant dietary differences by age, sex, or status (Gerry 1993; Gerry and Krueger 1997; Piehl 2005). Patterns in other regions associate maize with both privilege and deprivation. For example, carbon and nitrogen isotopes show a varied – and presumably more healthy – diet for elites at Copán that contrasts with the nearly-vegetarian commoner diet (Whittington and Reed 1997; Reed 1999). Maize is associated with privilege and

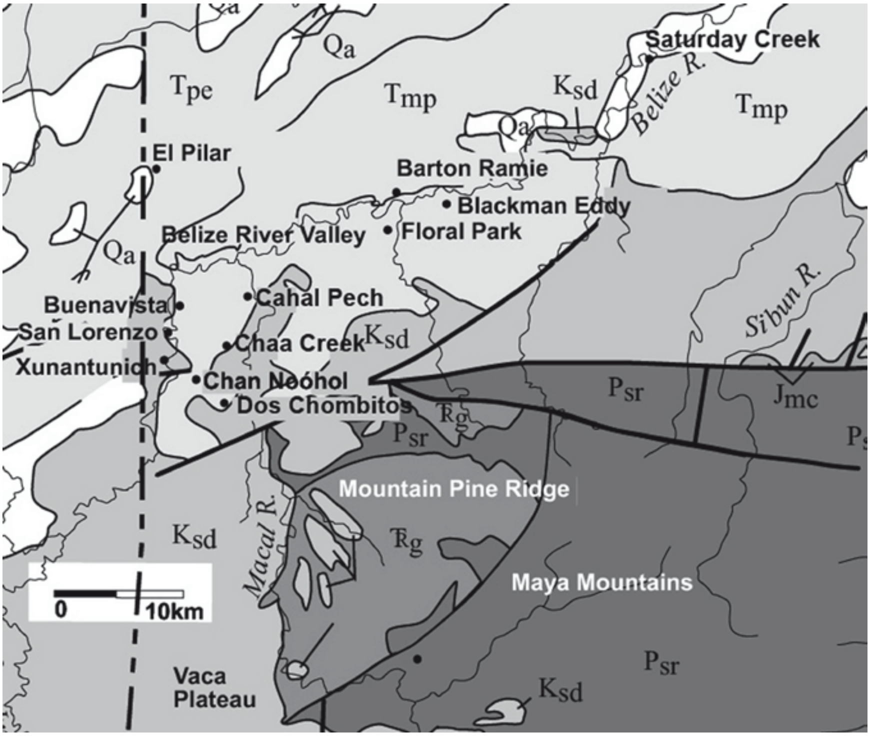

Fig. 1 Map of the upper Belize River valley showing sites referred to in the text (map from Jean Cornec 1986 and modified from Yaeger 2000)

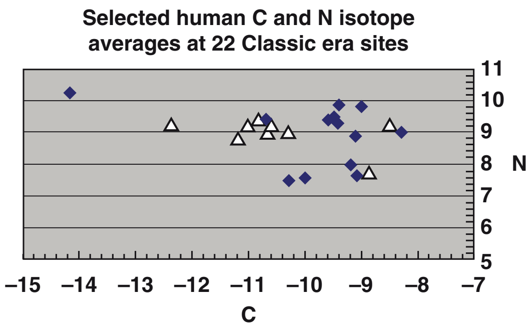

Fig. 2 Average carbon and nitrogen isotope ratios at Maya Lowland sites: Belize River valley sites in white (Gerry and Krueger 1997; Piehl 2005; Wright 1997; White 1997)

status at other sites. Males consumed more corn in the Pasión River region (Wright 1997), as well as at Pacbitun, where lower maize consumption characterized diets of women and children (White 1997; but see Coyston et al. 1999). Maize also is associated with elite diet at Caracol and La Milpa (Chase et al. 2001).

What, then, is the best explanation for the dietary patterning at upper Belize River valley sites? Gerry and Krueger (1997) note a relationship between low population density and environmental diversity in this region. Environmental heterogeneity, however, is more of a description than an explanation. The Belize Valley is situated in the eastern Maya Lowlands, and its plant and animal communities are similar to those near other Maya Lowland sites. It is not enough to say that diverse resources were locally available, as cultural values are as important as practical ones in determining dietary choices (Emery 2004). What specifically were Belize residents doing differently? Data from Xunantunich offers one possible explanation: rather than including different *types* of food in their subsistence regime, its inhabitants used diverse local and non-local catchments to meet their dietary needs. This can be demonstrated through a combination of zooarchaeological and isotopic analysis of animal remains found at sites in the polity.

Isotope Methodology: Humans and Other Animals

Most dietary studies use carbon isotopes to approximate levels of maize consumption, and nitrogen isotopes to estimate proportions of plant and animal proteins in the diet. Strontium isotopes, normally used to identify population movement, fundamentally measure the location where consumables were acquired by an individual (White et al. 2006). A combination of these methods can provide information that complements more traditional zooarchaeological data.

Carbon isotopes can be measured in both bones and teeth, enabling scholars to compare tooth enamel that formed during early childhood with bone collagen and apatite formed during the final years of life. More specifically, the photosynthetic pathway used by temperate plants differs from that used by tropical grasses, which results in a different average ratio of $^{13}C/^{12}C$ isotopes. Most plants use the temperate C_3 pathway, which results in depleted $\delta^{13}C$ values that range from −22 to −35‰. C_4. plants have enriched $\delta^{13}C$ values ranging from −9 to −19‰, while plants like cacti have a highly variable isotopic signature that can resemble either C_3 or C_4 plants (Ambrose and Norr 1993; Tykot 2006). However, researchers consider maize to be the main C_4 contributor to Maya diet and use carbon isotope signatures to assess the level of maize consumption.

Nitrogen isotopes are measured in bone collagen and the ratio of $^{14}N/^{15}N$ isotopes indicates the trophic position of a food source, which becomes increasingly enriched in each level of the food chain. Legumes have more depleted values than terrestrial game or riverine foods, which in turn are more depleted than marine foods (Ambrose 2000). Because seafood consumption also is indicated by enriched $\delta^{13}C$ values, consumption of maize and seafood in the diet can be distinguished when both isotope measures are employed (Schoeninger and De Niro 1984).

Interpreting the results is a complex endeavor. Values not only vary within a plant, but between plants of the same species that grow under a dense forest canopy versus open forest (van der Merwe and Medina 1991). Values also vary over time, and modern plant values must be adjusted before comparison is made with preindustrial ones (White et al. 2001a). More important, values for each trophic level are estimates that do not translate directly into food quantities; therefore, isotope values can only approximate the proportions of plant and animal food inputs to diet rather than reveal actual meals eaten in ancient Maya households.

The metabolic processes of animals that eat these plants, and the humans who consume both, cause both carbon and nitrogen isotope ratios to become heavier in each level of the food chain (Tieszen and Boutton 1989). It is important to measure both plants and animals to establish a regional isotopic baseline, and to determine whether animals eating C_4 foods could contribute to enriched isotopic signatures in humans (Emery et al. 2000; Tykot 1996, 2006). Both deer and peccary are known to invade cornfields in and around their home ranges (Cormie and Schwarcz 1994; Sowls 1984). While C_4 input to animal diet in Mesoamerica is generally low (Gerry 1993; Gerry and Krueger 1997; Tykot et al. 1996; Whittington and Reed 1997; White et al. 2001b, 2006, 2004; Wright 1997; van der Merwe et al. 2000), most studies identify a small number of animals that fed opportunistically upon human food sources. The level of maize consumption may reflect the level of interdependence with humans. In fact, some researchers suggest that very heavy maize consumption in Mesoamerica reflects varying degrees of animal management suggestive of semidomestication, especially in combination with faunal and iconographic evidence of the use of juvenile animals in particular ceremonies (Pohl 1991, 1994; White et al 2001b, 2004, 2006).

Interpretation of strontium isotopes is much simpler. There is no fractionation: the food and the consumer will have the same measure of strontium isotope ratios $^{87}Sr/^{86}Sr$. Change over time occurs over millions of years, which allows comparison of strontium isotopes in modern fauna to those of Classic Maya archeological samples (Ericson 1985; Ezzo and Price 2002; Price et al 2008). The Belize River valley also is unique in that strontium isotope values in each of its neighboring regions are distinct. Food grown in the Maya Mountains, the limestone uplands of the Vaca Plateau, and the central Maya Lowlands have $^{87}Sr/^{86}Sr$ signatures distinct from those in the valley (Yaeger and Freiwald 2008).

Isotopic information on human diet and mobility usually are measured separately (but see Wright 2007), with animals sampled for baseline dietary information. Animal diet also reflects certain aspects of the environment (Emery 2008; Emery et al. 2000; Emery and Kennedy Thornton 2008) and on potential interaction with humans. In this study, strontium and carbon isotope values show where basic foods were acquired and in what type of environments, and are interpreted in conjunction with zooarchaeological observations and other archaeological and contextual evidence to evaluate the impact on human dietary studies.

Zooarchaeology of Xunantunich: Polity, Site, and Context

The faunal assemblage discussed in this paper was excavated by the Xunantunich Archaeological Project (XAP), directed by Richard Leventhal and Wendy Ashmore, between 1991 and 1997. Xunantunich is a medium size center located near the modern Guatemala-Belize border situated just a few kilometers away from Buenavista and Cahal Pech, forming part of a series of eastern Maya

Lowland polities situated along the Belize River and its tributaries in close proximity to the Maya Mountains (LeCount et al. 2002; Leventhal and Ashmore 2004). Animal bones from smaller centers and communities within the Xunantunich polity are found in small numbers and are poorly preserved, but generally mirror broader Maya Lowland trends that show use of predominantly mammals, especially whitetail deer.

Parts of the collection were initially studied at the UCLA Cotsen Institute of Archaeology during the late 1990s. The assemblage was reanalyzed in its entirety by the author using the comparative collection of the UW-Madison Zoological Museum. A modified version of Redding and colleagues' (1978) coding system was used to record species identification, pathology, side, age, and completeness estimation for each element, along with qualitative observations on modifications by animals, humans (e.g., cut marks, burning, production of tools and art), and the state of preservation as affected by natural elements like water and sunlight. Qualitative observations were made using a hand lens and microscope, and human, animal, and natural modifications were compared with material in the collections of the UW-Madison Anthropology Department. Quantitative observations are discussed using standard zooarchaeological terminology, relying mainly upon weight in grams, the number of bone fragments identified, and the minimum number of individuals (MNI) identified in each unique context.

Several factors will affect interpretation of animal use in this assemblage. First, this analysis does not include shell remains of what likely were important food sources. Many contexts contained *jute (Pachychilus* sp.) and other riverine and marine species. Second, most units were processed using ¼ in. screens: flotation, wet-screening, or smaller mesh may have resulted in recovery of more fish and small bird or mammal remains. However, Yaeger (2000) found little to no microfauna at San Lorenzo in samples using finer-grained recovery techniques, so the lack of fish more likely represents actual diet or differential disposal practices. Finally, excavation focused on the site of Xunantunich in order to elucidate its political history and chronology, as well as to develop its center for tourism (LeCount et al. 2002; Leventhal and Ashmore 2004). As a result, many contexts in this discussion were located in monumental architecture, which resulted in a large quantity of fauna from structural fill and building collapse.

Xunantunich Polity Fauna

XAP faunal remains were identified at Xunantunich and smaller communities in its hinterland, including Dos Chombitos, Chan Noóhol, Chaa Creek, and San Lorenzo, as well as the Early Classic center of Actuncan and several transects that parallel the Mopan and Macal Rivers in the upper Belize River valley (Table 1). While the smaller sites only provide information on the type of animals used by polity residents, detailed contextual information from Xunantunich and San Lorenzo can

Table 1 Fauna from XAP excavations 1992–1997

	Weight (g)	No. of bone fragments
Dos Chombitos	16	17
Chan Noóhol	52	55
Other transects	76	12
Actuncan	89	152
Chaa Creek	202	196
San Lorenzo	1,663	2,075
Xunantunich	2,721	3,424
Total	3,841	5,298

address where and how residents of the site obtained wild game, the key source for variability in human diet in this discussion.

At Dos Chombitos, 17 animal bone fragments from refuse deposits and other locations were analyzed. The poor preservation of the faunal material allowed identification of only one animal, a deer (Cervidae), from burned antler fragments with cut marks. Bone fragments from XAP excavations at the Chan Noóhol site include whitetail deer (*Odocoileus virginianus*) and puma (*Felis concolor*) from a localized refuse deposit. These bones were recovered during survey and testing along one transect; a wide variety of other animals were identified elsewhere along the transects, including turkey (*Meleagris*), armadillo (*Dasypus novemcinctus*), crocodile (*Crocodylus*), agouti (*Dasyprocta punctata*), and tapir (*Tapirus bairdii*). However, most come from contexts of uncertain origin.

Assemblages at Actuncan and Chaa Creek are somewhat larger, but each contains fewer than 200 bone fragments. Eighty percent of those at the Early Classic center of Actuncan, located 2 km from Xunantunich, are poorly preserved, resulting in identification of only seven bones to species, or 5% of the 152 fragments. These include whitetail deer, armadillo, and dog (*Canis familiares*). Large mammals dominate the assemblage, though a number of bird and turtle elements also are present.

Fauna from Chaa Creek are better preserved, allowing the identification of 17 animals from distinct excavation units (operations), including three iguana (Iguanidae), four whitetail deer, one rabbit (*Sylvilagus*), three turtles (Testudine), one puma, one peccary (*Tayassu*), one opossum (*Philander opossum*), one large rodent, and one tapir (Fig. 3). Nearly 40% of the bone fragments (by weight) were identified below the level of class, with most classified to genus or species. Although many bones came from secondary (Connell 1995) contexts identified as structural fill (19% by count) and architectural collapse (14% by count), just 17 show markedly poor preservation. No animal gnawing is visible and human modification is limited to cut marks on two whitetail deer lower limbs and six burned bone fragments.

The information most directly related to human diet comes from trash deposits in and around households that formed 9% of the assemblage. Animals associated with Late and Terminal Classic domestic ceramic refuse on an eroded *sascab* floor (Preziosi 1998) include mainly whitetail deer and large mammals – specifically

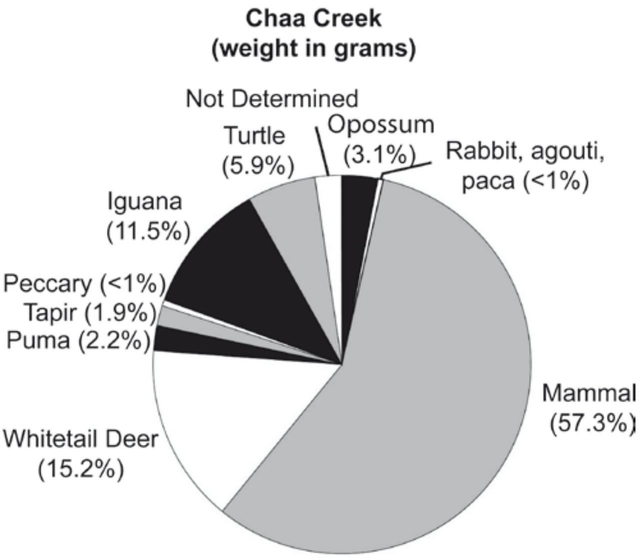

Fig. 3 Fauna from XAP excavations identified at Chaa Creek, Belize

lower limb elements – along with iguana and an immature large rodent. Unfortunately, the small assemblages from Chaa Creek and other sites in the Xunantunich polity are limited to the types of animals used in fairly general contexts. Faunal data from San Lorenzo and the polity capital Xunantunich provide a more detailed contextual analysis.

San Lorenzo

San Lorenzo faunal information comes primarily from Stein and Yaeger's analyses (2004; Stein n.d.; Yaeger 2000) and suggests that the main faunal input to human diet was whitetail deer, and that parts of the whole animal were available to residents of the site. The eight identified species include fox (*Urocyon cinereoargenteus*), brocket deer (*Mazama americana*), dog, whitetail deer, peccary, tapir, rabbit, and armadillo, along with crab, turtle, bird, squirrel, gopher, and other large and small mammals. Mammals form the bulk of the assemblage by weight and count, especially large mammals, some of which likely are deer (Fig. 4).

The fauna were located mainly in primary contexts, like de facto refuse along patio edges and on top of frontal terraces, rather than secondary ones. Of the 17 residential mounds, 89% of the fauna and 99% of the vertebrate remains were concentrated in four groups at the site, including three households and one ceremonial structure. Whitetail deer and turtles dominate the assemblage (Stein and Yaeger 2004), including worked bone from both species. In addition to limb bones, skull

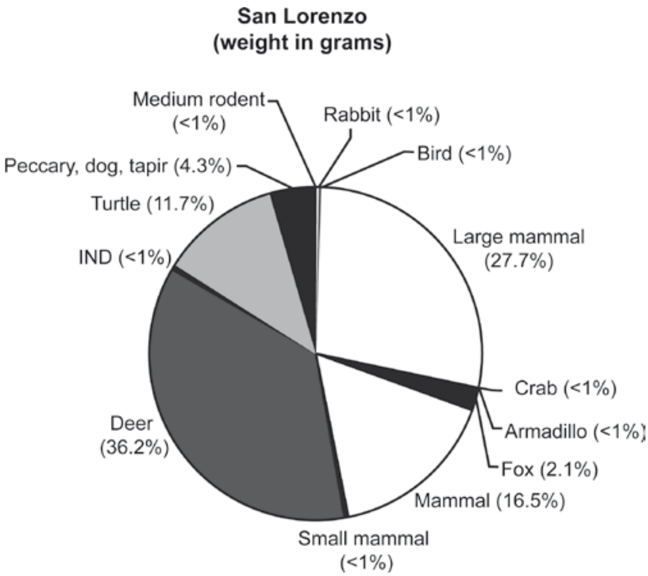

Fig. 4 Fauna from XAP excavations identified at San Lorenzo, Belize

elements, ribs, and vertebrae were identified. The presence of both axial and appendicular skeletal elements suggests that portions of whole animals were available.

Xunantunich

Like the sites in its hinterland, the majority of the 3,424 bone fragments from the site of Xunantunich come from mammals (Fig. 6), especially large game species (Fig. 7). While heavier mammal bones may bias a comparison based on weight, the number of individual mammals also far outnumber birds, reptiles, or fish. A total of 25 different animal species were identified, along with fish, bird, and mammal identified only to class or order. Burned bone fragments comprised 1.8% of the assemblage, 1.6% showed signs of other human modifications like polishing or drilling, and just 0.3% had gnaw marks or punctures that would indicate access to the remains by other animals. A contextual analysis of the fauna precedes discussion of the implications for human diet.

Faunal remains at Xunantunich were identified in 114 excavation units located mainly in the site core, which is comprised of monumental architecture, *sacbes* and plazas (Group A) and residential architecture in Groups B, C, and D (Fig. 5). Bone fragments were identified in 23 different contexts, which fall under three broad groupings, including architectural fill and collapse, use-related deposits (including middens), and burials. Much of the assemblage comes from structural fill and collapse. While this still relates to activity during the Late Classic, when the bulk of

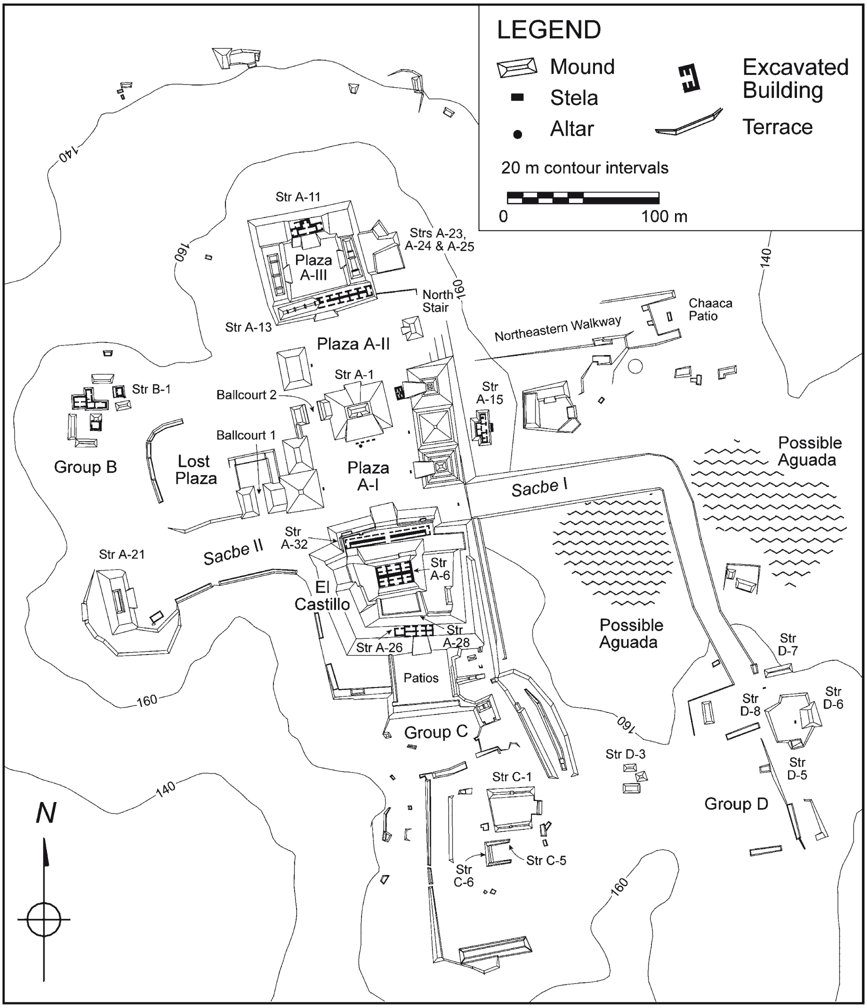

Fig. 5 Site map of Xunantunich showing locations of contexts discussed in the text (map from LeCount et al. 2002, Dating the Rise and Fall of Xunantunich, Belize: a Late and Terminal Classic Lowland Maya Regional Center (Ancient Mesoamerica 13: 41–63)

the standing architecture at the site was constructed, it reflects dietary patterns from earlier time periods as well. For example, twelve bone fragments from bird, reptile, and whitetail deer in a Group A *chultun* likely reflect Late Preclassic and Protoclassic activities (Leventhal 1995).

Fifty eight percent of the bone fragments come from Group A structures, including *sacbes*, ballcourts, funerary monuments, plazas, and administrative and residential units. Ten percent comes from fill and collapse debris in units on the stairways and the upper patios of structure A-1, a large ceremonial platform inserted into the center of the massive central plaza, effectively dividing it in two (LeCount et al. 2002). Like many tropical assemblages, a large number of species and a small

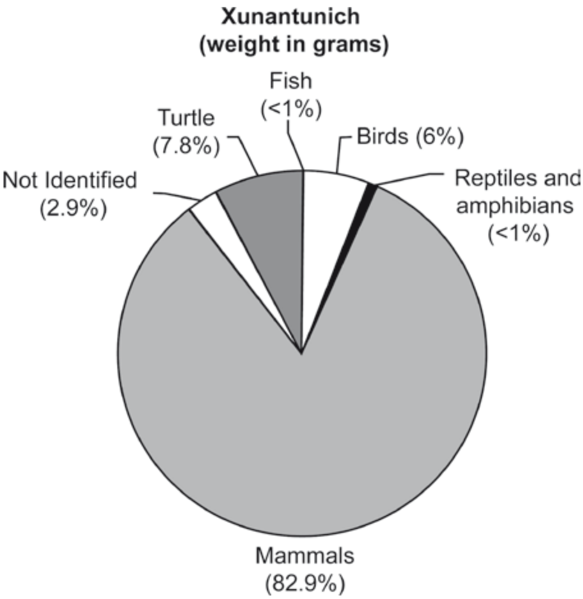

Fig. 6 Fauna from XAP excavations at the site of Xunantunich, Belize

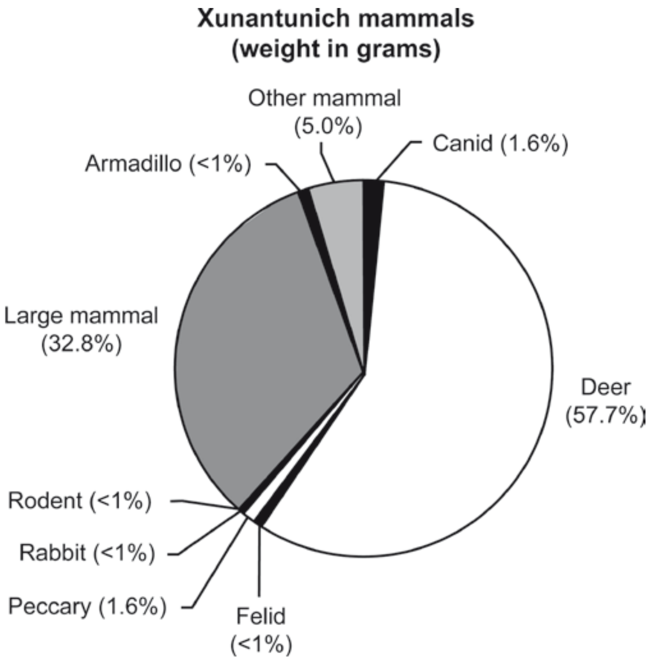

Fig. 7 Mammals identified at the site of Xunantunich, Belize

number of individual animals are present, including collared peccary (*Tayassu tacaju*), whitetail deer, dog, rabbit, turtle, armadillo, fox, puma, brocket deer, human bone debitage (*Homo sapiens*), and other bird, rodent, mammal, reptile, and amphibian bone (e.g., *Bufo marinus* and *Cryptotis mayensis*). Nine percent of all bone in Str. A-1 is worked, compared to just 1.6% of the site as a whole. This ranges from stage 1 debitage (Emery 1999), to broken needles and awls (e.g., Willey et al. 1965) and makes up 41% of the worked bone at the site. While this likely attests to some Late Classic activity it is obscured by mixed deposits of Middle Preclassic ceramics associated with construction fill.

Bone fragments present in burials and caches also relate to both the Late Classic and earlier activities. The presence of nearly complete wing elements suggests that a whole bird may have been placed with a juvenile interment in the center of Ballcourt 2. A deposit of four birds is associated with the earliest platform under Str. A-6, or El Castillo, a 39-m-high complex with multiple structures and terraces (Miller 1996, 1997). It includes at least one *chachalaca* (*Ortalis vetula*), two turkeys, and other assorted bird and mammal bone. The deposit predates the Late Classic. It makes up more than 38% of the bone fragments in the assemblage. Just over two percent of the faunal material comes from other units on Str. A-6.

Other deposits relate more directly to Late Classic diet. A ceramic deposit in Group A structures 23 and 25, interpreted as the service area for the royal residence, may represent feasting refuse (LeCount 2001). This includes 37 fragments of whitetail deer, probable brocket deer, and bones that could only be identified as large mammal. Whitetail deer antler and lumbar vertebrae come from a primary context on top of the plaza floor, and are poorly preserved, indicating possible post-use exposure. A wider variety of animals were present in the royal residence and administrative buildings nearby. Miscellaneous mammal and unidentified bones excavated from structures A-10 and A-13 and during 2003 excavations of Str. A-11 (Yaeger 2005) can be supplemented by Mackie's (1985) 1959–1960 excavations at Str. A-15 that identified paca (*Agouti paca*), agouti, pocket gopher, lepus, and puma, with whitetail deer the most frequently identified animal.

Other animal remains were present in small quantities along *sacbes*, plazas, and in other contexts, including terminal use activities near Ballcourt II that left whitetail deer limb bones and worked large mammal bone near structural collapse that contained brocket deer limbs and armadillo scutes. Other scattered refuse deposits include whitetail deer molars, a rib, and burned and broken limb shaft fragments. Burned bone was present in only 8 of 28 operations, but most contexts contained an insufficient number of bones to assess the implications of taphonomic observations. Cumulatively, the Group A assemblage contains more animal species, but contexts other than fill and collapse show a repeated use of mammals, especially white tail deer, with bone elements representing all parts of the animal, from the antler to the phalanges.

Group C is the residential complex closest to the site Group A monumental architecture and contains just 5% of the faunal assemblage. It comes mainly from fill and collapse along the center and sides of the structures, but a quarter of the bone fragments come from whitetail deer and turtle in a midden associated with feasting refuse along the eastern edge of a platform abutting El Castillo (Church 1996; Keller 1998; LeCount 2001). Scattered refuse identified during testing in other Group C structures also consisted mainly of whitetail deer and other large mammal bone fragments, including pelvis and vertebral elements.

Southeast of Group A is elite residential Group D, which is connected to the site core by a *sacbe* (Braswell 1995). Bone fragments in these deposits represent 12% of the total assemblage (9% by weight), and come from four structures and a *chultun* that contained a number of burials. The use of whole or nearly whole animals in burials and caches recurs with the placement of turtle carapaces with two male burials. The rest of the fragments come from deposits of domestic trash, structural collapse, and fill that likely relate to Late Classic activities and include two large mammals, one medium mammal, an additional turtle and two birds. Deposits from each structure are considered separately in this determination, but the number of mammals (MNI) is reduced if Maya households shared foods, a variable that remains unknown (Emery 2004).

Group B is the fourth residential complex in the site core, located 100 m west of the palace complex. It contains 23% of the Xunantunich animal remains, most of which come from a partially excavated special-use deposit that contains the remains of a minimum of 18 animals, including nine whitetail deer, and at least one collared peccary, dog, puma, rabbit, ocelot (*L. pardalis*), turtle, iguana, brown basilisk (*Basilicus vittatus*), and a medium bird. The rapid formation of the deposit and large quantity of fauna allow exploration not only of which animals were important, but also on how they were acquired and used. The deposit contains 867 bone fragments excavated in 1991 and 1995, 67% of which are from a 60-cm-deep deposit formed during the Late Classic. Animal remains from Terminal Classic construction fill in the upper levels are sparse, in part because the area was partly excavated in 1938 (Yaeger n.d.; Etheridge n.d., 1996). However, most faunal material in the upper levels is identifiable only to order (turtle) or size class (large mammal). The deposit contains 93% of the identifiable fragments, likely due to the plaster floor that sealed the context.

The deposit likely was formed during a single short-term event based both on faunal, ceramic, and contextual observations. First, scavengers like dogs and rodents had very little access to the bones, which suggests the deposit was created and covered very quickly. Only seven bone fragments (0.9%) of Group B bones had animal gnaw marks, but nearly half the animal damage came from small rodents that likely were intrusive taphonomic agents. The frequency of animal gnawing is similar to that of the assemblage as a whole when these bone elements are removed. More important, 2% of the bones in the assemblage could be refit with other fragments, including pieces of the same deer bone in upper and lower levels. While whitetail deer were present throughout the deposit, turtle bones were located near the top, rabbit, peccary, and felines in the middle, and dog and lizard near the bottom, indicating little postdepositional disturbance. Other artifacts include large and well-preserved pottery fragments that exhibit little or no sign of exposure (Yaeger n.d.), a pattern shown in the bone fragments as well. Intentional placement of the deposit also may be indicated by a cache of two complete vessels on worked bedrock below the deposit, and the placement of four broken vessels on the plaster floor that capped it (Etheridge 1996; LeCount 1996).

Whitetail deer comprise 19% of the Group B bone fragments, but 70% by weight due to low fragmentation rates for large limb elements. More important, whitetail deer comprise 50% of the animals in the midden. Deer astragalus and calcaneus tarsal bones are the most abundant elements and form the basis for the MNI estimate. However, while limb bone fragments are more prevalent than those of the axial skeleton, such as ribs and vertebrae, the difference is not statistically significant. Differential preservation of hard cortical and spongy trabecular bone is an important consideration, but so is a disparity in fragmentation patterns of axial and appendicular bone. Like other deposits throughout the site, the presence of parts of all skeletal elements shows that residents of Xunantunich had access to whole animals for use at the site. The absence of cranial elements in the Group B midden is notable, but these are present in Str. A-1, which also includes both limb and axial skeletal elements, as do feasting contexts in structures A-23 and A-25. Like Group A, fauna from Groups B, C, and D derive from a variety of contexts, but those most directly related to Late Classic diet show a similar emphasis on mammals, especially whitetail deer.

Discussion: Placing Faunal Data in Isotopic Context

The faunal analysis provides three important pieces of information. First, the animal species present in the assemblage show the types of environments used. Second, while the overall assemblage reflects the diversity present in tropical assemblages (Stanchly 2004), the emphasis remains on large mammals like deer. Finally, elemental and isotopic analysis of these animals shows that Xunantunich polity residents used diverse animal acquisition strategies that may explain some of the variability in human diet in the region.

Animal Habitat and Habitat Diversity

The most commonly identified animals were those that adapted well to disturbed landscapes. Rabbit, armadillo, fox, and peccary are commonly found near fields that can serve as excellent edge habitat. Deer also can thrive in a variety of landscapes, and may adjust their territory size in accordance with food availability. Likewise, peccary utilize human food sources like *milpas*, roaming and grazing in herds of up to 20 animals (Sowls 1984.) Also identified at the site were forest-dwelling animals like brocket deer, usually considered less well-adapted to human pressures. So were tapir remains, which while rare, show that Xunatunich polity residents also accessed riparian habitats near forests.

Xunantunich residents also utilized riverine resources such as *jute*, oyster, and other mollusks, which contributed to diet in the region from Preclassic to modern times. Though only one fish bone was identified, 11% of the bone fragments were those of turtles, including the Central American river turtle (*D. mawii*), which is found in a variety of freshwater environments. However, this is much lower than would be expected given the location of most of the sites on or near major waterways. While both birds and turtles were identified with caches and burials, the focus remains on terrestrial ecozones.

Strontium isotope values ($^{87}Sr/^{86}Sr$) provide more specific environmental information than the type of habitat used. The $^{87}Sr/^{86}Sr$ values from animals sampled at Xunantunich, Chaa Creek, and San Lorenzo show that residents at each site obtained large game from as far as 20–25 km away, including whitetail deer, peccary, and tapir. Values were measured in the tooth enamel of large game from a variety of contexts and are used to differentiate animals acquired near the site from those obtained in neighboring geologic zones. Distinct isotope values show that residents at each site obtained game from two or three different locations, including the Maya Mountains and Mountain Pine Ridge and upland regions in the Vaca Plateau, as well as in the vicinity of the site (Yaeger and Freiwald 2008).

The types of animals acquired and their archaeological contexts present a complicated picture of animal acquisition. Nearly all the whitetail deer sampled from San Lorenzo household contexts, which may be associated with feasting activities (Stein and Yaeger 2004; Yaeger 2000), were acquired nonlocally. In fact, more than half of the animal teeth sampled were not acquired in the immediate vicinity of the site, and most of these were whitetail deer, the largest commonly hunted game (Yaeger and Freiwald 2008). However, the Xunantunich Group B deposit and the Group A feasting remains contain both local animals, including peccary and brocket deer, and peccary and whitetail deer acquired in different regions at some distance from the site. Both local and nonlocal animals also were found at Chaa Creek, where the $^{87}Sr/^{86}Sr$ value of a tapir shows that it came from the less inhabited mountains south of the site, while a peccary likely was acquired locally.

Carbon isotope values of deer and peccary teeth show use of diverse local and nonlocal habitats (e.g., Emery et al. 2000). Nearly 30% of whitetail deer and peccary sampled in the Xunantunich polity consumed significant quantities of maize, in extreme cases up to 25% of their diet (Yaeger and Freiwald 2008). At the same time, many whitetail deer, brocket deer, tapir, and peccary had no access to C_4 foods. Both local and nonlocal animals had some access to maize, which may demonstrate fairly complex animal habitat on a microscale, and definitely indicates a patchy landscape of field and forest on the regional level. More importantly, if human foods have highly variable isotope signatures, so will the human population in the region. The possibility that enriched human signatures came from game as well as maize is especially intriguing since the average Belize Valley diet contained the lowest average maize input in the central lowlands (Gerry and Krueger 1997).

A sense of how animals were acquired also comes from interpretation of carbon isotope evidence in conjunction with two lines of zooarchaeological inquiry. Pohl (1991) suggested that access to significant quantities of maize might indicate animal foddering or herd management, especially in ceremonial contexts and with juvenile animals (White et al. 2001a). Pohl (1991) relates juvenile animal use at Cuello to both ceremony and animal management. In addition, White et al.

(2004, 2006) identified both dogs and deer in cache contexts at Lagartero and Colha with nearly pure-maize diets that they relate to intentional human feeding.

Similar lines of evidence, however, indicate different strategies at Xunantunich. The whitetail deer in the special-use deposit at Group B had more maize in their diets than elsewhere in the polity, and 26% of all bone fragments are those of juvenile animals. More specifically, these include more than 30% of whitetail deer bones and four of the nine whitetail deer in the deposit. However, comparison with modern development of northern whitetail deer suggests that these animals were 2–3 years old (Gilbert 1990), significantly older than patterns expected for animal husbandry and not comparable to the oft-cited depictions of women suckling fawns shown in historic and iconographic accounts. A comparison may be drawn instead with modern herd structures in the US in which mainly young animals are harvested (e.g., Sowls 1997).

Carr (1996) suggests that similar patterns at Cerros might reflect managed hunting practices aimed at sustainable harvests of wild game. In this case, however, no pattern links a particular site or context to a general hunting region. Moreover, the levels of maize coincide with those of modern opportunistic feeders that benefit from indirect human landscape modification rather than direct management. While controls at a cultural or sociopolitical level would be difficult to assess archaeologically, the way in which animals likely were obtained can provide some additional insight.

The Maya obtained animals in myriad ways, many of which are shown in artistic representations (Pohl 1990), and fishhooks and canoe remnants (McKillop 2005) show archaeologically other means of acquiring and transporting foodstuffs. At Xunantunich, the presence of parts of whole animals is consistently identified. It is not possible with these limited data to ascertain who acquired the animals or how they were distributed at each site, but it is clear that large wild game were transported from other regions into Xunantunich and sites in its hinterland. While zooarchaeological research suggests that small animals and high utility portions of large game are found more frequently at sites based on transportation costs (e.g., Perkins and Daly 1968), wild game is not the only bulky item acquired from the Maya Mountains and Mountain Pine Ridge. Other common items like granites and pine are found in the Belize Valley and more distant sites in the Central Lowlands (Graham 1987; Lentz et al. 2005). While Wright (1999) suggests that most foods were locally grown in the Pasión region, it is likely that wild game was not the only perishable good obtained from diverse, nonlocal catchments in central Belize (e.g., Graham 1987).

This discussion focuses on a single food source in one polity in the region, so does not represent the full range of food acquisition behaviors at the sites in the study. However, it does show one way that heterogeneous environments were used, and if some staples and resources were procured from multiple catchments, other crops and food sources may have been as well. Carbon and nitrogen isotope data on humans from Xunantunich and other sites in the polity are forthcoming: in the meantime, it is possible to apply these data to other sites in the region due to similarities in zooarchaeological assemblages at sites and isotope measures in humans in the region. This study also applies only to the Late and Terminal Classic, and variation over time is another variable that remains to be tested.

Conclusion

The data from Xunantunich and sites in its hinterland show that Belize Valley residents did utilize diverse environments, both local and farther afield, for at least one important source of food. Use of these same nonlocal environments, the Maya Mountains, Mountain Pine Ridge, and upland regions, for resources like granite and pine suggests that other staples may have been acquired there as well. Identifying nonlocal animals also poses questions on transportation and distribution mechanisms for game and other staple products (also see Kennedy Thornton 2008). Wild game studied at the sites also show that C_4 enriched animals may contribute to isotopic signatures in some human individuals that artificially inflate the perceived contribution of maize to the diet (e.g., Coyston et al. 1999; Tykot et al. 1996), but also that carbon isotope ratios in this region are highly variable. While fauna in and around Xunantunich are similar to that reported at other sites in the region, isotopic studies of Xunantunich polity individuals are underway to assess possible dietary differences at the site level. This will directly assess the effect the diversity present in the animal population has on human isotope measures. In addition, consideration of differences between animals in distinct contexts from larger datasets might prove useful. Animals used in large-scale events might be acquired from different regions than those found in household contexts, further complicating efforts to discern patterns in the diets of human who may have participated in both types of activities. Even more fine-grained analyses of diet in the Belize Valley promise to address these questions and likely will create many more.

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Power Plants: Paleobotanical Evidence of Rural Feasting in Late Classic Belize

David J. Goldstein and Jon B. Hageman

If food is to be treated as a code, the message it encodes will be found in the pattern of social relationships being expressed. The message is about different degrees of hierarchy, inclusion and exclusion, boundaries and transactions across boundaries.
Mary Douglas (1970:249) "Deciphering a Meal"

Our recent investigations into food use and preparation at Guijarral, a small-scale Late Classic Maya settlement in Northwestern Belize, confirm Douglas's observations on the codes embedded in foodways (Keller Brown and Mussell 1997b). Rapid regional population growth after 700 B.C. led to increasing land scarcity, which fostered new forms of social organization, including lineages. Archaeological and paleoenvironmental studies convincingly support that centuries of erosion contributed to Late Classic ecological and social milieus, and forced the pressing of ever more marginal lands into agricultural production. In this instance the marginal lands are hill slopes with thin soil coverage and lowland seasonal swamps, or *bajos*. Agricultural landscape modifications, including terraces and check dams, were critical to the sustainability of human habitation in these areas. Such features generated agricultural microenvironments near residential groups where people could access a wider range of foodstuffs apart from those like *Zea mays* (maize), *Phaseolus* sp. (beans), *Cucurbita* sp. (squash), grown using more traditional means of shifting agriculture.

We recovered archaeobotanical datasets from two distinct contexts at Guijarral, a rural site in northwestern Belize. One is associated with periodic feasting near ancestor shrines, while the other is from daily domestic activities of housemounds unassociated with an ancestor shrine. In both instances the plant remains recovered represent materials grown in successional forest stands associated with the broken terrain where the terraces and check dams occur. We believe that within this archaeobotanical assemblage of plants from successional species, some "coding"

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for different types of commensal events is evident. When compared with daily meals, feasting provides the kind of contrast in food use that Douglas argues actively entrenches and codifies social hierarchy. Our data include plants generally held to represent comestibles outside the agricultural complex considered "traditional" by Mayanists (maize, beans, squash; Coe 1994; Fedick 1996; Reina 1967; Sharer 2005).

The importance of this traditional triumvirate of maize, beans, and squash, however, is largely assumed with respect to other potential foodstuffs among the ancient Maya, and predicated on an often, uncritical approach, to food production and direct historical analogy. This approach uses modern and colonial Maya groups as the basis for this supposition. While it is likely that these "traditional" foodstuffs played a critical role in the development of Maya social and cultural complexity, we argue that these three foodstuffs are overly emphasized in reconstructions of ancient Maya subsistence to the point that they distract from other potential contributors to Maya foodways. At the same time, authors who reinforce the importance of the maize-beans-squash triumvirate over any other contributors indicate that botanical resources expressed and maintained localized social inequality in the Late Classic period (A.D. 600–900). If all ancient Maya had access to the same triumvirate, focusing on these foodstuffs alone is not likely to bring us closer to understanding food use, social use of food, and the different kinds of contexts in which food was consumed (see discussion in (Coe 1994:120-22:247-52). Additionally, precious few archaeological projects present systematically collected and recovered archaeobotanical data that indicate the presence of any of the triumvirate in any significant quantity. Couched within the concepts offered by Douglas, as long as we only focus on the presence, absence, or quantities involved in the main staples of Maya cuisine, we are not likely to locate the foodstuffs that coded for status among the ancient Maya. Our application of Douglas's observations on coding of food here is in locating the archaeobotanical remains that relate directly to foodstuffs grown on modified portions of the landscape. We compare the remains from a low-level residence with similar samples from a small ancestor shrine and feasting center. Both areas are associated with terracing and check dams that likely provided foodstuffs encountered.

The data and discussions that we present in this analysis demonstrate that the Late Classic Maya, in instances of daily and feasting food production and consumption, used a variety of species both complementarily and differentially. These instances are likely to demonstrate coded food use for the Late Classic Maya. In keeping with the concept of how historical and ecological realities impacted the resource base in our study area, we highlight that the species encountered indicate a heavy reliance on successional forest species, associated with fallowing processes in agricultural terraces and shifting cultivation. The fact that these species were of primary importance for performing the daily and feasting-related food production is consistent with investigations in other lowland tropical zones where successional species are a dominant part of food systems both for daily and ritual practices (Baleé and Erickson 2007; Moran 1990; Rappaport 1984).

Our findings demonstrate that the traditional vision of ancient Maya foodways requires deeper inquiry to better reconstruct the ecological and social implications of population pressure and subsistence on the landscape. We begin with a description of the evidence as it pertains to the ancient paleoenvironmental and demographic setting. This assessment is followed by a description of the archaeobotanical and other excavation data from our test case, the site of Guijarral. In conclusion, we explain the taxa recovered and their determinations, and discuss the implications of their presence for our understanding of subsistence and the association between plants, coding food utility, and potentially social power.

The Pre-Hispanic Contexts

Palynological and geomorphological studies of northwestern Belize indicate widespread deforestation from the Preclassic (400 B.C. to A.D. 250) through the Classic (A.D. 250–850). Pollen cores show a predominance of maize pollen and disturbance taxa such as grasses and asters typical of maize cultivation (Dunning et al. 2003; Marchant et al. 2002). Within the same diagram most high forest taxa are absent, with the exception of some economic families such as the Sapotaecae (Dunning et al. 1999:654). Deforestation is particularly evident where drainages intersect *bajo* margins. Here, soil profiles include buried peaty layers, which in turn contain pollen from aquatic plants. This evidence led Dunning et al. (1999:655) to argue that, by A.D. 250, the *bajos* of northwestern Belize had transformed from perennial to annual wetlands through infilling processes, and that much of the region's sloping upland terrain was "largely devoid of soil cover" (Dunning et al. 1999:656).

Archaeological remains from the Preclassic through the Classic offer a certain perspective on regional shifts in paleodemography. Investigations in the region from 1992 to 2008 indicate relatively sparse Preclassic and Early Classic occupation followed by a Late Classic population explosion. At ca. A.D. 650, population density for northwestern Belize is estimated at 110 persons per km^2. The overwhelming majority of settlements were confined to large sites and their immediate environs. By A.D. 800, population density is estimated to have been 510 persons per km^2. This dramatic increase is mirrored by intensified construction in the major centers of La Milpa, Dos Hombres, and Ma'ax Na and widespread settlement of previously uninhabited rural areas. Survey and excavation have shown that between 80 and 90% of settlements investigated to date in northwestern Belize were occupied from A.D. 700–850 (Adams et al. 2004; Hageman 2004b; Tourtellot et al. 1997).

Mayanists generally agree that, as the Late Classic progressed, Maya society overall became more highly stratified and land became more tightly controlled and contested (Dunning et al. 1999; McAnany 1995). Studies of rural settlement indicate single-phase construction of houses and farms in ever more marginal landscapes, where large-scale modifications to the land were implemented and added to earlier infrastructure to increase agricultural productivity (Hageman 2004a). Elsewhere, Hageman and Lohse (2003) have argued that corporate groups, such as lineages, coalesced in this environment as a means of controlling increasingly scarce land. These newly created field systems would have added a potential fourth agroecological system, terraced plots, to the one traditionally held existed for the Classic Maya that is composed of three parts, gardens, infield, and outfield agricultural systems (Rice 1990; Reina 1967; Sharer 2005)

Lineages emerge in areas moderately to highly competitive for essential or desired resources (Hayden and Cannon 1982:149), or in contexts of social disruption, competition, uncertainty, and change (Rankin and Esherick 1990:317). Lineages are landholding entities with a group identity, internal ranking, and ancestor veneration. The economic base is rooted in agriculture, with ownership or rights over land maintained through an ancestral claim (Fortes 1953; Shipton 1994; Watson 1982). The lineage head, whose position was negotiated through appeal to ancestral authority, typically coordinates the labor of lineage members, allowing for the construction of complex agricultural systems (Ebrey and Watson 1986; Fortes 1953; Shipton 1994).

In sum, by A.D. 650 the environment of northwestern Belize had been severely degraded as a result of widespread and long-term human impact. Populations in the area increased by over 460% between A.D. 650 and 800 while simultaneously facing ever-diminishing amounts of per capita arable land. During this period, previously unoccupied areas were settled and pressed into agricultural service, in some cases through the construction of terraces. These terraces protected soils and permitted marginal areas to sustain more intensive agricultural activity. Corporate groups, such as lineages, emerged in these areas as a means of securing productive resources and minimizing risk.

Guijarral: A Late Classic Maya Rural Settlement

Guijarral is a small rural settlement located some 8 Km east of the monumental Late Classic center of La Milpa (Fig. 1). Guijarral is on the western slope of the Rio Bravo Escarpment and brackets a broad, shallow drainage flowing from the escarpment edge on the east to a *bajo* on the west (Fig. 2). Guijarral features a series of housemounds, small plaza groups, and a single two-courtyard group. This group contains, as a focal point, two shrines in the form of small pyramids (Structures A-1 and A-8; Fig. 3). Areas between the site center and other plaza groups and housemounds feature terraces, *chich* mounds, and *chich* berms of varying types and sizes. Over 140 hill slope and crosschannel terraces have been recorded in an area measuring less than 0.5 km^2. This is a particularly heavy investment in construction for an area so far removed from a large center. We interpret this density to mean that Guijarraleños were dedicated to wringing every last ounce of productivity from their land while maintaining a dependable and consistent level of production over time (Dunning et al. 2003).

The settlement history of Guijarral is complex and not completely understood. Late Preclassic and Early Classic ceramics appear in excavated contexts both at the site center and at some of the smaller *plazuela* groups, indicating the presence of human activity at the site for over a period of 800 years. At the site center, the smaller of the two pyramids was built near the end of the Early Classic at about AD 550, but

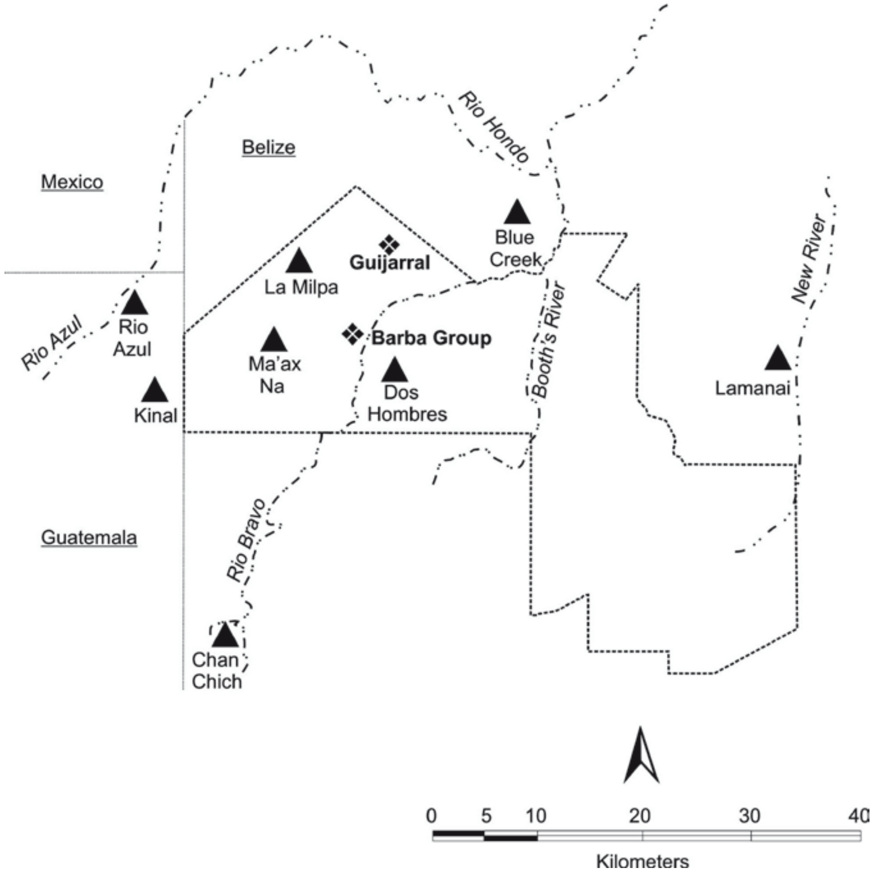

Fig. 1 Map of study area showing location of sites mentioned in the text

the remaining buildings, *plazuela* groups, housemounds, and terraces indicate Late Classic 2 (A.D. 700–850) construction.

In terms of interpreting the local political economy of the site, a lineage-based system best fits the data from the site of Guijarral (see Hageman (2004b) for a more detailed discussion). The area is circumscribed on the west by a *bajo*, to the south by a large drainage, and on the north and east by the Rio Bravo escarpment (Fig. 2). The terraces and shrines reflect the bounded corporate resource of the area and the claim to that resource. The shrines are also located in the largest house in the area, likely the house of the lineage head. The larger, Late Classic shrine has been looted and is dangerously unstable, but the smaller, Early Classic shrine was less damaged and yielded a burial radiocarbon dated to A.D. 732 ± 45, a Late Classic ancestor interment. Ancestor veneration is further indicated through ceramic evidence of feasting (Table 1), where almost 65% of the ceramics recovered from the site center were from food preparation and serving vessels, compared to 50% from regular

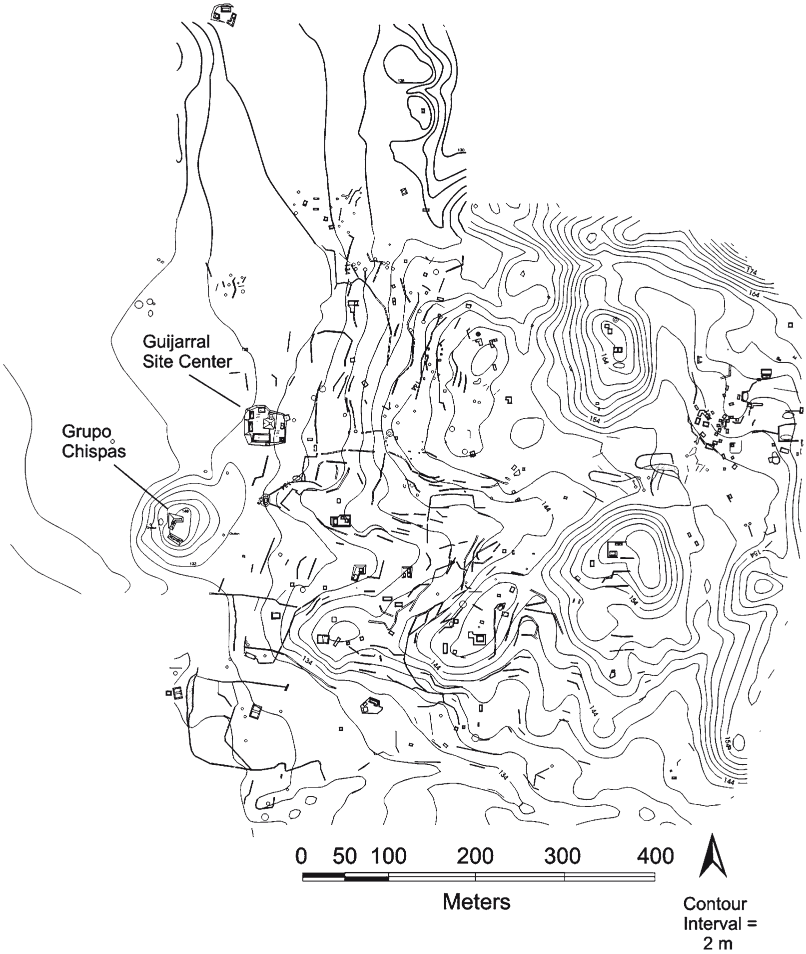

Fig. 2 Map of Guijarral and surrounding area

domestic contexts (Hageman 2004a; see also LeCount 2001). The focus of consumption at the site, however, was only conjecture until recently.

Late Classic Plant Consumption at Guijarral

In 2005, the authors excavated middens in two residential groups at Guijarral: the site center, identified with ancestor veneration and feasting, and Chispas, a small, nonelite residential plaza group atop a nearby hill (Fig. 4). Four square meters of midden was excavated at each site**.** Digging in 10-cm levels, we collected a minimum of eight liters of soil per level. We used flotation and dry standard series fine screens

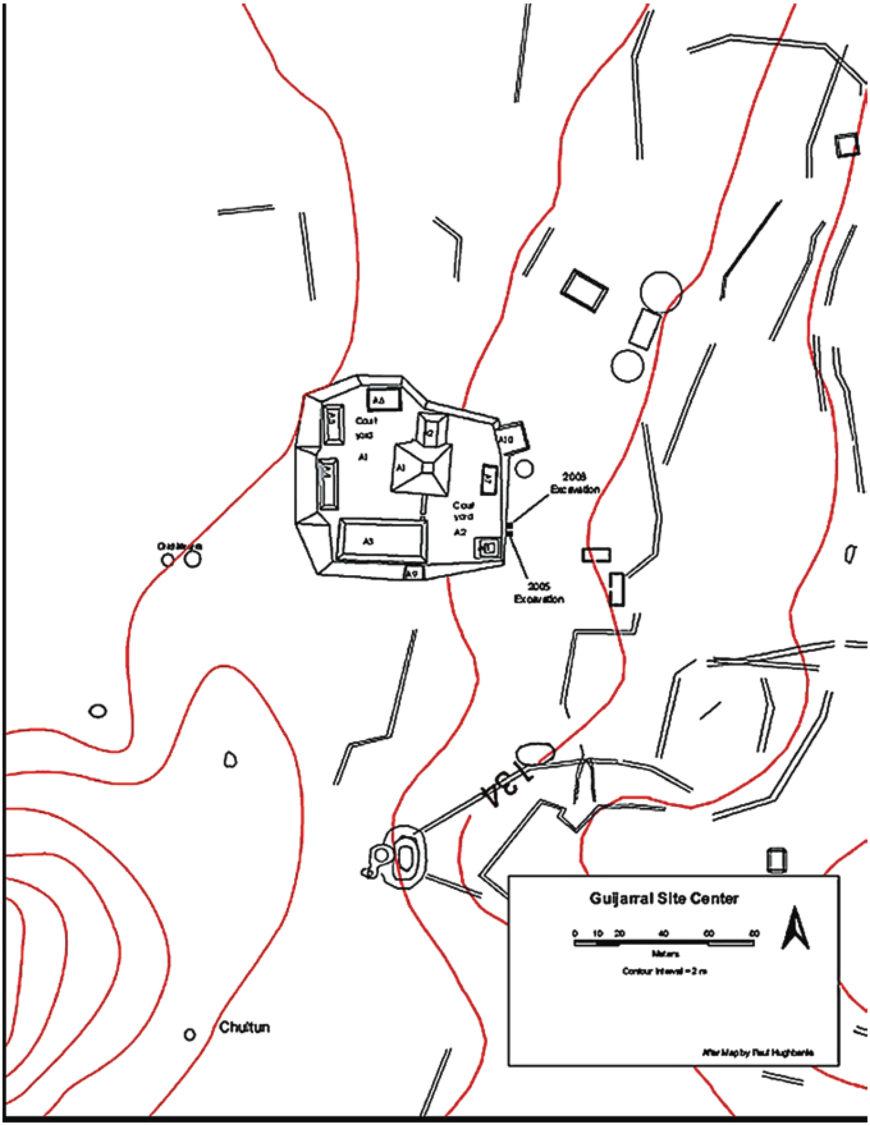

Fig. 3 Map of Guijarral site center showing location of excavations

Table 1 Distribution of ceramic forms at Paco 15 (Fox 1996), Xunantunich (LeCount 2001), and the study area (Hageman 2004a)

	Paco 15 Ballcourt	*Xunantunich Group D*	Xunantunich Plazas	*Guijarral Center (Op 45)*	Grupo Chispas (Op 46)
Plates	*5.36*	*6.64*	3.94	*7.59*	0
Bowls	*58.90*	*65.81*	46.46	*56.96*	50.00
Total preparation and serving	*64.26*	*72.45*	50.40	*64.55*	50.00
Jars	*27.7*	*26.5*	48.82	*35.44*	50.00

Italicized columns indicate feasting loci

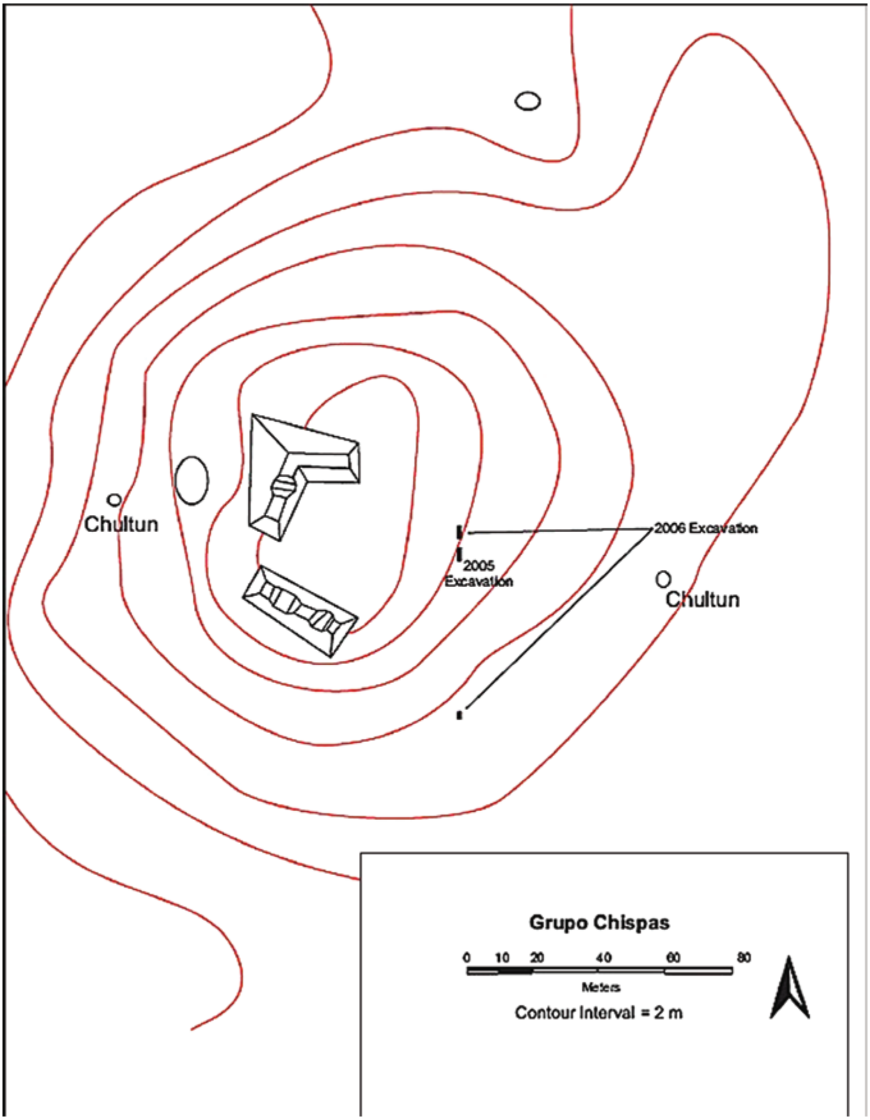

Fig. 4 Map of Grupo Chispas showing location of excavations

for archaeobotanical recovery, with processing alternating by excavated level and by meter square excavation area. The result was a mosaic of coverage where each level of the excavation was half dry sieved and half floated. Each processed sample was then examined under incident light microscopy in the field lab.

Archaeological plant remains were compared with a locally available ethnographic seed collection and modern specimens collected during the field season.

We examined all the soil samples but report only the materials recovered from 21 cm below the ground surface as this material is likely better preserved and bioturbation less evident. Again, the feasting contexts correspond to the settlement at the site center, while our domestic, nonfeasting contexts correspond to Chispas.

The data are presented here in three distinct ways: the actual counts of materials recovered, their ubiquity at each site individually and between the two, and finally as a percentage of each taxon's contribution to the sample diversity reported from each site. Ubiquity was computed as a quotient of the number of lots where a taxon was reported over the total number of lots recorded. Representative diversity was computed as a quotient of the raw count of each taxon divided by the total number of taxa recorded at each site. Both ubiquity and representative diversity are reported as percentages in this presentation.

Overall, we recovered 3,738 individual items (Table 2). Of these, 1,710 were from the site center feasting middens and 2,028 were from Chispas' domestic trash. Between the two contexts 190, or 4.1% of the total individual plant remains, were unidentifiable. This leaves some 20% of other unknown materials (reported in Tables 2–5 as UKN#) that require further research to identify. As can be seen in Table 2, land snails account for over 44% of the material that we recovered. In this instance we are interpreting them as postdepositional phenomena and not consumed by humans. As a result, subsequent tables report findings and quantities minus the land snails. We have since returned to both sites and continue to develop a more extensive excavation strategy designed to test and expand our ideas regarding food use at the site; these results are forthcoming. Our analyses of the 2005 data demonstrate that certain genera are limited to feasting loci, others to domestic use, while still others are common to both contexts.

Plants Associated with Feasting: Site Center

We have assigned seven different plants taxonomic determinations restricted to the feasting context at the site center, with an additional 12 that require more work in determining their related taxa (Table 3). We found fruit and seed remains common to ethnographic and ethnohistoric feasts, including *Zuelania* sp. ($n=2$), *Psidium* sp. ($n=2$), *Guazuma* sp. ($n=5$), *Amaranthus* sp., ($n=3$), *Malva* sp. ($n=1$), and *Orbignya* sp. ($n=1$).

Zuelania sp.($n=2$) may be *Zuelania guidonia,* commonly found in contemporary forests of northwestern Belize. Modern Yucatec Maya grind the leaves of this plant into a paste for use as a diuretic and for relief from general body pains. As far as feasting is concerned the bole of the tree *Zuelania* serves as a game where people are invited to climb a greased tree trunk during certain festivals, e.g. carnival (Atran et al. 2004; Roys 1931). While *Psidium* sp. is known for its fruits, and may represent guava (*P. guajava*), *Guazuma* sp. fruits, some of which are called *pixoy* (Yucatec; *G. polybotria*) or bastard cedar (*G. ulmifolia*) are and have been used in the Maya lowlands for producing a ritual fermented beverage, and being potential

Table 2 Recovered taxa by operation 2005

Family	Determination	Chispas raw count	Chispas ubiquity ($n=9$ lots)	Guijarral raw count	Guijarral ubiquity ($n=11$ lots)	Total raw data	Overall ubiquity ($n=20$ lots)	Overall rep. diversity
Alismataceae	*Potamogeton* sp.	3	11%	0	0%	3	5%	0.1%
Amaranthaceae	*Amaranthus* sp.	0	0%	3	18%	3	10%	0.1%
Arecaceae	*Orbignya* sp.	0	0%	1	9%	1	5%	0.0%
Asclepidaceae	*Asclepias* sp.	0	0%	191	82%	191	45%	5.1%
Asteraceae	cf. Asteraceae	1	11%	3	18%	4	15%	0.1%
Burseraceae	UKN #195-FS4	0	0%	1	9%	1	5%	0.0%
Cecropiaceae	*Cecropia* sp.	1	11%	1	9%	2	10%	0.1%
Fabaceae	cf. Fabaceae	2	22%	2	18%	4	20%	0.1%
	Pinnae	165	89%	6	18%	171	50%	4.6%
	UKN #6-FS1	27	22%	0	0%	27	10%	0.7%
Flacourtiaceae	*Zuelania* sp.	0	0%	2	18%	2	10%	0.1%
Malphigiaceae	*Byrsonima* sp.	12	33%	11	18%	13	25%	2.0%
Malvaceae	*Malva* sp.	0	0%	1	9%	1	5%	0.0%
Myrtaceae	*Psidium* sp.	0	0%	2	18%	2	10%	0.1%
Onagraceae	*Oenothera* sp.	43	78%	24	82%	67	80%	1.8%
Poaceae	cf. Poaceae	1	11%	5	27%	6	20%	0.2%
	cf. *Chusquea*	1	11%	4	18%	5	15%	0.1%
	UKN #37-FS19	6	22%	9	55%	15	40%	0.4%
	Zea mays	2	11%	9	9%	11	10%	0.3%
Solanaceae	UKN #4-FS1	2	22%	1	9%	3	15%	0.1%
Sterculiaceae	*Guazuma* sp.	0	0%	5	18%	5	10%	0.1%
Verbenaceae	UKN #5-FS1	4	11%	0	0%	4	5%	0.1%

Undetermined	Ceramic	40	56%	61	64%	101	60%	2.7%
	Charcoal	8	11%	0	0%	8	5%	0.2%
	Lithics	79	67%	232	100%	311	100%	8.3%
	Pachychylus sp.	2	11%	0	0%	2	5%	0.1%
	Shell	891	100%	1159	100%	2150	100%	54.4%
	Stem	32	100%	9	45%	41	75%	1.1%
	UKN #7-FS1	3	22%	27	9%	30	15%	0.8%
	UKN #11-FS1	5	33%	0	0%	5	15%	0.1%
	UKN #13-FS1	22	44%	15	27%	37	35%	1.0%
	UKN #14-FS1	3	22%	0	0%	3	10%	0.1%
	UKN #20-FS7	51	78%	10	27%	61	50%	1.6%
	UKN #24-FS7	0	0%	3	9%	3	5%	0.1%
	UKN #26-FS7	3	11%	0	0%	3	5%	0.1%
	UKN #28-FS7	0	0%	28	27%	28	15%	0.7%
	UKN #31-FS7	3	11%	0	0%	3	5%	0.1%
	UKN #32-FS7	11	11%	0	0%	11	5%	0.3%
	UKN #33-FS23	1	11%	1	9%	2	10%	0.1%
	UKN #34-FS19	0	0%	6	27%	6	15%	0.2%
	UKN #35-FS19	0	0%	45	45%	45	25%	1.2%
	UKN #38-FS19	0	0%	2	9%	2	5%	0.1%
	UKN #39-FS19	0	0%	4	18%	4	10%	0.1%
	UKN #44-FS20	0	0%	3	18%	3	10%	0.1%
	UKN #45-FS20	0	0%	7	9%	7	5%	0.2%
	UKN #49-FS20	0	0%	3	9%	3	5%	0.1%
	UKN #50-FS20	0	0%	4	9%	4	5%	0.1%
	UKN #51-FS13	13	11%	0	0%	13	5%	0.3%
	UKN #56-FS29	0	0%	3	9%	3	5%	0.1%
	Unid	67	100%	123	100%	190	100%	4.1%
	Wood	204	33%	0	0%	204	15%	5.5%
Grand total		1710		2028		3738		100.0%

Table 3 Taxa associated with feasting at Guijarral

Family	Determination	Guijarral raw data	Guijarral ubiquity ($n = 11$ lots)	Guijarral rep. diversity	Overall ubiquity ($n = 20$ lots)	Overall rep. diversity
Asclepidaceae	*Asclepias* sp.	191	81.8%	15.9%	45.0%	9.2%
Undetermined	UKN #35-FS19	45	45.5%	3.7%	25.0%	2.2%
Undetermined	UKN #28-FS7	28	27.3%	2.3%	15.0%	1.3%
Undetermined	UKN #34-FS19	6	27.3%	0.5%	15.0%	0.3%
Amaranthaceae	*Amaranthus* sp.	3	18.2%	0.2%	10.0%	0.1%
Flacourtiaceae	*Zuelania* sp.	2	18.2%	0.2%	10.0%	0.1%
Myrtaceae	*Psidium* sp.	2	18.2%	0.2%	10.0%	0.1%
Sterculiaceae	*Guazuma* sp.	5	18.2%	0.4%	10.0%	0.2%
Undetermined	UKN #39-FS19	4	18.2%	0.3%	10.0%	0.2%
Undetermined	UKN #44-FS20	3	18.2%	0.2%	10.0%	0.1%
Arecaceae	*Orbignya* sp.	1	9.1%	0.1%	5.0%	0.0%
Burseraceae	UKN #195-FS4	1	9.1%	0.1%	5.0%	0.0%
Malvaceae	*Malva* sp.	1	9.1%	0.1%	5.0%	0.0%
Undetermined	UKN #24-FS7	3	9.1%	0.2%	5.0%	0.1%
Undetermined	UKN #38-FS19	2	9.1%	0.2%	5.0%	0.1%
Undetermined	UKN #45-FS20	7	9.1%	0.6%	5.0%	0.3%
Undetermined	UKN #49-FS20	3	9.1%	0.2%	5.0%	0.1%
Undetermined	UKN #50-FS20	4	9.1%	0.3%	5.0%	0.2%
Undetermined	UKN #56-FS29	3	9.1%	0.2%	5.0%	0.1%

Table 4 Taxa exclusive to the Chispas domestic context

Family	Determination	Chispas raw count	Chispas ubiquity ($n = 9$ lots)	Chispas rep. diversity	Overall ubiquity ($n = 20$ lots)	Overall rep. diversity
Undetermined	UKN #11-FS1	5	33.3%	0.6%	15.0%	0.2%
Fabaceae	UKN #6-FS1	27	22.2%	3.1%	10.0%	1.3%
Undetermined	UKN #14-FS1	3	22.2%	0.3%	10.0%	0.1%
Alismataceae	*Potamogeton* sp.	3	11.1%	0.3%	5.0%	0.1%
Verbenaceae	UKN #5-FS1	4	11.1%	0.5%	5.0%	0.2%
Pleuroceridae	*Pachychylus* sp.	2	11.1%	0.2%	5.0%	0.1%
Undetermined	UKN #26-FS7	3	11.1%	0.3%	5.0%	0.1%
Undetermined	UKN #31-FS7	3	11.1%	0.3%	5.0%	0.1%
Undetermined	UKN #32-FS7	11	11.1%	1.3%	5.0%	0.5%
Undetermined	UKN #51-FS13	13	11.1%	1.5%	5.0%	0.6%

parts of ritual feasts (Roys 1931; Atran et al. 2004). We also have a piece of what might be *Protium* sp. or *Bursera* sp. in our feasting context, UKN #195-F.S.4. Both generally come from the family Burseraceae from which various types of incense, *copal* (Yucatec; e.g. *Protium copal*), are made. The incenses are made from the sap, fruit, bark, and leaves of these genera (Atran et al. 2004; Roys 1931; Stross 1997).

Table 5 Taxa from both feasting and domestic contexts

		Domestic			Feasting					
Family	Determination	Chispas raw count	Chispas ubiquity ($n=9$ lots)	Chispas rep. diversity	Guijarral raw data	Guijarral ubiquity ($n=11$ lots)	Guijarral rep. diversity	Overall raw count	Overall ubiquity ($n=20$ lots)	Overall rep. diversity
Onagraceae	*Oenothera* sp.	43	77.8%	4.9%	24	81.8%	2.0%	67	80.0%	3.2%
Undetermined	UKN #20-FS7	51	77.8%	5.8%	10	27.3%	0.8%	61	50.0%	2.9%
Poaceae	UKN #37-FS19	6	22.2%	0.7%	9	54.5%	0.7%	15	40.0%	0.7%
Undetermined	UKN #13-FS1	22	44.4%	2.5%	15	27.3%	1.2%	37	35.0%	1.8%
Malphigiaceae	*Byrsonima* sp.	12	33.3%	1.4%	11	18.2%	0.9%	23	25.0%	1.1%
Fabaceae	cf. Fabaceae	2	22.2%	0.2%	2	18.2%	0.2%	4	20.0%	0.2%
Poaceae	cf. Poaceae	1	11.1%	0.1%	5	27.3%	0.4%	6	20.0%	0.3%
Asteraceae	cf. Asteraceae	1	11.1%	0.1%	3	18.2%	0.2%	4	15.0%	0.2%
Poaceae	cf. *Chusquea*	1	11.1%	0.1%	4	18.2%	0.3%	5	15.0%	0.2%
Solanaceae	UKN #4-FS1	2	22.2%	0.2%	1	9.1%	0.1%	3	15.0%	0.1%
Undetermined	UKN #7-FS1	3	22.2%	0.3%	27	9.1%	2.2%	30	15.0%	1.4%
Cecropiaceae	*Cecropia* sp.	1	11.1%	0.1%	1	9.1%	0.1%	2	10.0%	0.1%
Poaceae	*Zea mays*	2	11.1%	0.2%	9	9.1%	0.7%	11	10.0%	0.5%
Undetermined	UKN #33-FS23	1	11.1%	0.1%	1	9.1%	0.1%	2	10.0%	0.1%
Undetermined	Lithics	79	66.7%	9.0%	232	100.0%	19.3%	311	100.0%	15.0%
Undetermined	Unid	69	100.0%	7.9%	125	100.0%	10.3%	194	100.0%	7.5%

Orbignya sp. probably relates to one of the most useful successional trees in the forests of Northwestern Belize, *Orbigyna cohune*, the *cohune* palm.

Zuelania sp., *Psidium* sp., *Guazuma* sp., and *Orbignya* sp. (Atran et al. 2004) are all successional trees**,** most of which have predictable and consistent fruiting seasons. Aside from their incidence here, lowland rainforest agriculture commonly recognized in South America notes the agricultural importance of these types of species and some of the same ones that we have recovered (Denevan 2007). They regenerate quickly; they also provide shade cover, timber, renewable and sustainably harvested fuel resources, protection from erosion, and would stand to survive in terrace-based agricultural systems such as those at Guijarral (Clement 2007). Trees are invaluable resources as they offer their products even when the field systems directly associated with them are not undergoing active cultivation (Atran 1993).

Additional species include *Amaranthus* sp., a leafy green that can be eaten as an important source of fiber and iron. They are known generally in Central America as *quelites* (Bye 1981) and more generally in the area under this genus by Yucatec names *Eɔen, X-tez, Tez-mucuy,* and *Chac-tez* (Roys 1931). *Amaranthus* is associated with agricultural and specifically human disturbance activity, as weeds growing in open areas and fields. *Malva* sp. is a plant of nominal medicinal and comestible purpose. Most importantly it grows in plowed or on continuously disturbed land surfaces, often demonstrating the human intervention in an agricultural landscape (DeWet and Harlan 1975). Closely allied with the genus *Abutulon*, whose seeds are very similar, for which we have two species that grown in the area and are known medicinal/leafy greens *A. trisulcatum* (Yucatec: *Zac-mizbil* and *Zac-xiu*) and *A. gaumeri* (Yucatec: *Yaax-hol-che*).

Additionally, we have some plants whose presence we cannot yet explain. The most ubiquitous taxon present (n = 191) in feasting contexts are seeds from *Asclepias* sp. *Asclepias curassavica* (Yucatec: *Anal, Anal-kak,* or *Anal-xiu*) and *Asclepias longicornu* (Yucatec: *Cabal-kun-che*) are used in treating intestinal worms, inducing sneezing, relieving toothaches, and treating the bites of many poisonous animals (Atran et al. 2004; Roys 1931). These plants thrive in open as well as wet or seasonally inundated areas and are found in and around the swampy margins of Guijarral. There is no apparent ethnographic precedent for their association with feasting contexts. The presence of this plant, however, indicates that while under production, the surrounding seasonal wetland potentially sustained areas of standing water year round where plants like *Asclepias* sp. grow and be available to residents in the area.

Plants Associated with Domestic Consumption: Chispas

Nine taxa occur only in the domestic midden, of which we have so far identified one: *Potamogeton* sp. (English: duckweed; Table 4) *Potamogeton* sp., comes from areas of standing water, perhaps growing in the bajos during the rainy season

(Atran et al. 2004; Roys 1931). Its presence complements the presence of *Asclepias* sp., at Guijarral. It does appear that both sites were extracting resources from standing wetlands, and at the same time the resources that they are exploiting in food production are somewhat different; daily food using *Potamogeton* sp., and communal events *Asclepias* sp.

Lastly, we have eight other taxa whose seeds are present only at Chispas. These taxa, including one from the Fabaceae, are potential indicators for daily use materials. Unknown numbers #11 and #6 both show up in several different units, potentially signifying that their presence is not a chance occurrence and is instead related to activities at the site. #11 is likely a tree legume, many of which are native to the area.

Plants Found in Both Contexts

Fourteen taxa appear in both feasting and nonfeasting middens (Table 5). These include *Byrsonima* sp., *Cecropia* sp, cf. *Chusquea, Z. mays* and unknown seeds from the families Fabaceae, Asteraceae, and Solanaceae. Additionally, we recovered *Oenothera* sp. (Onagraceae) seeds. *Oenothera* sp. ($n=67$; English: evening primrose), in its modern extension, does not appear to be present in the region, though it is the most common seed occurring in both contexts. This plant has been suggested as being part of the Pre-Hispanic ceremonial snuff traditions of the Caribbean and South America (Newsom and Wing 2004). If *Oenothera* seeds are associated with ritual snuff use among the Maya, its production or even use may be just as prevalent in domestic settings as in ritual affairs.

Byrsonima sp. (English: nance or craboo) is a tree that produces edible fruits that can be used to make fermented beverages and are often preserved as a jam or confit. *Cecropia* sp. ($n=2$) (trumpet tree) is common in house gardens, abandoned fields, fallow areas, and any disturbed area of the forest, and is not surprisingly a tree with many uses, mostly to cure common ailments (Atran et al. 2004; Roys 1931). Cf. *Chusquea* represents the presence of a grass; generally, in the lowland areas of Central America their presence is common to human disturbed or otherwise open areas, especially those that practice agriculture, similar to the case as of *Amaranthus* sp.. It is likely that cf. *Chusquea* is getting into the sample as an incidence of weeds that accompany other processes related to activities at Chispas, not necessarily eating.

In general, plants associated with both feasting and domestic contexts may indicate similar patterns of consumption across all houses in the area, or perhaps overlap between daily and festal foods. This is especially so in the case of *Z. mays*. We only recovered seed fragments from the site center, whereas we recovered cupules and cob fragments from contexts at Chispas. While the *Z. mays* remains are few, it may well have been a common denominator between the foods at both sites, instead of being restricted to the activities of one site or the other.

Discussion: Ecological, Subsistence, and Social Implications

Plants from these middens are related to smallholding agriculture typical of contemporary regional farming systems as well as broader Neotropical rainforest subsistence patterns (Baleé and Erickson 2007; Clement 2007; Denevan 2007; Fedick 1994). Often Mayanists engage in the ideal presented by authors like Rice (1990) and Reina (1967), that infield and outfield agroecologies play the only significant role in traditional agriculture. Yet, the data from Guijarral and Chispas indicate that something else was happening in the immediate area: In addition to gardens and fields in production, the entire human disturbed landscape was exploited for subsistence means. The overall catchment of food resources included species from fallow fields, weeds tolerated around settlements, and even plants obtained from the nearby *bajo*.

The idea that tree crops were important in both modern and ancient agricultural systems has been relegated to house gardens rather than farming in recent years (Fedick 1996). Instead of considering gardens as potent areas of catchment in times of scarcity (Killion 1992), pressure or sheer adaptive management of the local ecology at Guijarral relied on the integration of successional forest species into local foodways. This situation is the present understanding of Lowland South American food systems in both the prehistoric and colonial periods (Denevan 2007). Given the ecological similarity between the two regions and the potential for human-induced ecological pressures to be similarly received in two similar tropical ecosystems, it seems that the Late Classic Maya of Guijarral chose a similar subsistence strategy in light of compromised resource availability.

Our data indicate plant resource use was extensified, thereby increasing the breadth of the diet base (Winterhalder and Goland 1997). The overall catchment of food resources included plants from fallow terrace agriculture where weeds tolerated around settlements and fruits hanging from successional trees were common aspects of the dietary and medicinal repertoire. Some of these were also integrated into marked food preferences. Moreover, some of these items were seasonal fruits, suggesting a schedule of feasts. It is likely that, within our developing dataset, the plant remains will point to groups of genera or species that have similar flowering or fruiting periods that can be used to indicate seasonality of the use of particular midden deposits. To better understand the potential for food residues to indicate social activity, we continue to process remains from subsequent seasons and pursue the identification of our unknowns. Surely, more data will enhance our developing impression of both daily and festival food production.

As Douglas (1970) proposed, we clearly see processes of distinction operating through foodstuff selection at both Guijarral and Chispas. Archaeologically, we believe that the middens investigated at both sites represent discrete events of food production/consumption detritus deposition, perhaps being reused between two and six times. Historically and ethnographically the use of discrete middens away from but adjacent to the feasting or food preparation/consumption event has precedence.

Given their proximity (300 m) archaeological and historic context, it is clear that these two sites were socially linked.

Yet it appears that similar middens produced both distinct and complementary remains. The presence of fruits and seeds from successional species at both sites demonstrated that they shared some coded food practice that incorporated gathered species from potentially fallow terraces. Their production and consumption residues signal that processes of choice and selection of foodstuffs also encoded differential information; identified by the discrete incidence of certain species at each site. Kalcik (1997):46) refines the set of codes outlined by Douglas and makes them concrete by stating that food preferences are some of our best indicators of cultural identity. The commonalities that exist between the two residences are potential signs of taste and flavor held in common between the residents of both groups. These may represent components that coded as daily food or daily use plants for the Late Classic Maya at these sites.

That successional trees and what non-Maya might consider "wild foods" formed a potentially significant part of the subsistence base taken from the generalized ecology around the site defines that bond even further. On the other hand, the clear distinctions between foodstuffs from the same catchment base deployed in each locale under different circumstances (e.g., *Asclepias* at the site center and *Potamogeton* at Chispas) clearly demonstrate how distinction was asserted or controlled during the Late Classic. Again, Kalcik (1997:48) offers that these patterns of inclusion and exclusion of foodstuffs, especially when centered around kinship and lineage ties, are clear indicators of within-group social difference. The uses we refer to here are the feasting activities that distinguished everyday consumption from more auspicious occasions. The fact that commonalities exist between the archaeobotanical remains from both sites allows us to posit that the differences between the two datasets are in fact significant socially and not due to differential preservation alone. In this case, we are looking at the remains of foodways that code for the ties that bound the residents of both sites during the Late Classic.

The application of Douglas's ideas of food codes is not particularly astonishing when it comes to the Late Classic Maya. Surely codes of differential food use existed. Douglas's ideas apply to complex societies, where there are site hierarchies, kinship ties, and differential access to material goods. The Late Classic Maya of what is now Northwestern Belize had all these structures in place and was surely no exception. What is enticing, however, is that if we move beyond considering the staple production of these Maya, (e.g., maize beans and squash), we can see that some foodstuffs were related directly to the agricultural projects developed during this period. Successional tree arboreal species, wetland plants, and weeds related to the normative Late Classic Maya agricultural technology provided critical resources. Beyond what may have been timber, fuel, or fruit resources, we see that certain taxa were employed differentially in feasting. It is here, with these foodstuffs and their archaeobotanical remains, that we can begin to discuss what these food codes were, and how these resources contributed to social differentiation and status relationships.

Conclusions

In the face of increasing population pressure and decreasing availability of land after A.D. 700, the residents of Guijarral transformed their social organization and their environment to safeguard their resource base and to produce larger quantities of food. As the number of northwestern Belize inhabitants increased, so did the need to delineate and control agricultural land. Many wild and successional plants were not only utilized as part of the day-to-day diet, but also may have been employed to address the effects of likely decreasing qualities of health and concomitant diseases and pathologies.

Guijarraleños appear to have organized themselves into a lineage, a landholding corporation grounded and legitimized in the ancestral past. Feasts held as part of lineage activities incorporated not only domesticated plants used by Maya in early twentieth century feasts and tree crops, but also plants associated with fallow field and swamp contexts. Plants found exclusively at the site center were implicated in negotiating the status of the lineage head through feasting, thereby creating and maintaining power and status within a small, rural, nonelite population in Late Classic Maya society. In contrast, the more humble settlement of Chispas, while sharing the use of some of these same resources, depended on similar agricultural niches, but did not employ the same species on the occasion of large-scale food production. We believe that inherent to these differences exists the potential to decipher social practices that dealt with negotiation of power and inequality between these sites based on the rituals that their use encoded. In our estimation these foods were ancient codes transmitting the messages regarding social power, legitimized in the shadow of their ancestors.

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Food and Feasting in the Zona Maya of Quintana Roo

E.N. Anderson

Pre-Columbian Heritage

Skeletal analysis shows that the ancient Maya typically obtained about 75% of their calories from maize (White 1999, *passim*). In some areas, they ate more seafood or root crops, and maize dropped to around 50% (Magennis 1999; Staller et al. 2006; White et al. 2006). Maize is a C_4 plant; other common Maya foods are primarily C_3 plants. This refers to different pathways for metabolizing carbon; the C_4 pathway is more efficient than the C_3 under very hot conditions, and is thus commonest among plants of hot, sunny, tropical areas. The C_3 pathways works better under cooler conditions. These photosynthetic pathways leave different carbon isotope signatures in the people or animals that eat these plants. Thus, analysis of skeletons can tell us how much maize people ate (Reed 1999). Usually, the Maya ate much maize, and so did their one domestic mammal (the dog) and so did two of their favorite game animals – peccaries and pacas – who lived by robbing *milpas*. Deer, however, ate more C_3 food (Reed 1999), though they ate enough C_4 to prove they had been raiding gardens – or, locally, raised in captivity, possibly for sacrifice (White et al. 2006), though modern Maya raise deer simply as pets or for food.[1]

In the early twentieth century, an ethnographic study by Benedict and Steggerda (1936) showed that 75% of the calories consumed by Maya in rural Yucatan were still coming from maize. Toward the end of the century, research by Maria Elena

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[1] Recent findings show that, at least in some communities, people of higher status – dwellers in palace complexes, men as opposed to women, etc. – got more maize (White et al. 2006). The people of Chunchucmil, in the dry and hot northwest of Yucatán, receive considerably less maize in Classic times than did other areas (Mansell et al., 2006). Maize will barely grow in the area and fails completely during the rather frequent drought years. Unfortunately, the record is silent, so far, about what they did eat. They had access to trade, and in fact had a true marketplace, like those of Mexico's cities today – a rare thing in Mayaland, ancient or modern. They also had access to wet savannahs and swamps that produced fish and various vegetable foods.

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Peraza Lopez Maria Elena Peraza Lopez (1985) in rural Quintana Roo showed the same. And, for the rural poor, I found the situation still the same in the twenty-first century. The well-to-do are now eating white bread and sugar – far more than is good for them – but even they still get about half their calories from maize. The 50–75% figure has remained stable for 2,000 years.

Maize was divine for the ancient Maya, who worshiped the young Maize God (see Taube 1989a b, 1996), often under the name of Handsome Lord (*k'ichkelem yum*) (Fig. 1). This name has been transferred to Jesus, whose cross strikingly resembles pre-Columbian representations of the maize plant. The ancient Maya bound the heads of infants, to give them the elongated, tapered shape of the sacred corncobs.

Very early, people discovered that maize cooked with lime (burned limestone) became softer and easier to grind. They probably realized it was more nutritious. Boiling with lime destroys phytic acid, which otherwise bonds with niacin and mineral

Fig. 1 Drawing of a painted capstone from the northern Yucatan in the collections of the San Francisco Museum of Art (drawing by Michael D. Carrasco)

Fig. 2 Cooking maize with lime for nixtamal, on the three-stone hearth (photograph courtesy of Michael D. Carrasco)

nutrients, making these much less available to the human digestive system. Lime-boiled maize – known by the Nahuatl name of *nixtamal* (Fig. 2) all over modern Mexico – is thus much more nutritious than plain maize grain (Katz et al. 1974). The vast majority of maize in south Mexico is so prepared and then ground into a wet dough known as *masa* (Fig. 3). This can be dried for flour or meal, or, more usually, made directly into breads, tortillas, and tamales. Maize breads are known as *waah* (or *waah*), a term going far back into pre-Columbian times. The term has spread to cover tortillas. A lump of masa mixed with water becomes *pozol* or *pozole* (another Nahuatl word, borrowed into Maya), the universal drink in fields and woods. In central Mexico, pozol often has pork and chile and other good things in it, but in Mayaland it is just corn dough and water – leading some early English pirates to nickname it "poor soul" (pronounced "po'soul"; Esquemeling 1967). At home, one more often drinks *sak ja'*, "white water," generally known in Mexico by another Nahuatl name, *atole.* This term covers various preparations made with plain maize rather than nixtamal. The simpler atoles are ritually important everywhere; more complex ones (sweetened, flavored) are occasional indulgences. All these foods date to long before the Spanish conquest, though tortillas may not have reached Yucatan till after that traumatic event.

Fig. 3 Preparing tuutij waaj – ritual corn breads – for the Food of the Milpa (jaanlil kool) ceremony. The mound of nixtamal in the foreground is being rapidly converted into layered breads that will be wrapped in boob leaves (the large green leaves all around; *Coccoloba* spp.) and baked in the piib. The finished bread in the right background has seven layers of maize dough and six of ground squash seed meal (sikil) – the thirteen layers of the cosmos (photography courtesy of John Tuxill)

The second most important staple in ancient times was probably *sikil*, ground squash seeds. These are made of the whole seeds of *Cucurbita moschata* (Fig. 4). There are even varieties with huge, thin-shelled seeds and very little flesh. Sometimes other species are used, and in old times there were special words for their seed meal types. Sikil is still vitally important in ritual maize breads. Many other squashes occur (*C. pepo*, common; *C. maxima*, rare and probably late; *C. argyrosperma*; *Sechium edule*; *Lagenaria siceraria*). Most are used more for flesh than for seed, though the larger ones are drawn on for seeds occasionally. The bottle gourd is used only for vessels. It was the major source of these until plastics appeared.

Also important were, and are, tuber crops: manioc, sweet potato, and the taro-like *makal* (*Xanthosoma yucatanensis*; the Maya name now also includes African yams). The tubers were and are especially important as famine staples. If a fire or hurricane passed, their underground storage structures remain untouched. The plants withstand drought and, unlike maize, tolerate poor soil. Sweet potato, in particular, still has its role as a back-up when maize failed. In 1989, 1995, and 2007, when hurricanes devastated Quintana Roo, this crop saved many lives – including friends of mine.

Vitamins and minerals were particularly abundant in chiles and greens, including the extremely vitamin-rich leaf crop known as *chaay* (Hispanicized to *chaya*;

Fig. 4 Squash harvest in February, apparently k'uum (Cucurbita moschata). These can be baked, used in soup, or used for squash seeds. They shore well (photograph courtesy of John Tuxill)

Cnidoscolus aconitifolius var. *chayamansa;* see Diaz Bolio 1974; Leon de Gutierrez 1974). This appears to have been domesticated in the Mayan region. Jeff Ross discovered that most of the millions of individual *chaya* plants in the modern Maya world are clones of *one* plant (Ross-Ibarra and Molina-Cruz 2002)! Apparently some ancient farmer found the perfect *chaya*. This illustrates the Maya fondness for propagating plants by cuttings. (One is constantly amazed by the rare old rose varieties and other unlikely clones that turn up in today's Maya villages.) Other major vitamin sources included tomatoes, squash, fruit, and especially chiles, which are almost as rich in vitamins and minerals as *chaya*. Pre-Columbian chiles included not only ordinary chiles (*Capsicum annuum*) but also Tabasco chile (*C. frutescens*). It is *maax* in Maya. I used to wonder what Tabasco peppers are called in Tabasco. They are called by this name, borrowed into local Spanish as "max." The native common chiles of Yucatan are usually called *xkatik*, which means "little pod chiles." They are large and relatively mild, varying from a medium-sized, flavorful yellow chile to a large green one. Other varieties of *annuum* in the region seem to be post-Columbian borrowings from central Mexico. The incandescent *habanero*

(*C. sinensis*), now indispensable in Maya cuisine, is a post-Columbian borrowing via the Caribbean, as its name shows.

Meat came from game and from domestic turkeys. These were the highland species (*Meleagris gallopavo*). The local species (the ocellated turkey, *Agriocharis ocellata*) was not domesticated, although it does better in tropical conditions. The domestic Muscovy duck (*Cairina moschata)* had probably reached Yucatan from South America before contact. In any case, local wild Muscovy ducks (very different-looking birds) occur. Important game species included deer, peccaries, pacas, agoutis, and many birds. Black turtle beans were another protein source, as were various wild plants.

Fats and oils were common in the diet, mostly from the ground squash seeds (*sikil*), also from game meats. However, no free fat or oil was used, so far as we know. However, the pre-Columbian Maya must have already known the custom – common today – of cooking down a fatty piece of meat or fowl to produce a very fatty stock; such stock is necessary in making the heavy *waah* and is also eaten with them. Either way, they are too hard and heavy to eat without it.

Chocolate (another rather oily food) was the great drink, the great luxury, and the great ceremonial and ritual indulgence (Fig. 5). Its story is abundantly told

Fig. 5 Cacao (we still use the Maya word: kakaw) growing. The pods grow directly from the trunk, as do many tropical fruits; this is technically known as cauliflory ("flowering from the trunk" – no relation to cauliflowers) (photograph courtesy of Michael D. Carrasco)

elsewhere (Coe and Coe 1996; Landa 1937; LeCount 2001; McNeil 2006; Young 2007). Suffice it to say that cacao is still grown widely in the peninsula – in *cenotes* in the dry north, in ordinary gardens in the moist south.

The most ancient foods in Mayaland – now confined largely to the Yucatan Peninsula – are maize breads cooked in the earth oven known in Maya as *pib* or *piib* (see Taube 1989a). These now are almost exclusively ceremonial in use (Fig. 6). (For more on ancient Maya foods, see Coe 1994; Fedick 1996; Flannery 1982; Gómez-Pompa et al. 2003; Harrison and Turner 1978; Sharer and Trax;er 2005; White 1999; Lentz 1999. For the biology of the area, see Gómez-Pompa et al. 2003.)

Early Spanish accounts preserve a record of traditional food at the time of the Conquest. Bishop Landa (infamous for his burning of Maya codices) wrote in 1566 (Landa 1937; cf. Bartolome 1988, Clendinnen 1987) that the Maya depended on maize, supplemented with chile, chocolate, and stews. He describes the drink made of toasted corn meal and flavored with chile and chocolate, still popular in much of southern Mexico under the name "tascalate." Another source from the late 1500s, probably written by a Maya (possibly Gaspar Antonio Chi), states that *mamey* and *chicosapote* fruits were dried for storage, and that this was a hedge against famine (Relaciones 1983/1579). I met an old man in southern Quintana Roo who remembered this as a regular practice in his childhood. It is no longer done.

Fig. 6 Large-scale baking for a ch'a chaak, ceremony to pray for rain. Ritual maize breads wrapped in leaves are being placed in the piib. Only men officiate at the piib in such ceremonies (and usually even in everyday baking); the women are elsewhere, preparing the stew (kool) (photograph courtesy of John Tuxill)

In some cases, the Spanish found equivalents to their own home cooking in the new land. Maize was not too dissimilar to wheat, and the Spanish soon adopted tortillas in place of bread. Yucatan oregano (*Lippia* sp.) is almost the same as that of the Old World (*Origanum vulgare*). Judging by its popularity today, it must have been just as important to pre-Columbian Mayan cooking as its relative was in the Mediterranean. The Spanish in the central highlands of Mexico even found onions, garlic, cherries, and hawthorns – not quite the same as Europe's, but close enough. Allspice resembled pepper, and is still called "Tabasco pepper" in south Mexico. Tabasco also had a native cilantro-like or parsley-like herb, *Eryngium foetidum*, now "culantro" or "Tabasco parsley." Conversely, the Maya quickly adopted cinnamon and cloves, which taste like allspice – but, typically, only allspice is used in the most sacred ritual dishes.

Spanish and African Borrowings

In Maya cooking today, black pepper is by far the commonest borrowed spice, but, cinnamon, cumin, and cilantro (coriander) are popular. True parsley and the usual European vegetables – lettuce, cabbage, beets, and the rest – came with the conquerors (on the introduction of European plants into Mexico see Dunmire 2004). Lowland south Mexico, however, is a hostile climate to the temperate crops. Outside of a hardy few, notably coriander and radishes, most took poorly there.

The more elaborate dishes of south Spain are largely of Arab ancestry, even today (see Benavides-Barajas 1996; Bolens 1990; Eléxpuru 1994; Fabregas 1982; Morales Rodríguez and Martínez García 1999; Watson 1981). Muslims, Jews (Gitlitz and Davidson 1999), and Christians mixed easily in Spain in the early Middle Ages, and taught each other (Mann et al. 1992). Many Moorish dishes crossed the Atlantic. The standard Moorish spice mix – cumin, clove, cinnamon, and black pepper, sometimes also saffron – became standard in Mexico as well. (This medieval Arabic spice mix builds in turn on earlier Roman and Babylonian usage. See Perry 2005; Rodinson et al. 2001) Marinated and herb-rich dishes are often Moorish. In many rural parts of Mexico, including much of Mayaland, these spices are almost the only plant foods that are generally used but not raised locally. A later wave of Arab influence came when Lebanese immigrants to Mexico in the late nineteenth and early twentieth centuries (Manzur de Borge 2001). Lebanese *kibi* (ground meat and bulgur patty, fried) is now a Maya food.

Most of the conquistadores and early Spanish settlers came from Andalucía and Extremadura. Therefore, widespread south-Spanish dishes, such as *chanfaina* (a stew usually made from internal organs) and *escabeche*, came to Mexico in Extremaduran-Andalucían forms. *Escabeche* is food cooked, or at least marinated, with vinegar – initially to preserve it; the name is from Arabic *sikbaj*, itself derived from the Persian word for "vinegar." In both Yucatan and Extremadura, turkey in *escabeche* is a popular traditional dish; it is a New World bird cooked by an Extremaduran technique (compare Villalón and Plasencia 1999:161, 166 with, for example, Neri 1998:52–53). A Maya touch is that the Yucatan version is served hot, unlike the Extremaduran and, indeed, all other *escabeche* and *sikbaj* dishes, which are served cold or room temperature (Charles Perry, personal communication, March 26, 2008). More interesting is that this dish has become a standard "white" dish among ritual color-coded dishes (see later). Extremaduran spicing – bay leaf, parsley, pepper, occasional saffron, sometimes cinnamon, clove, and other exotica – became standard in Mexican folk cuisine, especially in the south. Needless to say, this was a two-way flow, and Extremaduran cooking today is enormously influenced by Mexican food (personal observation; see also Crosby 1972, 1986, and Weatherford 1989 for Native American influences on world food).

Another channel for exchange and flow of foods led through the Caribbean, and, often, from Africa. Yucatan was closer to Cuba than to central Mexico, and in sailing-ship days Havana was Yucatan's close trade partner. Thus, much of Yucatecan cuisine is Cuban (cf. Reyes Gavilán y Moenck 1942). This makes the picture even more complicated, for Cuban food is a fantastic mix of Spanish, Indian, and African. Caribbean Indian traces mediated through Havana to Yucatan include the habanero chile, one of the hottest chiles in the world. The heavy use of *achiote* is probably another Caribbean Indian contribution to Yucatan via Cuba, though the Maya had achiote and used it considerably even before this. Spanish in origin, and ultimately Arab-Andalusian, is the enormous importance of bitter orange as marinade and cooking liquid in Cuba and Haiti (Paul and Cox 1995) and hence in Yucatan. Elsewhere, in Mexico, lime has been substituted for bitter orange, but bitter orange was used in at least some of the original Spanish (Andalusian) dishes for souring, though vinegar was the commonest souring agent in Spain.

Rice growing and technology is, to a great extent, an African borrowing into the Caribbean world. Judith Carney (2001) has shown that early attempts to grow rice led to importing slaves from the Wolof and Mande (Mende, Mandingo) areas of West Africa that grow native African rice. These slaves brought with them the techniques, including the cooking techniques, that made rice a major Caribbean product. Of course, Arab-Andalusian rice cookery was not unrelated – the Wolof and Mande had been in touch with Morocco. Unfortunately, rice cultivation failed in the Yucatan Peninsula, after a hopeful start in the southwestern part.

Another African contribution is the black-eyed pea, which has found a happy home in Yucatan. The native Mexican beans are mostly highland plants, and although they grow in Yucatan they do not yield well. The black-eye is more resistant to Yucatan's climate. Moreover, it is better than the native beans for eating in the young and tender stage. Thus it has propagated throughout the cuisine, under the name *xpelon*. This means "little bald ones" – the Maya diminutive *x* coupled with the Spanish *pelon* "bald," with reference to the smooth, rounded, white top of the bean. The other common non-native bean in Mayaland, the pigeon pea (*Cajanus cajan*), came via the Caribbean; it is originally from India, but possibly was brought to the Caribbean from Africa. It is wrongly called "lentil" – *lenteja* – in the Yucatan Peninsula.

Maya Food Today

Maya food today uses an incredible range of ingredients. Domestic and wild animals are all still used. Food plants range from standard crops to a kaleidoscopic array of wild leaves, berries, roots, and shoots; I recorded over 100 species of plants used for food in Chunhuhub (Anderson 2003, 2005b; Anderson and Medina Tzuc 2005). People try anything; I saw apple trees and European grapevines, neither of which fruited in the tropical climate. Since I began fieldwork in Quintana Roo, I have seen new fruits – South American passion fruit, Hawaiian *noni* – introduced to the area.

A lore still diligently learned is knowledge of wild famine foods, which range from wild jicama roots (*Pachyrrhizus erosus*) to the bitter, celery-like shoots of the *jujuub* tree for which *Chunhuhub* is named (*Spondias mombin*) and the grape-like berries of several wild vines. These can still save lives, since hurricanes remain a constant threat. A hurricane in 2007 wiped out almost all the crops in my research area, and drove some back to these resources.

Maya cooking, in ancient times and now, took place over the *k'oben* (see Fig. 2) or in the *piib*. The *k'oben* is a simple hearth: three roundish stones, a few inches thick, placed in a triangle. A fire is built within the triangle and is fed by sticks pushed in between the stones. Although this is the simplest of arrangements, it is psychologically of tremendous import to the Maya. It is the center of the home and thus the symbol of home, family, nurturance, mutual support, and all good things that pertain thereto. I have seen the same three-stone arrangement in up-country Southeast Asia – among the Toba Batak people of Sumatera, for instance. It has a similar significance there. One thinks also of the equation of "hearth and home" in English, and of the Spanish word *hogar*, which means both hearth and home. Don Pastor Valdez, from whom I rent my room in Chunhuhub, is a fairly affluent school principal; he bought a modern gas stove to make life easier for his wife. They soon left the stove to rust away, and went back to the *k'oben*; it cooks better.

The other cooking site in the villages is the *piib*, a word now borrowed into local Spanish (*pib*). This is an earth oven, a barbecue pit, identical to the ancient *luau* of Hawaii (on pit cooking see Wandsnider's definitive review, 1997). It may be a small, impromptu one, only two feet deep and two or three feet long, for baking a few tamales, or it may be a mammoth pit six feet deep and ten feet across, used to cook whole large animals. It is first filled with firewood. Large stones are put on top of this, and the wood is burned. Sometimes the stones are put in first, and the wood burned over them. Either way, the stones become intensely hot. The ash blankets the stones, insulating them somewhat. Then packages of food, wrapped in many layers of tough green leaves, are placed on the rocks. Then the whole is covered over – sometimes with a layer of palm fronds, always with a metal cover. In earlier times, before the days of metal, a layer of poles was laid over and covered with fronds. Finally, the whole thing is buried in several inches or more of dirt, and left for anywhere from an hour to overnight. (Four hours is usually about the maximum.) Then the food is dug up and unwrapped (see Fig. 6).

The wrapping is itself an art. Traditionally (and still today), the first layer was often the leaves of the cultivated pepper plant called *hojasanta* in Spanish (*Piper auritum*). These large, soft leaves have a fennel-and-black-pepper flavor, which they impart to anything wrapped in them. Around these were wrapped the large, tough leaves of the *boob* tree (*Coccoloba* spp.). Around these in turn were wrapped the huge, thick, almost indestructible fronds of palms (usually *Sabal* spp.), which protected the bundle from burning by the rocks. Today, banana leaves often replace all these. Banana leaves have a good flavor, are large, and are tough enough to withstand the heat. Even burlap is pressed into service. Both the *k'oben* and the *pib* impart a wonderful smoky flavor to the food.

The Maya are past masters of firewood choice, picking chunks that will burn perfectly and provide just the right flavor. The hard, clean-burning wood of *ja'abin* (*Piscidia piscipula*) is preferred, but several other woods do almost as well. Every Maya above a very young age knows how to select the right species from among the dozens of local tree species, and to select the right stage of dryness. This takes a phenomenal amount of practical knowledge. Probably the lowest point in anthropological debate was Marvin Harris' (1968) arch dismissal of Metzger and Williams' (1966) important study of Maya firewood use. Harris thought firewood was too trivial and uninteresting to be worth studying. Clearly, Harris knew nothing of the Maya, or of Third World realities; firewood remains the leading use of wood worldwide (far ahead of paper and construction), and selecting it is a very difficult and serious art everywhere. This knowledge is a life-and-death matter in the Yucatan rural world, where firewood is still the source of all cooking and heat for the vast majority of people.

In traditional households, people eat from the common pot or common roast of meat. One tears off pieces of tortillas to use as spoons or to pull off pieces of larger hunks of food. *Pib*-baked maize breads are broken up to be dipped in stews. Soup and corn gruel required a *luuch*: half of a tree-calabash (*Crescentia cujete*), hollowed out and cleaned. This makes a tough, light bowl holding about a pint. Today, plates and ceramic bowls have come, but villagers still prefer to scoop up food with bits of tortilla, or to make small tacos by holding pieces of meat in tortillas.

In a contemporary Maya village, the daily fare is tortillas. A grown man will eat at least 30 a day, and in seasons of hard labor, such as planting and harvesting times, he may eat 50. This is not so heroic as it may seem; Maya tortillas are half the size of the ones familiar in the United States and northern Mexico. Women and children eat proportionately less, but still consume many tortillas. This keeps the women of the family very busy. Most women still boil the corn and make their own tortillas. However, the maize is now ground in the village mill, not by hand on a grinding stone. For variety, the family may make their corn into pozole (*k'eyem*), tamales, or big corn breads baked in the earth oven.

The maize tortilla, now universal in Mayaland, was apparently not present in the Classic Period. It came later, from central Mexico. It may even be a post-Conquest introduction, but evidence against such a late origin is a striking difference in production method: the Yucatec Maya tortilla is not patted out (or "applauded" – *aplaudada*), as in central Mexico, but are pressed out on a leaf (or, today, a plastic sheet). A thicker tortilla is a *xkakatak'* ("little double-size").

Many other maize preparations, used in rituals as well as home life, are now being forgotten. (Benedict and Steggerda's account from 1936 provides detail on some of them.) This is especially true of preparations that use honey. Honey was formerly a major staple of the Maya. Originally it was acquired from stingless native bees (Fig. 7), especially *Melipona beecheii*, which was domesticated (see Anderson and Medina Tzuc 2005; De Jong 1999). Spanish honeybees tended to replace these over time, because they produce much more honey, though the honey is less choice and does not have the magical and religious values of the older product. Commercial sale now preempts much of the honey from domesticated-bees, and wild hives have become rare because of forest degradation. Moreover, the bees are now usually Africanized and very dangerous to keep, so apiculture is rapidly dying out. Expert apiculturists are few; Chunhuhub's bee expert sent his children to school, and they are now computer programmers in urban south Mexico. The quick, technically minded intelligence necessary for beekeeping has more profitable employment in such sectors. Honey, once a leading export of the Yucatan Peninsula, may soon be a thing of the past there.

Everything else is but a relish for the maize products. Today, among traditional families, probably the most common relish is boiled black beans (more specifically, black turtle beans). This variety of the common frijol bean (*Phaseolus vulgaris*) is a small bean with a distinctive, intense flavor. It is the preferred bean throughout south Mexico and most of Central America and the Caribbean. It grows rather poorly in Mayaland, surviving well but yielding small crops. It requires long cooking

Fig. 7 Stingless bees (xunaan kaab) with wax and honey from hive (photograph courtesy of John Tuxill)

and is usually simmered slowly in the ashes by the fire. *Bu'ul k'abax*, black beans boiled with a sprig of *epazote* (*Chenopodium ambrosioides*), is a mealtime regular. One scoops up the beans and their cooking liquid with a bit of tortilla. The small native Mexican lima beans, *iib*, are far less often eaten; they are stewed with pork. Black-eyed peas are most often cooked and mixed with corn dough to produce various dumplings. They are often eaten boiled with chile. A "snake's head" is a split-open maize dumpling with black eyes and chile in it.

Flavorings in everyday Maya food are onions, garlic, garlic chives, tomatoes, chiles, radishes, mint, basil, oregano, cilantro, and more. The old squash varieties all remain important. There is always fruit: avocadoes, bananas and *plátanos*, mameys, anonas, chicosapotes, oranges, limes, grapefruit, guavas, nances, and many others. A typical family's dooryard garden has about a dozen kinds of fruit, and neighbors grow still other kinds, so families trade. Never is there a day without fruit, and the collective total is often second only to maize as a calorie source.

Meat and eggs are usually available, but in small quantities. On almost any given day, someone has killed a pig. Or someone has a birthday and a few chickens were cooked for the occasion. Or someone with a shotgun had good luck the night before, and shares the game meat with kin and neighbors. Deer are favored but almost extinct; rodents, game birds, coatis, raccoons, peccaries, and other smaller animals are the remaining hunted animals, and these are not common. Even gophers are fair game (Hovey and Rissolo 1999) and iguanas have been almost eaten out of central Quintana Roo.

The Maya know many ways to stretch the meat. Commonest is to eat it as tacos. Also convenient is to boil it, and there are many stews. Chopping meat and using it in tamales is more a strategy for leftovers than for fresh meat, unless this is a ritual occasion when serious killing of poultry must be done. Alternatively, one can eat the meat with strong chiles, which makes it seem like more. One bite feels like a major event.

Children may have a hard time between weaning and young adulthood, because they cannot tolerate strong chiles, and thus cannot eat many of the meat dishes and other nutritious foods. In fact, chiles are the most nutrient-rich food in the everyday Maya diet. Thus children of that age are prone to anemia and digestive upsets, and parasites are not uncommon. But children (and others) partially make up for this by eating all the fruit they can find. Fruit, especially mangos and mameys, has vitamins and minerals they would otherwise lack. Children, and everyone, would be doing better if they would grow and eat more greens, especially chaya, but habits die hard; maize and meat are *real* food, greens are not (see also Peraza Lopez 1985).

The simpler recipes in south Mexico are still Native American ones: maize gruel, tamales, venison stew. Some of the elaborate dishes are almost pure Spanish. However, the vast majority of the recipes combine the two. In most of these cases, they add Spanish ingredients to a basically indigenous dish. Conversely, sometimes the basic dish is Spanish, and only the tomatoes and peppers announce a Maya or Aztec influence. In some cases, it is impossible to tell which way the influence went. Consider the stew-of-almost-everything known as *puchero* or *cocido*. The name is Spanish, and the dish is well known in Spain, but surely the Maya had the same sort of dish – every culture has it. The recipe is, after all, hard to miss: Take anything edible you can find and boil them together. (*Puchero* is actually more specific than that – meat, summer vegetables, and root vegetables – but the idea is still very basic.) And the omnipresence of tomatoes, peppers, squash, and allspice in the south Mexican variants bespeak indigenous ancestry. There is, today, a close relationship between *puchero*, Yucatec Maya *k'ool* "stew," and borrowed stews like *ajiaco* (Caribbean) and *mole* (Nahuatl). Puchero has maize only in green-ear form and is spiced with the standard Spanish (i.e., Arab-Andalusian) mix; *k'ool* is thickened with maize meal and is usually spiced with *achiote*; the Nahuatl stews are much more heavily spiced with chiles.

A characteristic of Yucatan is the profusion of spice pastes, mostly based on chiles and achiote, used to smear on foods for roasting, grilling, pib cooking, and even boiling. These pastes are known as *recados*. They are another Caribbean feature; similar pastes occur in Cuba and other islands. The word is a local pronunciation of the Spanish word *recaudo*, "collection." The Maya word for these and any spice mix is just *xak'*, "mix." Recados can be bought readymade in the cities, but in the villages they are usually made at home. They are sold in bulk at special stands in the larger markets. They are also available in small rectangular blocks (*cubos*). They are diluted with bitter orange or lime juice, or vinegar, and smeared on foods for pib baking, roasting, grilling, and even boiling.

The Nahuatl, at least some of them, traditionally divide major foods (as opposed to snacks) into *tlaxcalli* (tortillas), *tamalli*, and *taballi*, the last term meaning everything eaten with the tortillas (Stuart 1978). A taco is some taballi folded in a tortilla. The Maya seem not to have this formalized threefold division, but the idea is there. Solid food is largely divided into tortillas and the many things (usually rather soupy) picked up with them. Tamales are ritual foods or occasional snacks.

A large range of snacks seems hard to fit into other categories. Market and street foods, modern packaged items, and other small items do not fit into traditional categories. Small fried and baked items abound in markets. In the home and on the street, boiled sweet potatoes, popcorn, bread rolls, roasting ears, and the ever-present fruit are particularly common.

The drinks of the past – maize preparations of various sorts – have now been largely replaced by sodas and alcohol (cf. *México Desconocido* 1994). Overconsumption of beer and rum is a chronic problem in some communities. Bishop Landa already noted: "The Indians are very dissolute in drinking and becoming intoxicated…" (Landa 1937:35). They were drinking *baalche'* (see later). Today's rum is very much stronger. The communities where I work are proudly independent and are strongly influenced by Calvinist Protestantism. Both these factors militate against alcohol abuse. At the other extreme are some of the old henequen towns in Yucatan state, where economic decline and social breakdown are associated with heavy drinking. A common drink is cheap "white lightning" rum, known as *chak pool* – "red head" – from the red wax used to seal the bottles.

Medical beliefs about food go back to pre-Columbian times, but are influenced by Hippocratic-Galenic medicine (Anderson 2003, 2005; Foster 1993). Most important is the concept that drinking anything cold, when one is overheated, produces major stomach trouble, and can even cause cancer. Therefore, warm water and hot drinks, teas, and soups prevail. Similarly, cold winds striking an overheated body produce rheumatism or other painful conditions. These beliefs appear to be pre-Columbian, but have assimilated to the Hippocratic ideas. However, the latter are little known in Quintana Roo; coding food by its intrinsic heating and cooling qualities is not usually done, and never done very seriously. Biomedical ideas about vitamins and other nutrients have only very recently become established. Maize remains the ideal food. Virtually everyone maintains that the old diet of maize, fresh garden produce, and wild or home-raised meat was healthy, and the new store-bought foods are not. Yet, convenience and taste, especially among the young, are causing rapid change in a direction known to be unhealthy.

Ceremonies and Feasting

Maya ceremonies survive, especially those connected with rain and agriculture. Their traditional foods, including *mukbipollo*, *sikil wah* (thick maize dough with sikil decorations), and others, still appear on the offering altar, an improvised table set up in the open and shaded with leaves.

Ceremonies are quite self-consciously managed to bring the community together. The *ch'a' chaak* I observed in Dos Aguadas in 1991, for instance, was quite explicitly organized for that purpose; the women of the village concluded that this small, tight-knit community was drifting apart and organized the festival to counteract this. The whole process of organizing, planning, and mounting a festival is critical, not just the festival itself – in fact, in Dos Aguadas, the organizing process was the important thing, because the festival itself was run by a *hmeen* from elsewhere, there being none in Dos Aguadas itself.

A large ceremony in Chunhuhub – a much bigger town – can attract hundreds of people. The most important traditional ceremony today is probably the *ch'a'chaak* – a ceremony to ask the storm gods for rain. However, the many ceremonies to pray for success with the milpas and fields, or to thank God (or the gods) for a good harvest, are more numerous and often attract more people. Also, every town has its fiesta, in honor of its patron saint, and these bring out much or all of the community.

Anyone wandering through the food stalls of the Mérida market cannot help but be struck by the colors of the stews: brilliant yellow, rich glossy red, opalescent white, and intense jet black. This is partly due to use of such dishes in the many rituals involving the winds or gods of the four directions. In traditional Maya thought, east is yellow; west is red; north is white; south is black. The center, our world of plants, is green. To this day, the *ch'a-chaak* rite is oriented toward the east, and foods offered in it are intensely yellow. Each Maya direction had its ritual stew, presumably once offered to the god of that compass point. The stews survive, traditionally made with turkey, now usually with chicken. White color comes from whitish maize meal; yellow and red from progressively stronger admixtures of *achiote*, which is intensely red but dilutes to a brilliant yellow in small quantities. The black is the most interesting: Chiles are burned – the cooks taking great care not to stand downwind – and the resulting glossy-black material crushed into the stew. The result is more interesting to see than to eat.

Other ceremonies of many sorts are generally called *loh* (for excellent accounts of all these ceremonies, including the foods, (see Love 1984, 2004)). These are rituals to ask for good fortune or thank the deities for fortune granted. A *loh* may be a *jaanlikool*, "food for the milpa," (or "*waahikool*," "bread of the *milpa*"; Love 1984) in which food is offered to the forest and field spirits (Fig. 8). There are *loh* for the hives and the domestic animals. There is even a *loh ts'on* ("ceremony of the gun"), to reconsecrate a shotgun after it has killed several game animals. The Maya are careful hunters; they try to avoid killing too much game, and they feel that the spirits will punish them if they do not treat animals and hunting seriously. A gun that has killed several animals has depleted its luck and must have its blessing renewed by a ceremony. The *loh* is a significant outlay of effort and wealth, and reminds the gun owner that hunting is serious business, supervised by strong powers such as the *yumilk'aax,* "Lords of the Forest," and Siip, the Spirit of the Deer.

Fig. 8 Ritual leader, jmeen, praying at the mesa ("table," i.e., offerings table) for the jaanlil kook ceremony. Larger luuch (calabash bowls) hold chicken stew (k'ool, not to be confused with kool "milpa") colored with achiote. Smaller ones holding saka', white maize drink (atole). The ritual breads, tuutij waaj, are displayed on leaves of jaabin (Piscidia piscipula), a tree with lush green leaves that flowers at the time when rains will soon begin (photograph courtesy of John Tuxill)

Today, as modern beliefs spread and old gods die, a *loh* is apt to be known by its Spanish name *acta de gracia* ("act of grace" or "thanks") and to be seen as a general festival to give thanks to God and to the human community for good harvests. But the tradition goes on, maize breads and all, even among staunch Protestants who have no patience with *cha'chaak*. Sometimes a whole steer is butchered, cut up, and cooked in a giant pib.

For a ceremony, the *hmeen* or "hmen" (pronounced "men" – the h is silent) – the ritual officiant – lays out offerings on a table. These offerings make a formal pattern representing the cosmos. Among them are ritual breads, and calabashes of turkey stew (now more usually chicken stew). Another common ritual maize food is *saka'* (from *sak ja'*, "white water"), lime-processed maize dough mixed up in water. This is a necessary part of most ceremonies. It is served in calabashes – small bowls made from the fruit of the calabash tree (*Crescentia cujete*). The huge round hollow fruit is cut in half and the halves cleaned and dried to make these bowls (known as *luuch*).

The main ritual drink is *baalche'*: Honey fermented in water, flavored, and preserved from spoiling with the bark of the baalche' tree (*Lonchocarpus* spp.; Fig. 9). Often, the ceremony also requires traditional cigarettes – native hand-processed tobacco rolled in cornhusks. Ceremonies can involve a very informal table with small offerings, for minor curing or good-luck rites. On the other hand, a *ch'a'chaak* may go on for days. A minor curing rite can involve only two or three people; a major thanksgiving *loh* for a community, or a major *ch'a'chaak*, may involve hundreds.

Ritual breads often represent the cosmos. Common is a bread layered with seven layers of maize dough alternating with six of *sikil*, representing the thirteen layers of the universe. Or a bread may have a sikil cross), or five spots in a pentagram, or some other sacred pattern. One *hmeen* told Betty Faust that the maize

Fig. 9 Baalche' tree (*Lonchocarpus* spp.) in flower (photography courtesy of Michael D. Carrasco)

dough represents the flesh and the sikil the blood (Betty Faust 1998 and personal communication). Presumably the reference is to the creation of humans from maize dough by the gods of pre-Columbian Maya religion; the gods shed their blood on the dough to animate it.

Various special maize breads, molded into the shapes of animals, sacred trees, sacred mountains, and other important forms, have been made for thousands of years for ceremonies, and they are made today. Dr. Taube has shown that certain pictures of lords offering up plates of food show these fancy breads, and I have seen some very similar ones at rural ceremonies. They are scarcely more edible than the salt-dough bread sculptures of the European world, but the Maya – who wasted nothing in the old days – break them up into stew. With these breads go the variously colored ritual *k'ool* preparations.

The *mukbipollo* ("buried chicken," using the Spanish word for the bird) is a chicken pot pie made by enclosing chicken *k'ool* in a maize shell (Fig. 10). This can be less than a gourmet delicacy. John Stephens' (1843:21–22) classic nineteenth-century account is too wonderful to miss:

> A friendly neighbour ... sent us a huge piece of *mukbipoyo*. It was as hard as an oak plank, and as thick as six of them; ... in a fit of desperation we took it out into the courtyard and buried it. There it would have remained till this day but for a malicious dog which accompanied them [the friendly neighbours] on their next visit; he passed into the courtyard, rooted it up, and, while we were pointing to the empty platters as our acknowledgment of their kindness, this villanous [sic] dog sneaked through the sala and out the front door with the pie in his mouth, apparently grown bigger since it was buried.

Fig. 10 Preparing muukbipollos for jaanal piixam (photograph courtesy of John Tuxill)

Recent visitors, too, are familiar with such cement mukbipollos. The problem with them is that the makers skimped on the fatty chicken broth that should be kneaded into the piecrust. Without this fat broth, the maize dough bakes rock hard.

Another ceremony of importance is the *jaanal pixaan*, "food of souls," the Day of the Dead, November 1 (see Rodríguez 1991). This is a Catholic ceremony, celebrated all over Mexico. It had pre-Columbian equivalents that show themselves in modern celebrations. This is a day when the souls of the dead return to visit their homes. Food for them is laid out on an altar decorated with flowers, and with photographs and memorabilia of the deceased. Their favorite foods and drinks appear, as well as *mukbipollos*, chocolate drinks, stews, ritual corn breads and drinks, and fruit. Traditionally, people placed foods on leaves of hojasanta (*Piper auritum*).

Many religious ceremonies, some with indigenous Maya flavors, punctuate the year. The Dance of the Pig's Head – not found in Chunhuhub, but common further north and west – involves a complex group dance that weaves through the town and marketplace; the head dancer carries a pig's head on a tray. It, like many other parades and festival food occasions, is often put on by *gremios* – religious organizations that help out at major festivals such as Easter and the saints' days, holding parades and feasts. Every town has its protective saint or holy image, and the day of this patron is always honored with some activity. Christmas and Easter are actually less important in most communities, but are not neglected. As elsewhere in Mexico, tamales are a Christmas tradition. These ceremonial cycles break the monotony of small-town life and provide an excuse to eat well.

Feasts of today are as apt to be of Hispanic-Mexican type as of ancient Maya antecedence. Birthdays, *quinceañeros*, and weddings are common, and have urban Mexican foods considered appropriate to them. Cold salads, notably Russian salad, have become a new tradition. Inevitably, a spectacularly decorated cake is the centerpiece of these rites of passage, and making and decorating such cakes is a small but real source of income for some Maya village women. A necessary part of a *quineañero* – the festival held when a girl turns fifteen, and thus "comes out" socially – is that the boys try (always successfully) to push the girl's face into the cake. Such is teenage humor, in Mayaland as elsewhere. Weddings are far more sedate, and the cake is more multilayered and decorative.

Town political meetings, *ejido* council business, school graduations, and other civic rites are usually celebrated with little food, but some form of meal or snack is normally available. Maya and urban Mexican dishes meet at such occasions. Individual families party with traditional foods after the school graduations, which are major celebrations in education-conscious communities such as Chunhuhub. Graduations can bring out thousands of people, to celebrate, eat, and dance on the school grounds or in the town plaza. Such secular festivals are slowly displacing the ancient Maya rituals, and, accordingly, modern foods are displacing ancient ritual foods.

The future of Maya food is uncertain. The environment is under many kinds of attack, from forest clearances for cattle rearing (Anderson and Medina Tzuc 2005b; Painter and Durham 1995) to excessively enthusiastic conservation, which may displace Maya or disrupt their lives (Haenn 2006). Population pressure, agricultural modernization, tourism, and urbanization are having obvious effects (Pi-Sunyer and

Thomas 1998). Biological changes, such as those involving bees (see earlier), are devastating whole sectors of the economy.

So far, the Maya have proven resilient. Urbanization siphons off population that would otherwise put unbearable pressure on the land. Agricultural modernization – especially fruit growing – allows people to make good money from farming, if they can find good land and hold it. Clearing for cattle can also be successful if done very locally and in areas where grass grows well. Change has been the norm for the 5,000 to 7,000 years of Maya occupation of the Yucatan Peninsula. Possibly the system of *milpas*, gardens, and forests will continue for generations more. There is no reason for it to fail; it is perfectly adapted to local conditions. Yet, it is also possible that the Maya prediction that the world will end on December 21, 2012, will be all too correct, at least for the traditional Maya world.

Thus Maya food has retained its basic staples and many of its basic dishes and concepts. Maize remains the basis of life, even more in ideology than in reality. Meat remains valued. Vitamin-rich fruits and vegetables remain popular. Foodways have, however, changed dramatically and are continuing to change. Moreover, the Maya and other Mesoamerican peoples have influenced the world enormously. Maize is now the world's third most important crop. Chocolate is a worldwide indulgent, important in trade and commerce. Many other plants are, or may soon be, influential. Such constancy in basic features underlying dramatic change in detail is fairly typical of foodways worldwide, even in this age of globalization.

Feasting remains a vitally important part of festivals, ceremonies, and community activities. The Maya, like almost every cultural group, use sharing of food to establish social solidarity and provide pleasure and good times. Feasts are structured according to traditional rules. New types of festival bring their own foods and structures of display. Once again, though details change, basic patterns remain constant.

End Notes

Spelling: I use the new system promoted as a pan-Mayan orthography. A recent development, followed herein, is to use *j* only for the harsh/h/sound, *h* for the very soft, almost inaudible/h/heard at the end of Yucatec words.

Note that the word "Yucatec" is *Spanish*, not Maya, and cannot be respelled according to the new orthography! The "Yucatec" of anthropology call themselves Maya (more accurately, *Maayah*) and use "Yucateco/a" to mean *any* resident of the Yucatan area, whether Maya, Spanish, or other.

Bibliographic note: Maya food is well described in a large number of cookbooks, ranging from very local and obscure, often self-published, to stunning productions by major Mexican and United States publishers. All the Spanish-language ones are more or less ethnographic, recording real folk recipes and providing varying amounts of cultural detail (Neri 1998; Ruz 1991). The English-language sources (Bayliss 1987; Gerlach and Gerlach 1994; Hamman 1998; Miller 2003; Morton 1996) are sometimes less authentic, but have even more ethnographic side information. Jeffrey Pilcher's invaluable history of Mexican food is relevant (Pilcher 1998).

This chapter concentrates on Yucatec Maya food plants (cf. Barrera Marin et al. 1976; Terán and Rasmussen 1993; Terán et al. 1998; Tuxill 2005) and foodways (see Aguirre 1980; Banrural 1988a,c,d, republished as Conaculta Oceano 2000b, 2001b,c; Carrillo Lara and Luz 1995; Flores de Vallado 1985; Hernandez F. de Rodriguez n.d.; Irigoyen Rosado 1991; Montes de Oca 1990; Velásquez de León 1952, 1987). However, good books exist for Tabasco (where the basis of cuisine is mostly Chol Maya; Banrural 1987, now Conaculta Oceano 2000a; Falconi Vera n.d.). See Carlos Inchaustegui's excellent and neglected ethnographies (1985, 1987) for the current situation of the "Chontal," i.e., Chol, of Tabasco.

Well described also is Chiapas (Banrural 1988b, now Conaculta Oceano 2000a; Murillo Cisneros 1992; Sanchez de Pineda 1988), where Tzeltal, Tzotzil, and other highland groups exist. Most of the cookbooks here deal with largely Spanish foods, but there is a superb anthropological study of Mocho Maya foodways – one of the best ethnographies of food in the world (Petrich 1985) – as well as wonderful ethnographies, rich in food detail, by Berlin et al., (1974), Breedlove and Laughlin (1993), Eugene Eugene Hunn (1977), Raúl Perezgrovas Garza (1990), Evon Vogt (1969, 1993) and others, and Miguel Álvarez del Toro's passionate advocacy for game conservation (1985, 1991). There are ethnobiology studies (Atran 1993, 1999a,b; Atran and Ucan Ek 1999; Schwartz 1990) and useful, ethnographically sophisticated cookbooks for Guatemala, where many Maya groups are influential in cuisine (Marks 1985; Sierra Franco de Alvarez 1990). Wilk's outstanding study of Caribbean food (Wilk 2006; see also R. Petrich n.d. and Petrich 1995) includes much Maya-related lore from Belize. Farther afield, Alcorn (1984) describes Huastec (Teenek) Maya food plants.

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All Maize Is Not Equal: Maize Variety Choices and Mayan Foodways in Rural Yucatan, Mexico

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Introduction

Foodways have changed substantially over the past several centuries in the Yucatan Peninsula and other areas of Mesoamerica, but one constant is the presence of maize (*Zea mays*) at the heart of rural economy, ecology, and culture. The domestication and diversification of maize – the world's most productive grain crop – by indigenous farmers ranks as one of the greatest accomplishments of plant breeding. Remains of ancient maize cobs in the archeological record suggest that maize was first brought into cultivation roughly 7,000 years ago in the highlands of central Mexico, where its closest wild relative, teosinte (*Zea mays* ssp. *parviglumis*), also grows (Wilkes 1977; McClung de Tapia 1997; Smith 2001; Piperno and Flannery 2001; Matsuoka et al. 2002). From that starting point, maize was gradually selected and diversified over time by farmers into an impressive array of different forms, sizes, and colors. Maize appears to spread out of central Mexico rapidly in the context of regional trade and exchange networks, and farmers selected and adapted maize populations to thrive in new environments. Archeobotanical evidence from northern Belize suggests maize arrived in the Yucatan Peninsula by about 5,000 years B.P. (Colunga-García Marín and Zizumbo-Villarreal 2004).

As maize spread and evolved in the Yucatan at the hands of Mayan farmers, it achieved a symbolic, ceremonial, ecological, and economic importance surpassing that of any other plant or natural resource in the Mayan world. Maize's importance endures today. The Yucatan peninsula and much of Mesoamerica are still landscapes shaped by *milpa*, a traditional swidden or rotational model of maize cultivation. Making milpa continues to be an important economic activity for millions of rural residents in the region, and also represents a wellspring of agricultural biodiversity, since maize is frequently grown in consort with beans (*Phaseolus* spp.), squash (*Cucurbita* spp.), and chile peppers (*Capsicum* spp.). While yields in milpa

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agriculture may be less than those of more intensive production systems under ideal conditions, milpa offers the advantages of a low level of monetary investment and a relatively reliable harvest (and household food security) in an unpredictable agroenvironment with highly variable soils and rainfall.

This chapter poses two related questions: why do Mayan farmers in Yucatan grow the diversity of maize varieties that they do? And in particular, how is the biological diversity of maize related (or perhaps unrelated) to the social meanings and ecological importance that farmers attribute to this singular plant? One reason these questions are important to investigate is because Mayan farmers themselves understand and make decisions about maize at the level of individual varieties. As such, scholars interested in Maya ecology, culture, and society (whether ancient or contemporary) also need to understand maize at the level of varieties, particularly when analyzing Mayan perceptions, representations, and decision making about maize.

Our starting point for this discussion is a recent field study of lowland Maya agriculture conducted in the municipality of Yaxcabá, in central Yucatan state. Yaxcabá lies approximately 112 km. east of Merida, the principal urban center of the peninsula, and is at the heart of the *zona maicera* – the maize-growing zone in central Yucatan where Yucatec Maya communities are still heavily reliant upon milpa and other components of household agriculture on collectively held *ejido* lands (Villanueva Makul 1990). Based on figures gathered by Duch (1995), approximately 1,800 ha of milpa are cultivated annually in Yaxcabá, all of which is rain fed production.

Between August 2001 and June 2002, as part of a multiyear research project "Biodiversidad y Conservación *In Situ* de Los Cultivos de la Milpa" we conducted semistructured interviews with 61 farmers in Yaxcabá who make milpa, corresponding to approximately 10% of the resident heads of household in the community. The sample of farmers was initially selected in 1999 through a stratified random procedure that involved dividing Yaxcabá village into four geographic quadrants and interviewing an equivalent number of households in each quadrant. The interviews were conducted variously in the homes and milpas of farmers, depending on the preference of the farmer. The interviews were conducted in either Spanish or Yucatec (and sometimes in both) depending on the language preference of the farmer; a local interpreter assisted with Yucatec translations. The variables quantified in the interviews included: the characteristics by which farmers recognize and classify particular maize varieties; the frequency and extent to which farmers plant different varieties of maize; the agroecological conditions under which they grow them; strategies and characteristics used by farmers for selecting their seed; and farmers' personal preferences related to growing and utilizing particular maize varieties. Although the great majority of heads of household interviewed were men, their wives also participated in many cases and their opinions and knowledge were solicited whenever possible. During 2001–2002 and for at least 1 month every year since then, we have supplemented the interviews with numerous conversations and visits with farmers, including to their milpas and other agricultural production sites.

Based on the data gathered, we describe the array of maize varieties present in Yaxcabá, and examine in detail how this diversity is related to the unique agroecological conditions that farmers face in Yucatan, and to the social and cultural significance of maize as a cornerstone of Mayan foodways. We also review the historical literature on maize in Yucatan and Mesoamerica in order to understand how Mayan conceptions and management of maize diversity have changed from ancient Maya times to the modernizing rural communities of contemporary Yucatan.

Maize Diversity in Yucatan: An Overview

Yucatecan farmers have a detailed indigenous taxonomy for describing and managing maize varieties (Arias et al. 2000) that parallels the botanical divisions of maize in Mexico described by Wellhausen et al. (1952). These authors classified maize into "races," following the terminology of Anderson and Cutler (1942:71): "A maize race is a group of related maize plants with enough characteristics in common to permit their recognition as a group… From the standpoint of genetics a race is a group of individuals with a significant number of genes in common, major races having a smaller number in common than do subraces."[1] Using Wellhausen et al.'s classification, the maize populations grown by Yucatec Maya farmers exhibit characteristics of three principal maize landraces: *nal t'eel*, *tuxpeño*, and *olotillo* (Arias 1980; Arias et al. 2000). When landrace combinations and variations in maturation time and kernel color are taken into consideration, the total number of distinct indigenous maize varieties present in Yaxcabá farmers' milpas rises to at least 16 (Table 1). In addition, at least six improved maize varieties have been grown in Yaxcabá in sufficient extent and duration that they can be considered as locally adapted or "creolized." This is a process wherein farmers encourage genetic mixing between improved seed stocks and their native landrace materials (Bellon and Risopoulos 2001), a relatively easy matter with a highly outcrossing species like maize.[2]

The principal characteristics that Mayan farmers use to differentiate their maize landraces are the time required by the plants to grow and mature, and the morphology of the infructescence or ear produced by each variety (Fig. 1). The most precocious maize race is *nal t'eel* or "rooster maize," which matures in 7 weeks from planting. The name of this maize in Maya is a metaphorical reference to its precocity. Nal t'eel is short in stature, slender, and produces very short, relatively narrow ears with 10–12

[1] The precise term used by economic botanists is a "landrace," which connotes a unique crop variety or population that has been selected and adapted by farmers rather than professional plant breeders.

[2] The term "improved" is used to designate maize varieties that have been developed through formal agronomic plant breeding, which is usually directed at increasing average grain yields. The agroecological and socioeconomic context of these locally adapted improved varieties has been explored by the authors elsewhere (e.g. Latournerie Moreno et al. 2006). This chapter focuses on indigenous maize landraces.

Table 1 Varieties of maize grown in Yaxcabá, Yucatan (adapted from Arias et al. 2000)

Maize landrace	Mayan or Spanish name	Cycle length	Grain color	Mayan name(s) according to grain color
Nal t'eel	*Nal t'eel* ("rooster maize")	7 weeks	White	Sak nal ("white maize")
			Yellow	K'an nal ("yellow maize")
Nal t'eel x Tuxpeño	*X-t'uup nal* ("youngest child maize")	2.0 months	White	Sak nal ("white maize")
			Yellow	K'an nal ("yellow maize")
Nal t'eel x Tuxpeño	X-mejen nal ("young maize")	2.5 months	White	Sak nal ("white maize")
			Yellow	K'an nal ("yellow maize")
			Dark purple	X-éek' jub ("purple")
Tuxpeño	*X-nuuk nal* ("old maize")	4.0 months	White	Sak nal ("white maize")
			Yellow	K'an nal ("yellow maize")
			Yellow-red	Piix cristo ("knees of Christ")
			Scarlet red	Chak chob ("red hot")
			Dark red	X-granada ("pomegranate")
			Dark Purple	X-éek' jub ("purple")
Olotillo x Nal t'eel	*Ts'íit bakal*, *Bek'ech bakal* ("long thin cob")	3–3.5 months	White	Sak nal ("white maize")
			Yellow	K'an nal ("yellow maize")
			Dark Purple	X-éek' jub ("purple")
Locally adapted improved maize:				
V-527	Maíz mejorado ("improved maize"), Maíz híbrido ("hybrid maize")	2.5–3 months	Yellow	
V-528			White	
V-532			White	
V-533			Yellow	
V-536			White	
Nal Xoy			Yellow	

rows of small, flinty kernels; it has rarely been documented outside of Yucatan, although Bellon and Brush (1994) report it from Chiapas. Nal-t'eel is considered one of the oldest extant races of maize, closely related to maize varieties first grown in Mexico several millennia ago (Wellhausen et al. 1952). Archeological remains of nal t'eel and other closely related archaic maize landraces (the nal t'eel-chapalote complex) have been identified from a number of pre-Classic, Classic, and post-Classic Maya sites throughout southern Mexico and the Yucatan Peninsula (Lentz 1999).

At the other end of the scale is the longest maturing maize in Yucatan, *x-nuuk nal*, literally "old maize," which takes nearly 4 months to mature from time of planting. X-nuuk nal is tall and robust, with large ears containing 10–12 rows of large kernels on thick cobs. The origins of x-nuuk nal are complex and probably include the more recent (though still pre-Hispanic) introgression of maize races from South America along with Mexican progenitors. Presently x-nuuk nal, also known as *tuxpeño*, is grown along the entire sweep of the Mexican Gulf coast lowlands, from Quintana Roo north to the U.S. border. It is one of the most productive and adaptable tropical maize landraces and has been widely used by plant breeders in tropical maize improvement programs worldwide (Bellon and Brush 1994).

Fig. 1 Principal landraces of maize grown in central Yucatan (from *right* to *left*): nal t'eel, x-nuuk nal, ts'íit bakal, x-mejen nal and x-t'uup nal (ears of these last two are nearly identical morphologically). All races occur in yellow, white, red, and dark blue color morphs (Photograph by John Tuxill)

Falling between these two extremes are three other varieties of maize, *x-t'uup nal* and *x-mejen nal*, maturing in 2.0 and 2.5 months, respectively; and a third type, *ts'íit bakal*, which takes approximately 3.0–3.5 months. X-mejen nal ("young maize") and x-t'uup nal ("youngest-child maize") are very similar morphologically in plant height and ear size. They likely arose from hybridization between nal t'eel and x-nuuk nal landraces, making them relatively recently derived varieties (Arias et al. 2000). The ears of both x-mejen nal and x-t'uup nal have small, round kernels arrayed in 13–18 rows. Ts'íit-bakal ("long thin-cob maize") varieties have a distinct maturation time, but as their name reflects, they also display the most unusual morphology of all Yucatecan maize ears, having an extraordinarily thin, flexible cob along with closely packed kernels in a mere 8–10 rows. Wellhausen et al. (1952:146) refer to ts'íit bakal as a subrace formed by the hybridization of nal t'eel with the maize landrace *olotillo*, which is grown throughout southern Mexico.

Within the aforementioned landraces defined by maturation time and ear morphology, Mayan farmers distinguish and maintain individual maize populations based on kernel color (Castillo et al. 2000). Yellow-kernel maize (*k'an nal*) and white-kernel maize (*sak nal*) are the most widely grown color variants, followed by dark purple- or blue-tinted maize (*x-éek' jub*) (Fig. 2). Some yellow maize populations are highly variable in color and contain individual plants whose kernels display varying mottles and shadings of red (Fig. 3). These red ears inspire a range of names in

Fig. 2 Examples of red- and reddish-colored morphotypes in a population of yellow x-nuuk nal maize from Yaxcabá, Yucatan (Photograph by John Tuxill)

Fig. 3 Ears of an x-éek' jub purple-grained maize (x-nuuk nal) from Yaxcabá, Yucatan (Photograph by John Tuxill)

Maya such as *piix-cristo* (the bloodied knees of Christ) for variegated red and yellow ears, and *chak-choob (red hot)* and *x-granada* (pomegranate red) for solid deep red ears. Despite this individual variation, most Yucatecan farmers refer to such maize at the population level as "yellow," since the endosperm of the red kernels is yellow, and upon boiling and processing it yields yellow-colored *nixtamal* for tortillas or other food items. Some white-seeded maize populations also display occasional red-tinted morphs, which similarly are referred to as "white" maize based on the kernel endosperm color.

Uniformity of kernel color is one of the key characteristics that Yaxcabá farmers take into account when selecting the maize ears that will serve as seed for next year's crop.[3] The importance given to uniform kernel color was most commonly justified on aesthetic grounds, with mixtures of the principal white, yellow, and blue color morphs seen by many farmers as "ugly." However, an additional explanation for farmers' preferences for uniformity in kernel color (though not one they state directly) is that kernel color serves as a readily identifiable marker for particular agronomic and culinary traits (e.g., drought resistance and quality of tortillas) that may vary from one variety to another. This interpretation is supported by the fact that maize color variation linked to desirable agronomic or culinary traits, such as red or orange kernel variants within yellow- and white-seeded populations, is widely tolerated by farmers, if not encouraged:

> I didn't get any harvest after the hurricane, so this time I bought 3 kilos of improved seed from don Fulano for planting. It's a white maize, but the kernels have their *pintaditos* [little streaks or spots of color, in this case red]. That's how I know its seed that can be conserved [i.e. re-saved] and won't spoil rapidly (Lead author's field notes, 2002).

In this case the farmer interprets the presence of reddish coloration in the white kernels as an indication that the improved seed has crossed to a certain degree with local maize landraces and, presumably, acquired some of their desirable traits, such as increased storability and resistance to pest infestation.

Relative Abundance of Yucatecan Maize Varieties

In 2001, Yaxcabá farmers managed an average of 2.6 maize varieties per household, with one-quarter of the farmers growing more than four varieties apiece, and the maximum number of maize varieties managed by any one farmer being twelve. The easiest way to understand the data on maize varieties from Yaxcabá is in terms of "seed lots." We use this term following Louette (2000) wherein a seed lot is a population of seeds of one specific type of maize selected and planted by an individual farmer during a single agricultural cycle. More than half of all maize seed lots planted in Yaxcabá are long-maturing varieties, particularly x-nuuk nal populations

[3] The other selection characters are the size and health of the ear (which reflect yield potential) and kernel size (which farmers view as an indicator of germination reliability) (Latournerie Moreno et al. 2006).

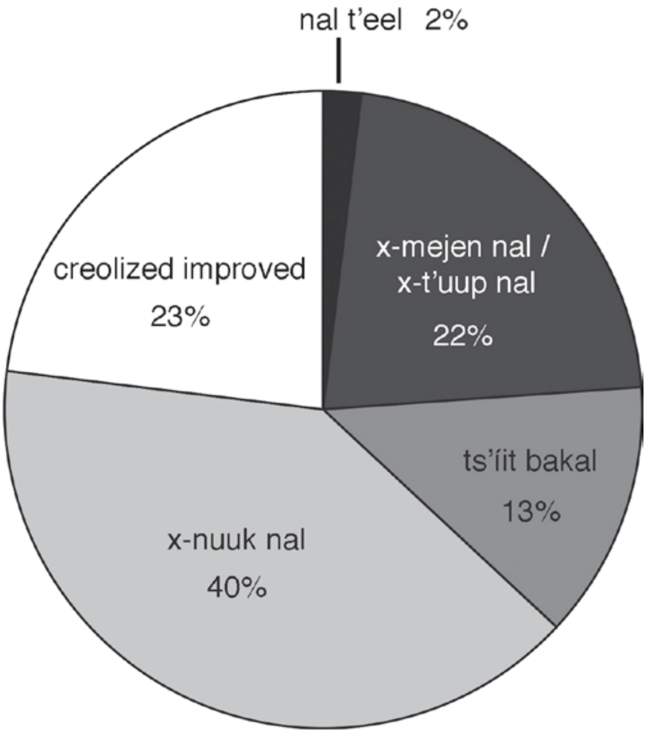

Fig. 4 Distribution of maize diversity in Yaxcabá, Yucatan (2001) as measured by percentage of seed lots ($n = 169$). X-mejen nal and x-t'uup nal landraces are grouped together for this analysis

(Fig. 4), and they are even more dominant in terms of area planted (Fig. 5). Nearly all farmers maintain at least one long-cycle landrace; the minority of farmers (8%) who do not fit this pattern all specialize in growing locally adapted improved maize. Fast-maturing landraces represent 24% of seed lots and were grown by 48% of families. Similarly, creolized maize types were planted by 45% of the families surveyed and made up nearly one-quarter of the seed lots sampled in Yaxcabá in 2001, but most farmers who grew them did so as a supplementary crop to their long-cycle maize. For both short-cycle landraces and creolized varieties, the mean estimated acreage planted per lot is less than one-third of that for long-cycle maize (Fig. 6). No family relied solely on short-cycle maize landraces for milpa production, although their contribution to harvest was substantial for some farmers.

Farmers' long-cycle seed lots were evenly divided between white and yellow seeded populations during 2001 (Table 2). The data on kernel color were obtained from farmers directly in interviews, and we verified farmers' classifications of kernel color visually when possible. Most farmers chose one or the other color type for their principal long cycle maize; only 22% grew both colors. Seed lots of the purple maize *x-éek jub* were grown by less than 10% of farmers, all of whom planted it as a supplementary crop. Likewise, most farmers only grew a single color of short-cycle

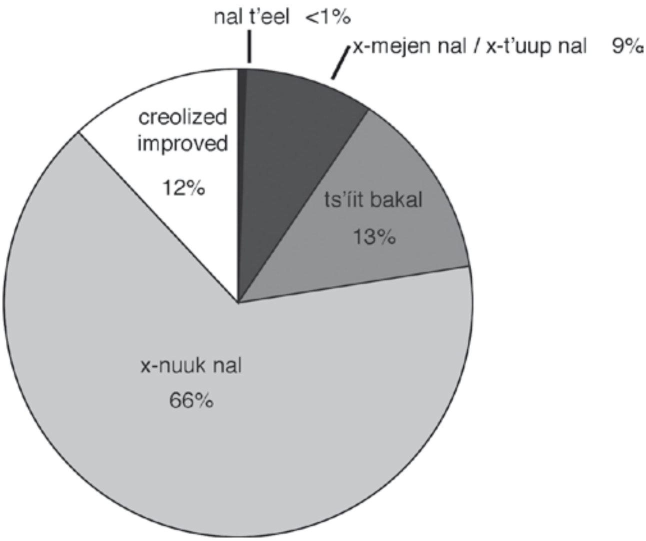

Fig. 5 Distribution of maize diversity in Yaxcabá, Yucatan (2001) as measured by percentage of hectares occupied (n=169). X-mejen nal and x-t'uup nal landraces are grouped together for this analysis

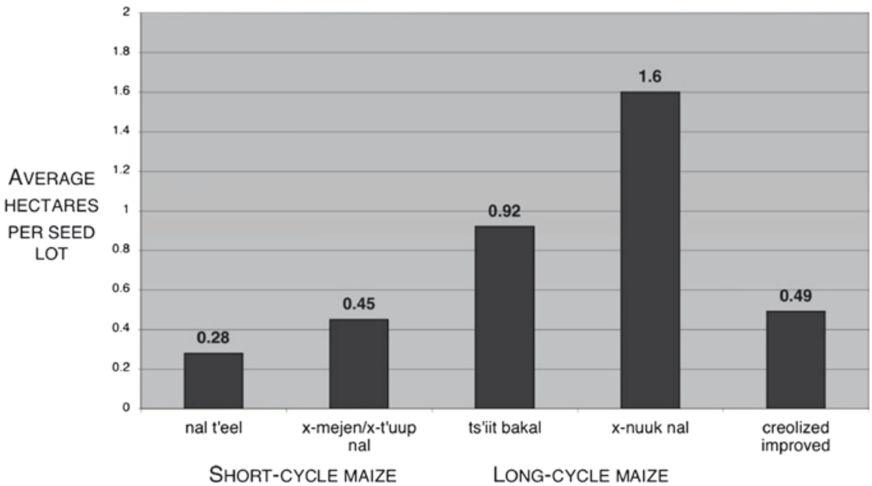

Fig. 6 Mean hectares planted per seed lot in Yaxcabá, Yucatan

maize; however, the majority of *x-mejen nal* populations grown were yellow seeded. The survey in Yaxcabá did not encounter any farmers who maintained populations of exclusively or predominantly red-kerneled ears, nor are any such individuals known within the community in general. Red appears to be the maize color least likely to be selected and maintained at the population level throughout Yucatan.

Table 2 Distribution of maize seed lots by grain color in Yaxcabá (2001)

	Grain color (proportion of seed lots)[a]		
Maize racial group	Yellow (%)	White (%)	Purple (%)
x-nuuk nal (*n*=68)	46	47	7
ts'íit bakal (*n*=22)	55	45	0
x-mejen nal/x-t'uup-nal (*n*=37) and nal-t'eel (*n*=3)	70	25	5
Creolized improved maize (*n*=39)	54	46	n/a

[a]Seed lots of red-colored maize were not encountered in the survey. Individual red morphotypes do occur within some yellow and white maize seed lots

Given these data on relative abundance, it might be tempting to ascribe the low proportions of short-cycle maize (especially nal t'eel and x-t'uup nal) and purple x-éek' jub maize to their being varieties that have undergone recent declines and are now on the point of disappearing entirely from Yucatec Maya agriculture – a familiar narrative of endangerment and loss of biodiversity due to the rapidly changing customs and practices of modernizing human societies. However, a brief review of Yucatec Maya field studies over the course of the twentieth century reveals that the present circumstances of maize are not as recently determined as one might think. For instance, Redfield and Villa Rojas (1962[1934]:45) recorded the following array of maize types in the village of Chan Kom:

> Corn is grown by everyone and only a minority grow anything else. Most commonly a white variety (*sak ixi'im*) is grown, but a yellow maize (*k'an ixi'im*) is not uncommon; the white variety is sometimes preferred for local consumption, and is more easily sold. Less common and less favored varieties are ch'oob a kind with purple and white kernels, and an all-red variety, chak ch'oob…Both yellow and white corn occur in early and late varieties , but most of the early corn is of the yellow variety. Early corn (*x-t'uup nal*, or *x-mejen nal*) yields its harvest in from 10 to 15 weeks; late corn (*x-nuuk nal*) requires up to 4.5 months.

Most revealingly, short-cycle maize was grown by only a minority of Chan Kom villagers, principally because of the ritual obligations involved:

> A ceremony very similar to the preceding [*u jaanlil kool*, a harvest offering], but involving the offering of only one hen, is known as *u jaanlil x-t'uup*. This ceremony is offered to the smallest and most important of the *cháako'ob* [god-spirits who bring rain], who is regarded as the guardian of a certain sort of corn (*x-t'uup nal*) that matures rapidly and is harvested a few weeks after planting… Most of the men in Chan Kom, in part restrained by the trouble of making the offering, do not plant this variety of maize at all. "I never plant *x-t'uup nal*," said one of the majority, "because the *x-t'uup* is so demanding of offerings that when one neglects to make them he punishes one with serious sickness." (Redfield and Villa Rojas 1962[1934]:137)

These and other references (Tozzer 1907; Villa Rojas 1945; Arias 1980) suggest that the array and abundance of maize varieties seen at present in Yaxcabá is characteristic of central Yucatan over a span of nearly a century. Why have these patterns been so persistent? Why have most farmers favored a small subset of maize varieties (specifically yellow- and white-seeded x-nuuk nal) out of the total array available? How is it that they have maintained other varieties at consistently low levels for close to a century, and quite possibly longer? Answering these questions requires understanding the effects of both the region's unique agroecology, and the sociocultural significance of Mayan foodways. The former is particularly important in regard to maturation time, while the latter is equally significant for kernel color.

Maize Maturation Time and Agroecology

Mayan farmers confront an environment in Yucatan that is extremely variable, and one of the best examples of this is rainfall. Precipitation during the growing season from May to October arrives primarily in the form of convection thunderstorms, which sweep across the Peninsula in temporally and spatially unpredictable patterns. It is not uncommon for a milpa to go without rain for 2 weeks or more at any point during the growing season.

The potential for smallholder farmers to make use of crop diversity as a general way of coping with variability in rainfall was illustrated by Wilkes and Wilkes (1972) in relating a conversation between the late Mexican ethnobotanist Efrain Hernandez Xolocotzi and a campesino in the state of Tlaxcala, where Hernandez asked the farmer what kind of maize he planted:

> The old man responded that he grew yellow-corn, cream-corn and white-corn. When asked what was the earliest maturing corn, he said that the yellow took five months, the cream six months, and the white seven months to mature. When asked which yielded the most, he informed Hernandez that the yellow-corn gave a little, the cream more, and the white-corn the best. Hernandez then asked him if the white corn was the most productive, why didn't he plant the best corn? The old man smiled and said "That is the question my son, who works at the factory, asks. Tell me, Mr. Agriculturalist, exactly how much and when will it rain next year?" At this point, Hernandez responded that he could not divine the future. With a knowing look, the old man said "Exactly! Therefore, I plant all three, so if there is little rain I always have some yellow-corn to eat. If there is more rain, I'll have enough to eat with the cream-corn, and if it's a good year, with plenty of rain, I have white corn to sell." He added drolly, "Usually, it isn't a good year." (Hernandez X. 1970, cited in Wilkes and Wilkes 1972:38.)

The presence of short-cycle varieties of maize in the seed stocks of many Yaxcabá farmers raises the possibility that farmers similarly are deploying crop diversity as a way of spreading out temporal risk and increasing the security of harvest. One exchange between a Yaxcabá farmer and a local researcher expresses parallel sentiments:

> Interviewer: So why do you grow the nal t'eel?
>
> don Esteban: Well, it provides the first ears and that way there is some to choose from.
>
> Interviewer: Then why do you have the x-mejen nal?
>
> don Esteban: That's in case I happen to lose the first one.
>
> Interviewer: And the "xtres meses" [3-month maize]?
>
> don Esteban: After the x-mejen nal matures, that one follows right behind.[4]

[4] Conversation documented by anthropologist C. Morales, 9 April 1999. From IPGRI Project files.

In central Yucatan, the most common climatic event that raises problems for farmers is the *canícula*, an interaestival dry period of irregular duration that often appears in late July or August. Short- and long-cycle maize varieties represent two distinct strategies for coping with the annual specter of the canicula. In terms of the moisture requirements of maize plants, the single most critical period is when the plants are tasselling and silking – that is, when the male flowers are releasing pollen and the female flowers become receptive. The second most critical period is when the pollinated kernels are developing and the ears are filling out (Larson and Hanway 1977). Drought stress or inadequate moisture availability during this time period will depress maize yields (Shaw 1977). The precocious phenology of nal t'eel, x-t'uup nal, and x-mejen nal offers the possibility of completing flowering and ear maturation before the canicula's onset in years when planting begins early (due to the timely arrival of the season's first solid rains) or when the canicula's onset is delayed (Fig. 7a). The very fact that maturation times are so finely partitioned in Mayan ethnotaxonomy of short-cycle maize is suggestive of a high degree of uncertainty in predicting the canicula's timing and severity.

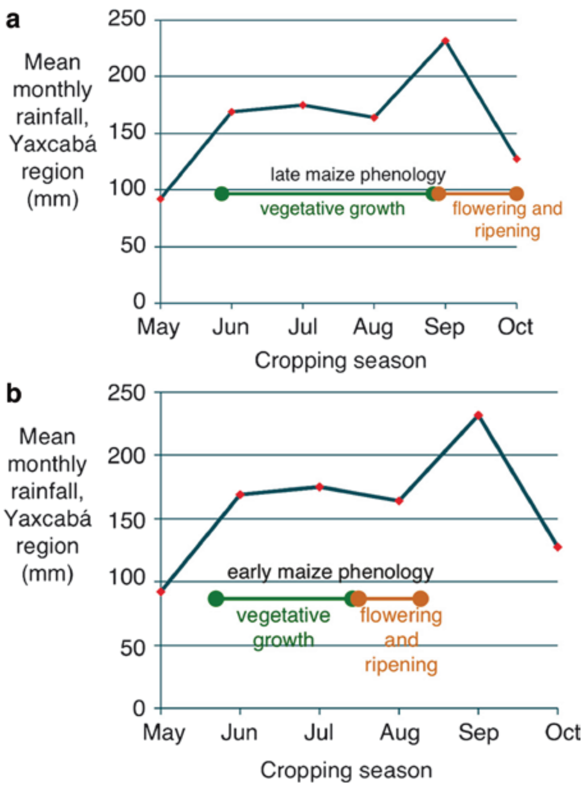

Fig. 7 Comparison of maize phenology with average monthly rainfall in Yaxcabá, Yucatan: (**a**) Early maize (x-mejen nal). (**b**) Late maize (x-nuuk nal)

Ts'íit bakal and x-nuuk nal varieties, by contrast, display a physiology where the immature plants, once established, are capable of weathering several weeks of drought conditions and then resuming their growth and development once the rains pick up again. With their longer growth cycle, flowering, pollination, and ear maturation are timed to unfold after the canicula usually abates (Fig. 7b). Reflecting this phenology, most farmers cite their long-cycle seed lots (and especially x-nuuk nal) as their most drought-resistant maize.[5]

The timing and sequence of planting is an additional way for farmers to manage temporal risk. Some farmers cite a desire to give their maize plants the best chance of ripening before the canicula as their reason for planting their short-cycle seed lots first. Alternatively, other farmers who grow x-mejen nal maize plant them last in sequence so that they will have greater likelihood of flowering and ripening after the canicula has passed. There are limits to a farmer's ability to stagger planting times, however. Farmers who plant out of phase with the majority of other farmers' plantings in surrounding fields run a greater risk of having their maize seed and seedlings preyed upon by birds and mammals that would normally be dispersed across all fields in the surrounding area. Having varieties with different maturation periods allows Yucatecan farmers the maximum possible flexibility in planning for and coping with short-term adverse climatic conditions during the all-important maize-growing season.

Kernel Color and Social Meanings of Maize

Yucatec Maya farmers state a variety of reasons for why they grow maize of a particular color. In Yaxcabá, the typical response of informants to the question of why they grew a particular color of maize was "*pues*, this is the color seed I've always grown and I like it," or "this is the seed my father gave me when I began making milpa on my own." Probing further via interviews and participant observation, farmers with white-seeded maize populations generally cited culinary or aesthetic reasons for their preference, such as the quality of the tortillas that white maize produces, while farmers with yellow maize tended to argue for their preference based on agronomic grounds, in particular yellow maize's resistance to drought and pests:

> My maize is yellow seed, I like it because it is more resistant, it just holds up better. If you look at the kernel you'll see it is round and very hard, while the white maize kernel is soft. Yellow maize doesn't get infested by bugs rapidly, but the white maize sure does.

Maize seed color is a frequent topic of discussion and debate among community members, including within families, such as the following discussion that took

[5] In Spanish, farmers say that x-nuuk nal maize *aguanta mayor* (holds up better) or *resiste más* (resists more) under drought conditions; the very terminology they use suggests that drought resistance has a phenological basis, with x-nuuk nal plants in early stages of development "resisting" or withstanding the canicula and other random temporary drought phases until the rains come in earnest in September.

place 1 day at breakfast as family members were degraining the household's yellow maize for preparation later in the day as tortillas:

> Son: Papa, could we try planting white maize sometime?
>
> Father: Why?
>
> Son: Because the tortillas come out nice and white and soft.
>
> Father: Yes, but white maize gets infested rapidly by bugs, and then next thing you know the seed is spoiled and ruined. That's why I like my yellow maize better. It's a good seed.
>
> Mother: Oh, you know that's not true! Don Fulano only plants white maize and he saves his seed just fine every year. I would like to eat white tortillas too.
>
> Father: Well, you know who's going to win this discussion? I am, because I'm the one who plants [the milpa].

Villagers' arguments in favor of one or the other maize color have a basis in kernel morphology: white maize kernels have a soft, floury endosperm, while that of yellow kernels has a harder, more crystalline structure. These characteristics ultimately stem from subtle biochemical differences in the starch molecules of each type of maize. Given the perceived benefits of white vs. yellow varieties, one might expect that a higher percentage of farmers would grow both, if for nothing else than to take full advantage of the culinary and agronomic traits offered by each color. The fact that many farmers stick to just one maize color may reflect that the benefits are not always worth the extra time and effort involved in managing multiple seed lots.

Regarding purple maize, farmers who grow it commonly extol the quality of their tortillas: "tortillas made from *x-éek' jub* maize are nice and soft and they stay that way even when they cool down, unlike white and yellow tortillas which get hard right away." A similar appreciation for the culinary qualities of purple-maize tortillas has been noted among the Mopan Maya of Belize (Steinberg 1999). Nonetheless, attaching such importance to purple maize is not a universal trait of Mayan foodways. In surveys from Yaxcabá, a number of farmers who do not grow x-éek' jub maize indicated that even though they know the tortillas stay soft longer, they find the color unappealing ("tortillas made from x-éek' jub, they just look dirty, I lose my appetite when I see them"). Farmers' wives sometimes complain about the color as well, because when they take the maize to the *molino* (a mechanized flour mill, of which there are two in Yaxcabá) for grinding, the x-éek' jub stains the machinery and leaves blue-colored spots on subsequent batches of white or yellow maize, which leads to conflicts with other women and the mill owners. Likewise, some farmers said their wives refuse to handle the dark red ears that occur as color morphs within yellow maize populations because they also stain other batches of lighter-colored maize dough.

While contemporary Mayan foodways and the agroecology of Yucatan provide a basis for understanding the patterns seen in the distribution and diversity of colors in Mayan maize, this ultimately is only part of the story. Ancient Mesoamerican iconography and writing make clear the central importance of maize as a sacred plant and sustainer of humankind (Schele and Miller 1986; Miller and Taube 1993). A close examination of indigenous writings reveals that the Ancient Maya also interpreted the colors of maize kernels as having distinct symbolic and ceremonial importance. For instance, in the *Popol Vuh* of the Quiche' Maya, the Creator-Forefathers, *Tepeu* and *Gucumatz*, fashion the first human beings of both white and yellow maize dough (Recinos et al. 1950). A more detailed example is the Ritual of the Four World-quarters that opens the *Sacred Book of Chilam Balam of Chumayel*, one of a series of oral prophecies recorded by literate Maya individuals in Yucatan in the late 1700s (italics and bold ours):

> The lord of the people of the south is the first of the men of the *Noh* family. *Ix-Kan-tacay* is the name of the first of the men of the *Puch* family. They guard nine rivers; they guard nine mountains.
>
> The red flint stone is the stone of the red *Mucencab*. The red ceiba tree of abundance is their arbor, which is set in the east. The red bullet-tree is their tree…Reddish are their yellow turkeys. Red toasted corn is their corn.
>
> The white flint stone is their stone in the north. The white ceiba tree of abundance is the arbor of the white *Mucencab*. White-breasted are their turkeys. White lima-beans are their lima beans. White corn is their corn.
>
> The black flint stone is their stone in the west. The black ceiba tree of abundance is their arbor. Black-speckled corn is their corn. Black tipped sweet potatoes are their sweet potatoes. Black wild pigeons are their turkeys. Black *akab-chan* is their green corn. Black beans are their beans. Black lima-beans are their lima-beans.
>
> The yellow flint stone is the stone of the south. The ceiba tree of abundance, the yellow ceiba tree of abundance is their arbor. The yellow-bullet tree is their tree… colored like the yellow bullet tree are the wild pigeons which are their turkeys. Yellow green corn is their green corn… (Roys 1967[1933]:63–64).[6]

This description of the ritual makes clear the significance assigned by the Maya to the prevailing kernel colors of maize (still evident in Yucatan maize populations today) and the colors associated with the four cardinal directions of the Mayan cosmos. Colors had immense symbolic value for the ancient Maya (Schele and Miller 1986). The prevailing kernel colors of Mayan maize varieties – red, yellow, purple-black, and white – gave maize an additional level of symbolic meaning and significance in religious offerings and other ceremonial occasions.

The conception of maize as sacred continues to be expressed today in Yaxcabá through offerings made by farmers, both individually and collectively, in ceremonies and gestures of reciprocity with the supernatural world, throughout the annual

[6] We have included Roys' 1933 translation verbatim here (adding only several ellipses for brevity) although we do not agree with all his choices of terms. The Mayan term *nal*, he translates as "green corn" (or fresh, newly ripened corn) but in our experience it refers broadly to whole maize ears or the entire maize plant. He translates the Mayan term *ixi'im* simply as "corn" but we have found it to mean specifically maize kernels. Roys also translates *ek hub* as "black-speckled corn", whereas we have found that Yucatec Maya farmers apply the name to any black-, blue-, or purple-seeded maize. The term *akab-chan* is left untranslated by Roys, but he states that it corresponds to an archaic term for dark-colored maize. Note also that the Latinized Mayan alphabet used by Roys is different from that used currently; thus, the Mayan orthography in this text fragment does not conform to that followed in the rest of this chapter.

agricultural cycle. The majority of these offerings are made by farmers directly, with a Mayan priest (*j-meen*) intervening in the most elaborate ceremonies such as the *ch'a' cháak* (a rain calling held at the height of the growing season) and *u jaanlil kool* (a harvest offering). Mayan elders in Yaxcabá commonly refer to maize as *la santa gracia* – the sacred grace – and as such it is to be handled and treated with reverence and respect. For instance, one farmer's wife commented to us that one should never toss out spoiled maize kernels when they can be fed to domestic animals, a gesture that is not only good household economics but also demonstrates respectful treatment of maize as sustenance.

While maize continues to be regarded as a life giving and ultimately sacred entity by many contemporary Maya households, there appears to have been a de-emphasis of the specific ritual symbolism of particular maize kernel colors, compared with that suggested by the previous description from the *Sacred Book of Chilam Balam of Chumayel*. In Yaxcabá, none of the Mayan ceremonies conducted as part of the annual milpa cycle, including the most elaborate *ch'a' cháak* rain callings or *u jaanlil kool* harvest offerings, were observed to require maize ears or kernel of a particular color. White and yellow maize were used interchangeably in the preparation of *sakab* (a fresh maize beverage prepared only as a ceremonial offering), as well as for thickening the deep red stew (colored with achiote) that accompanies both ceremonies. Nixtamal from maize of all colors (white, yellow, blue, and red-tinted) was acceptable for the *pibil waaj* tamales prepared for the same ceremonies (Fig. 8). When farmers individually offer up a sample of maize

Fig. 8 Scene from a *ch'a' cháak* raincalling ceremony in Yaxcabá, Yucatan, where participants are preparing *pibilwaaj* tamales. Note that the pile of maize dough (*nixtamal* or *masa*) in front of the men contains a mixture of white and yellow maize (Photograph by John Tuxill)

ears on their own household altars to give thanks at the start of the harvest, most farmers interviewed state that they choose *las mas bonitas* – the most aesthetically pleasing ears, large and free of insect damage--rather than paying specific attention to representative colors. It is not clear whether this is a recent de-emphasis in Yaxcabá and other lowland Maya communities, or a gradual ongoing process that may stretch back a century or more.

The one major exception to this trend in central Yucatan involves the dark purple maize éek jub, which in the form of nixtamal is frequently used to thicken a dark, rich stew called *relleno negro*. Made with turkey, pork, tomatoes, garlic, and large quantities of charred chiles, and cooked overnight in a piib or over a fire, *relleno negro* is traditionally served by Mayan families at weddings, religious celebrations, and other festive occasions. Some farmers regard éek jub maize as the only kind suitable for thickening a "proper" batch of relleno negro, since the dark blue color of the nixtamal enhances the black color of the stew. The enduring symbolic importance of relleno negro as a feast food extends in this case to éek jub maize itself, to the point where some Yaxcabá families grow the variety specifically to have a supply on hand for religious offerings or *primicias* that they sponsor every year. In other areas of Mesoamerica, the symbolic and ceremonial importance of maize colors may be more persistent than in central Yucatan. Among Mopan Maya communities of central Belize, red and black maize ears have maintained specific symbolic roles as offerings in traditional religious ceremonies, although these practices are now in decline across the region as individuals convert to Protestant beliefs (Steinberg 1998, 1999).

Conclusion: The Future of Maize Diversity

The splendid array of maize landraces present in milpas of Yucatan is the end product of several thousand years of directed selection by the region's farmers. By classifying maize lineages and understanding their relationships, it is possible to gain insight into the cultural history of maize in Yucatan. The particular traits exhibited by maize varieties today reflect Yucatecan farmers' short- and long-term responses to agroenvironmental conditions, the ecological demands of crop production, and the aesthetic, culinary, and religious sensibilities encompassed in Mayan foodways. With a range of maturation times represented by short-cycle maizes (nal t'eel, x-t'uup nal, and x-mejen nal) and long-cycle maizes (ts'íit bakal, x-nuuk nal), Yucatec Mayan farmers are able to minimize harvest risk and maximize household food security in an unpredictable and often adverse agroenvironment. One sign of the agronomic superiority of indigenous maize landraces in central Yucatan is that some thirty years after improved maize varieties were first distributed into the region, local landraces still account for at least 80% of the region's annual maize plantings (Arias et al. 2000). Local aesthetic and culinary preferences at the heart of Mayan foodways also provide incentives for maintaining diverse Yucatecan maize landraces, including blue-, white- and yellow-kernel landrace morphs.

While the present array of maize varieties in Yucatán has been relatively stable for decades if not centuries, it is clear that the social context of maize has evolved over time. For instance, while maize continues to be viewed as a living object that must be treated with respect and care as a foundation of human sustenance, the particular symbolic and religious context of individual maize color morphs no longer appears as specific or intricate as it once was in Yucatec Mayan communities. Over time, changes in the social and economic context of agrarian communities may even lead to the disappearance of certain crop varieties. This may be underway presently with nal t'eel populations that show characteristics of the original ancestral landrace (rather than x-mejen nal or x-t'uup nal traits). The nal t'eel samples of this kind that Wellhausen et al. (1952) collected came from villages not far from Mérida, where today it is difficult to find any traditional milpa being made, let alone an uncommon maize landrace like nal t'eel. This suggests a gradual geographic contraction of phenotypically ancestral nal-t'eel populations over time, toward east-central and southern Yucatan. Our research team was able to make four collections of nal t'eel seed lots of this kind in the region in 1999, two of which came from Yaxcabá, but all of these had been lost by local farmers by 2001. In 2002, after extensive searching we found one additional nal t'eel seed lot with ancestral characteristics, but overall this maize lineage now appears to be very rare. Many farmers knew of nal t'eel but said they were discouraged from growing it by the small ears and the difficulty of protecting the maize from bird and animal predation due to it being the earliest ripening variety. At one time, the value of nal t'eel as a "famine breaker" crop may have been great enough for more farmers to go to the trouble of cultivating it, but that no longer appears the case now that maize supplies are available for purchase year-round in most Yucatan communities.

Nal t'eel is a reminder there is no guarantee that the perceived benefits of native landraces at any one point in time will be sufficient to ensure their future persistence, or that the path of Mayan agriculture over the past century will always be an accurate predictor of farmers' future management of their agricultural endowments, including biodiversity. One often-overlooked way of providing incentives to maintain unique crop varieties is to reinforce the idea that they are an irreplaceable part of a society's or community's cultural heritage, as well as an economic or ecological resource. Keeping maize diversity alive in Mesoamerica is not just a task for farmers, it involves everyone who recognizes and appreciates the value of this most remarkable plant.

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Maya Foodways: A Reflection of Gender and Ideology

Amber O'Connor

Introduction

"Through analysis of food and eating systems one can gain information about how a culture understands some of the basic categories of its world" (Mary Douglas in Meigs 1997:100). It is through this lens of foodways analysis that I will explore the gendered nature of Maya foodways, the gendered division of labor[1] in maize production and consumption, and my hypothesized continuation of gender complementarity in Maya food practices. As Counihan has noted, "Gender matters in food centered activities as it does in structuring human societies, their histories, ideologies, economic systems and political structures" (1998:1). The issue of complementarity of gender roles in food practices and in other activities attributable to cultural models is somewhat contentious in the academic world of anthropology, and requires further investigation. I have conducted fieldwork among the living Maya during the summers of 2007 and 2008 in an effort to shed further light on the issue, and in this paper I intend to complement field investigations of my own and of others with conclusions about earlier Maya cultural expression derived from archaeologists, epigraphers, ethnohistorians, and art historians. As Nash (1997) states, gender complementarity is something that continues to be expressed by the modern Maya, no matter how

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[1] Gender is a cultural construction of kinds of entities that are often more or less isomorphic with the sexes male and female (or man and woman), yet not infrequently involving more than just these two kinds of entities (e.g. berdache, gay and lesbian, transsexual, etc., when culturally recognized). The sexes (male and female, or man and woman) are generally viewed as biologically given kinds of entities, viewed apart from any social expectations of traditional or other role behavior. Gender roles are the culturally appropriate social behaviors expected from the different socially constructed genders, and define these genders (as opposed to the biological sexual parts that form crucial parts of the definitions of the sexes).

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contentious its form. For the confines of this paper, I agree with Fischer, who observes that:

> Despite its general disrepute within the academy, an essentialist view of culture underwrites many contemporary ethnic movements the world over. As the former subjects of colonial and neocolonial governments seek to recover and assert their ethnic distinctiveness, they quite naturally turn to those elements that are perceived as being most authentic, the apparent essences of their culture (1999:473).

Foodways when viewed from an essentialist perspective can yield elements perceived as especially authentic, indicative of a culture, and thus useful in asserting ethnic distinctiveness and cultural continuity. Furthermore, these practices can be considered essential in another way, as the diet as well as preparation and serving of foods expresses not only the sociocultural rules within a given society, but also reflect what is often referred to as the sexual division of labor (Messer 1984). Moreover, they often serve to symbolically reinforce societal norms and to provide additional measures of social control. While it goes without saying that food and eating are important, anthropologists have analyzed foodways and deemed them a very useful tool for understanding gender relations (Counihan 1999:2). Sociologists agree that food provides moral and traditional education that helps socialize and enculturate an individual into their community. Because food practices can be reflective of a culture's ideology, one can gain insight into historical social relations through their study; however, due to recent changes in the pace of globalization, we have a finite window in which to study this history (Goody 1982).

For this paper, I will further explore stories and actions experienced in the field that encompass gender roles evident through food. I then elaborate on the ethnographic support for my observations and end with current discourse on these gendered separations within the Maya culture. I provide evidence that as a subsistence agriculture-based society, the modern Maya of Quintana Roo continue in their expression of gender relations, as reflected in the division of labor, and sets of symbolic associations, as the traditional association of the number three with females, to suggest that in the context of foodways gender roles may be viewed from a metaphorical sense as referring to the "cooked" and "culture" polarities. In other words, to raw/cooked and nature/culture binary oppositions, where males, associated with the number four, are better seen as "raw" or "nature".[2]

While researching the gendered foodways of the Maya, it is easy to assume that exclusion of females from public agricultural ritual might be a form of oppression or discrimination. However, Maya women did not seem to be negatively affected by this separation. I have come to view the gendered division of labor among the

[2] Some will see the gender symbolic polarities here as related to and contradicting the "man is to culture as woman is to nature" analogical relationship that has been viewed on occasion as a universal and perhaps a truism and interpreted as derivable from Lévi-Strauss's cultural formulations (Ortner 1974). This paper does not intend to join the theoretical argument which is played out in more universal terms and which is too complex to deal with here. It is the subject of a forthcoming paper, however, in which context it is seen as a necessary component.

Maya with respect to foodways as a form of complementary dualism that has a long history and that is useful to contemporary Maya society. This is supported by the theory that complementarity and its application in Mesoamerican subsistence labor is reflected in ritual and household interdependence (Cohodas 2002:25).

Fieldwork

During the summer of 2007, I worked in Quintana Roo with a shaman for the Maya communities extending from Playa del Carmen south to Coba. I spent time sitting with him at his second job, tending his convenience store in a small indigenous neighborhood on the outskirts of the booming tourist city of Playa del Carmen. Here, he wove for me stories of Maya past and present traditions before allowing me to accompany him to a small village where he was going to perform a thanksgiving ritual for some of his constituents. I was to purchase ingredients for *sa' ko'ol* (a stew-like dish made of chicken and vegetables and thickened with *masa*), often used for festal purposes, which I could help prepare with the women of the community for this familial ritual.

While I was working with the local women preparing the stew, Don Luis discussed some of the food traditions of the area. He said the only time purely indigenous and hand-prepared foods are eaten is during public ceremonies. Often, women are not permitted to prepare these foods due to the possibility that menstruation could contaminate food "for the gods." Otherwise, women use what food may be available from the *milpa* (the agricultural field where men typically grow corn, possibly mixed with other crops) and mix that with other ingredients from the nearest grocery store (Fig. 1). Most typically, chicken, onions, and garlic have been introduced into daily fare to the point that there is no indication that they are not originally indigenous. Don Luis says this is the reason that a shaman must provide the ingredient list and recipes for ceremonial food, because the people do not understand what is native and therefore acceptable as offerings. As this meal was not being offered to the gods, but was for familial consumption, it was acceptable for women to cook.

While we were cooking, I observed the use of the three-stone hearth and asked about its connection to food and family. Don Luis identified the three-stone hearth as a symbol of the union of the family and stated that it must be used to make any kind of ritual food. When I pressed him on any further symbolism of the number three for women or the hearth he said he had never heard any tales of constellations or creation myths that pertain to the number three and women, although apparently such narratives exist for other Maya groups (Christenson 2003; Freidel et al. 1993; Roys 1933; Tedlock 1993). He did provide information about the woman as a symbol of civilization and holiness via her ability to transform man's "rawness" via food and birth. She takes the man's raw corn and makes sustenance and she transforms his seed into human beings. According to Don Luis, she is cooked while he is raw. He goes on to state that the attraction between man and woman comes from

Fig. 1 Milpa, Quintana Rôo, Mexico

a Maya legend where man and woman were once one being, but ended up being split apart. He says, "We form a union to try and repair the separation." He illustrated this by describing the marriage ritual he performs which reinforces the notion of man as raw and woman as cooked via the man bringing an offering of raw maize kernels and cacao beans to the altar while the woman brings *masa* and tortillas, symbolizing that the man will be the provider of ingredients, while the woman will process those into nurturing sustenance.

The other village I was able to visit was Señor. It is located between Felipe Carrillo Puerto and Valladolid. Here there is an organization that is trying to start an interest in "sustainable" tourism. In 2008 I was able to live with the family of the president Marcos Canté Canul. I once again noticed the prevalence of the three-stone hearth (see Fig. 2) and asked about its significance. Marcos told a different tale than Don Luis. Marcos says the three stones are representative of the woman's work of cooking and are reflected in the timing of the *Hetzmek'* ceremony. For a girl, this ceremony (which I will discuss below) is performed at the age of three

Fig. 2 Three-Stone Hearth in Sahkabmucuy, Quintana Roo

months and her umbilical cord is buried under the hearth whereas the boy receives his when four months old and his umbilical cord is placed in the *milpa*. Marcos said the number four represents the four corners of the man's *milpa* and his work of farming. He also was unaware of any association of astronomical or creation myth including the three stones.

During my stay in Señor, I noted that the sexes mingled in two main areas. Publicly, people gathered in the village center, a four-cornered square-shaped public meeting place with a central round gazebo structure where everyone was welcome, particularly when a traveling market came through. The second, more privately, they gathered in their homes, united around the three-stone hearth. This appears to prioritize males for public activities, and females for private activities. As Hamman (1998) experienced, I also found the hearth to be the focus of the household. Here is where the family spends its quality time. This following section of this paper will address the phenomena of domestic vs. public cooking as well as the division of labor associated with different cooking methods, because both genders do in fact cook, but they use different tools and different methods for differing purposes. At first glance these divisions may appear to be hierarchical, but they are not.

The male and female are viewed as two parts that make up one economic and interdependent whole unit: the married couple. Both men and women of the area repeatedly stressed this to me.

Gendered Spheres of Activity

Several anthropologists have explored the theory that women are integral to the domestic sphere while men reign in the "natural" or wild areas outside of the "cultural" domicile or village. Anderson et al. (2005) found this phenomenon to be true in areas of Quintana Roo as did Burns (1983:50). In the village of Chan Kom, Redfield and Villa Rojas (1934) found that men were in charge of public rituals whereas women were in charge of domestic ritual. Sophie Coe (1994) also cites patterns of cooking, where women are in charge of private or home cooking, while man performs public ritual cooking. Both Cohodas (2002:26) and Joyce (Klein and Jeffrey 2001) have identified gendered spheres of activity for the Maya, and Gustafson (2002a) even argues that in the world of the Maya gender is defined by the type of labor one performs, not just one's anatomy.

E. N. Anderson et al. (2005) explore linguistic evidence that the forest is the "opposite of tame or household reared" and states that there is never a difference between man and nature. Redfield's findings in the 1930s and 1940s in which he described man's role in regard to nature as "…nothing stands between the woods and the *milpero*; he deals, so to speak, directly with nature" (1941:45). He goes on to note that men still perceive their world as quadrilateral and associated with the cardinal directions (Redfield 1941). According to Little (2004), today's traditional Maya continue with this division of labor, with the woman responsible for the household and the man working at anything requiring leaving the village. These traditional connections of the female gender with her work of home and hearth tie in with the association with the number three, while the male is more strongly associated with his work in the field and forest as well as the number four[3] (Clendinnen 1982:430). During my encounters, I found that both men and women cooked, but in different arenas and for different occasions. The woman was responsible for all food cooked on the three-stone hearth, while men made ceremonial food (typically roasted meats) in public spaces or at the *milpa* using the *pib* (pit oven). The hearth-cooked food was boiled and stew-like, whereas the *pib* food was roasted without liquid. I found support for what appears to be today's *habitus* rooted in ancient symbolism regarding woman's association with the number three (Clendinnen 1982:430; Freidel et al. 1993:105; Redfield and Villa Rojas 1934:128) and man's association

[3] This tie between gender, number and work is also evident in my later discussion of the *Hetzmek'* which was discussed by both villages during my fieldwork as well as in ethnographic/ethnohistoric sources sited later in this paper (Chán et al. 2002; Gustafson and Trevelyan 2002; Landa 1978 [1566]; Joyce 2000; Redfield and Villa Rojas 1934; Redfield 1941).

with the number four (Clendinnen 1982;430; Freidel et al. 1993:105; Redfield and Villa Rojas 1934:128) The shape and alignment of the world with its cardinal directions are reflected in the earth oven used by the Maya men to prepare roasted meat dishes for ceremonial use. The *milpa* is seen as the four-cornered world of men and is located in "wild" land, that is, land outside of the domestic sphere. This is the area in which Maya spirits are most prevalent. It is this area where men dominate and perform their rituals (Redfield 1941:115–121). Ritual is seen as dangerous, similar to a hunt, where conduits are open between earthly and cosmological realms (Joyce et al. 1993:261–266). Thus, this is the "wild" space of man.

According to Visser (1991), the "place" of the woman's work defines her participation in society, work within the home implying a retreat from the public realm of man. I do not believe the Maya women with whom I worked see this as a retreat so much as the realm of their duty, separate, but of equal importance to that of Maya men. Their home is where women maintain their relationships with gods by performing their rituals, just as men perform theirs in their place of labor, the fields outside of the village. I do however, support Visser's claim that the "place" of work is important in defining one's role in society. Specifically, with the Maya of the Yucatan, the realm in which one's labor is performed identifies their gender (Burns 1983, Hendon 2002, Robin 2006). Not only does the space in which labor is performed identify gender in Maya foodways, but the type of cooking methods and the cooking vessels used do as well. Joyce et al. (1993:261) observes that the ceramic dishes and cloth bundles held by women in monumental art represented an "end point of sequences of production which transformed raw materials into culturally defined forms." She goes on to state that men's work provides "raw" materials whereas women's work transforms these materials into culturally viable objects (*ibid.*). These cooking vessels are most often found in women's cooking, or simmering food indoors at the hearth (Fig. 3).

Sophie Coe informs us that:

> Domestic cooking was done by women, but the cooking of large quantities, and especially outdoor cooking, was done by men. The men dug the pib and probably loaded it, although the women may have arranged the ingredients in the individual vessels ... a pattern of private cooking being female and public cooking being male (1994:167).

This continues to be reflected in cooking methods found in the Yucatan. As I witnessed, men dug a rectangular (four cornered) oven or *pib,* in which to cook publicly for fiestas and rituals or to sell their roasted meats in the village center. In other areas, Claudia Alarcon (1999) has noted that tamales can be steamed or baked. In modern ceremonies, we most often see the large baked *tamal* as offering, cooked outside in a *pib* by a male associated with ritual (Taube 1989:45), while the smaller, steamed version that is more common is most likely prepared by a female.

Even in the time immediately following the Spanish invasion, Landa (1978:34 [1566]) found that women were in charge of making "ragouts," which by definition is a stew, implying a cooking method involving liquid and simmered over heat in some sort of culturally modified vessel. Both Gustafson (2002a:62) and Joyce et al. (1993:261) argue that these vessels are a cultural representation of the female:

Fig. 3 Woman making Sa' Ko'ol in Sahcabmucuy, Quintana Roo

a receptacle of warm liquid that produces a finished "cooked" product, whether that is humans from the womb or food from the hearth. This all suggests cooking method as associated with gender, once again identifying the feminine with internal or private, as the cook for moist foods over the fire, while the masculine is identified with external, roasting, dry heat and public.

Joyce et al. (1993:261) further generalizes, suggesting that, "among the modern Maya … male labor produces the raw materials and female labor transforms them into objects of use and consumption." The realm of foodways woman manipulates nature literally and figuratively through cooking. There may be other cultural constructs in which this will not hold true, but food, in its conservative nature, allows woman to hold power as cultural creator. Not only does she provide and sustain life through the transformation of raw food materials by preparing it in traditionally acceptable gender-appropriate ways; it is the woman by virtue of her sex who gives birth, thus providing for societal reproduction.

The pattern of complementary dualism is also evident in the practices of public cooking performed by men contrasted with the private cooking performed by women. Landa (1978 [1566]:34, 48, 55–56) observed this separation of duties in sixteenth century Yucatan, where he noted that men were participants in roasting fowl for banquets and in celebrations of festivals. Redfield continued to observe this pattern during his fieldwork in the Yucatan during the 1930s and 1940s. He noted that even in areas of syncretism involving traditional Maya religion and Christianity, the Christianized rituals were performed indoors, near the hearth, where women prepared the altar with *atole,* while the "pagan" deities "associated with rain, cornfield, brush and village" (Redfield 1941:95) were performed outdoors, with men preparing the food, offerings of alcohol, bread (such as tamales), and meats. He explicitly identifies the indoors with female and the outdoors with male (*ibid*.:106). Redfield goes on to observe that male-oriented ceremonies involved centering a ritual within four corners and typically consisted of posting four male participants at the corners which was thought to protect as well as define the ritual area (*ibid.*).

It is this identification of male as external participant in food production that Redfield (1941) expresses as man's direct affiliation with nature and the gods of the brush, the hunt and the *milpa*. It is the man who is obliged to maintain the reciprocal relationship of feeding the gods of nature and of the *milpa*. It is these gods who in turn reward him with a good harvest or hunt, or protection (*ibid.*). The four-cornered *milpa* and the *pib*, both aligned with the world's cardinal directions, are the domain of men (Burns 1983; Faust 1998).

The *milpa* is a sacred space outlined by four corners and usually marked with a sacred center point. It is an area set aside from the mundane and must be respected; one must act properly when interacting with nature in this space. It is thought of as protected from the contamination of the earthly realm, and one who "makes good *milpa*" is seen as having a good relationship with the gods (Redfield 1941).

Women are separated from men in their spheres of labor according to traditional gender roles of the Maya. Woman's work is at the hearth and the local domains of *cenote* and gristmill. The men work in the *milpa* and venture to the surrounding towns; they are present in public affairs. Redfield finds that new forms of labor within a community are typically divided among the males of a community. He finds that women are conservative in their tasks, and mainly perform traditional labor. Redfield (1941) also hypothesizes that the division of labor consisting of male as farmer and public participant and female as domestic laborer was probably found in both the indigenous population as well as among the Spanish invaders. Therefore, due to this long-standing pattern of gender-appropriate role behavior as cultural *habitus*, gendered division of labor has shown resistance to change in the Yucatan (*ibid*.).

These separate gender roles are not seen as hierarchical; they are seen as a continuation of the ideal of balance, as both parts are needed to keep society functioning. While this labor is identified as separate, it is also considered as two parts necessary to make a whole; the four-cornered world cannot exist without its central axis, just as the left side of the body cannot exist without the right (Klein and Jeffrey 2001). "Male and female action, when joined together through marriage, creates an economically interdependent and complementary whole" (Hendon 2002:80–81). This is as true today as it was in historic Mesoamerica, where blood was seen as nourishment for the earth. Man made sacrifices of blood to his land whereas woman sacrificed her equivalent, *masa*, of which the first humans were made (Fischer 1999:476; Landa 1978 [1566]:42, 56).

Today, this is readily evident in the marriage ritual described to me by *h'men* Don Luis in 2007; however, it brings up some of the issues anthropologists have with theories of balanced gender parity. Mascia-Lees and Johnson Black (2000:25) define functionalism as "viewing a society as an integrated whole with all of its practices and institutions working together harmoniously to fulfill individual needs or sustain the society in a state of equilibrium." They go on to critique this view as allowing for gender bias. I propose that this basic idea, which some modern anthropologists have disregarded as too simplistic, was essential to the living Maya at the time of Spanish contact and continues in some form with the Maya today. It is evident in the *Popol Vuh* and *The Book of Chilam Balam of Chumayel* that the division of labor by gender allowed for "ideal" societal structure. That is, males are public, provider for the gods, and gatherer of distant food items, while the woman is private, that is, stays closer to the home, provides for the family and gathers nearby food items (Gustafson 2002a: 55–66).

While some have argued that woman as domestic laborer is tantamount to oppression not dualism, I find many Mesoamerican gender scholars would argue that this division of labor in remote agricultural areas is necessary for survival, and therefore essential to adaptation in this cultural setting (Fischer 1999, Gustafson and Trevelyan 2002, Joyce 1992; Little 2004; Nash 1997). The Maya used gender as a way to express two interdependent parts of one whole. This idea of gender is reflected in work. According to Joyce (1992:69), the pair as one entity is the "basic unit of Classic Maya society." While this explanation of gendered labor division could be construed as "naturalizing" the gender bias, I think that it is only through utilizing western ideals as one's filter that this bias is seen. As E.E. Evans-Pritchard (cf. Mascia-Lees and Johnson Black 2000:25) argues, the division of labor that allows woman to work on domestic projects and men to venture farther allows society to function, is especially due to higher mortality rates in rural areas.

Because of higher infant death rates in these communities, women needed to provide more constant care to their young. This prohibited mothers from going on long hunts, leaving them to catch small animals near the domicile, domesticate other animals, and gather plants, where no stealth was needed. This division of labor led to increased population, as women could feed and rear children, while the men increased their social prestige with gods and noblemen by providing food for ritual as well as raw food for women to convert to sustenance (Cohodas 2002:41–43). Food sharing between males and females probably led to familial units (Mascia-Lees and Johnson Black 2000). It is the exchange of labor upon which the family and therefore society is built (Counihan 1999). This reciprocity as related to food and family still exists in the villages I visited.

Gendered Labor

In this area of the world, all rituals involve food (Sullivan 1989). The female maintains the household's relationship with gods, while male maintenance is fashioned around the *milpa*'s relationship with agricultural deities (Sharer and Traxler 2006). Each requires its own set of foods and tools, but each is necessary for cultural success (Gustafson 2002b). The woman performs her rituals using mundane foods of maize, garden herbs, and vegetables collected near the home and she performs the rituals within the home near the hearth (Redfield and Villa Rojas 1934). The male creator deity set limits of cosmos, as men continue to do today by outlining and honoring their *milpas* (Redfield and Villa Rojas 1934; Hendon 2002:75–92) (Fig. 4).

The labor for male and female is different, but both center on maize. According to Landa (1978:34 [1566]), maize was the principal subsistence item of the Yucatan during the era immediately following Spanish invasion; it was also true during the temporal provenance of ethnographies of the mid-1900s and during my fieldwork in 2007–2008. While today not every family produces its own maize, most families do in Señor. The men still work the *milpa,* performing rituals as appropriate, and the women still perform the work outlined in the *Popol Vuh* and *Chilam Balam.* Both sexes still perform their work as Landa observed in the sixteenth century: men labor in the *milpa*; women grind corn, pack lunches, and make tortillas.

The grinding has gotten easier, but tortilla production is still the result of hours of labor in the field by the men and hours near the hearth for the women. The tortilla

Fig. 4 Patio garden in Sahkabmucuy, Quintana Roo

results in great family pride. A woman's tortilla is a source of power. A great tortilla is something one's husband will brag about. While at the time of Landa's writing, women had to grind their husband's corn by hand on the *metate*, most will now use the local grist mill, allowing for a gathering place that has replaced the gathering at the *cenote* in areas where purified water is becoming available (Fig. 5).

This division of labor is tempered by the Maya ideology, which emphasizes balance and complementarity[4] over the Western norm of hierarchical structure placing male as above female. As further clarified by Bassie-Sweet (2002:169):

Fig. 5 Grist Mill in Señor, Quintana Roo

[4] Author recognizes that complementarity is not necessarily equality. The standard for equality differs based on an individual's personal filters, so that while a Westerner may view the Yucatec woman's position as subordinate, it appears that the Maya women with which I work do not view their position as less than equal to that of men…nor do the men view the women as subordinates. This perception is supported by anthropologists and other students of the Maya as noted in the present paper.

> The Maya placed themselves and their environment into categories that allowed them to order and manipulate their world. They frequently categorized using the basic complementary pairing of male/female, right/left, and senior/junior. In Maya mythology, the creator deities and their offspring were role models for proper human behavior and they reflected these principles of categorization.

Nash explains this balance by stating that each was equal in their importance for sustenance and continuation of life (1997:32). Faust finds that this balance between masculine and feminine is maintained in cycles of food and birth. Man provides the raw material for women to make humans as well as providing raw ingredients for women to make food for sustaining those human lives. She identifies gender and foodways as integral symbols for "social interdependency" (1998:94). As stated by Julia Hendon (2002:80–81):

> Maya gender ideology distinguishes between men and women more through productive tasks performed, dress, and comportment than through biology. Male and female action, when joined together through marriage, creates an economically interdependent and complementary whole. Male and female are the two halves of this whole, both necessary for creation and renewal. Neither is superior or able to subsume the other. This relationship is expressed through shared productive action... . Action – what people do and how they do it – rather than intention is how people establish their social identity and moral standing.

The Maya world is only in harmony when male and female are balanced and it is this need for balance that may assist in woman's continuation as partner instead of subordinate (Reilly 2002:229, 320). This balance is evident in feasting (Joyce 1992:262–263). Maya ritual is based in feasting, arguably due to foods as representative of both male work in agriculture and female work in cooking (*ibid.*). This once again illustrates the repeating theme of male equated with raw and female labor as transformative to cultural objects (*ibid.*).

It is the bread of the Maya, the basic unit of real and symbolic sustenance, the tortilla, or even the *tamal*, which best represents this unity and gender parity as we have seen in the marriage ceremony mentioned above. This is similar to findings in regions of Italy (Counihan 1999). She notes that, as in Mesoamerica, in more rural areas, where family centers around the grandmother, it is the consumption of bread, the combination of staple grains grown by man and the cultural labor of women, that represents the gender complementarity and basic units of society and identity (*ibid.*:31–37).

In the villages I visited, high value was placed on woman's work of creating food and maintaining relationships with gods and community. Therefore, I have extrapolated that females retain power in subsistence societies by maintaining this balance found in food. It is a medium of reciprocity that allows for both "connection and distinction between men and women" (Counihan and Kaplan 1998:3). The way a society maintains the reciprocal gifting of food determines whether this division is complementary or hierarchical (Counihan and Kaplan 1998). When either male or female begins buying prepared food, this relationship tends to break down. In traditional Maya society, it can even lead to loss of sexual identity since labor is the delineating factor of gender (Pollock 1998).

The division of labor is not simply a matter of men performing their labor publicly and women performing their labor privately. As Stross (this volume) and

Anderson et al. (2005) have stated, the Maya do not necessarily define their gods as *super*natural (emphasis mine), but as part of the natural world. The fact that male celebrants deal publicly with them not only supports my male-associated-with-nature thesis, but also does not place male as in a hierarchical position above female celebrants who perform domestic rituals. In fact, as Fischer has outlined, both male and female hold the responsibility to protect the balance and reciprocity with humans and gods. A hierarchical gender structure would not be holding with "Maya cultural logic" (Fischer 1999:478).

The three-stone hearth provides to the Maya both ritual and sacred space for a woman to perform her labor and ritual that has equal significance to the four-cornered world of men (Clendinnen 1982:430). In the 1930s and 1940s, ethnographers in the Yucatan found evidence that division of labor was simply another manifestation of Maya duality. That is, it is two parts of one whole unit. A married couple performed different tasks, like two parts of the body might (Redfield and Villa Rojas 1934:68–70; Redfield 1941:174–176). This ideology deemed it proper for male to produce and female to nurture and evolve something into a cultured object, whether it is humans or food – this "mutual economic support was the basis of marriage" (Redfield and Villa Rojas 1934:97).

Rituals of gender role reinforcement are evident among today's Maya. Two that were discussed during my fieldwork were the *Hetzmek'* and, as mentioned above, the wedding ceremony. Anderson et al. (2005) state, "[the] Yucatec Maya body of ritual is centered on food," and according to Counihan (1999), many cultures define marriage as reciprocal food gifting. It is marriage that re-creates the single entity mentioned by Don Luis and regarded as necessary for reproduction (Hendon 2002:82). One is not considered an adult until one is wed. This was further evidenced in my 2008 fieldwork, where a man, 36-years old had built his house, but was still living with his parents. When I asked why, he said he couldn't live in a house without a heart. A house must have a woman to make it a home. A man can produce food, but it is necessary for the woman to transform it into sustenance. She is the creator of, "products crucial to social, ritual and political process" (Bassie-Sweet 2002:169–170). It can therefore be assumed that it is still important to engender the proper roles for male and females via these rituals.

Hetzmek' means "taking astride the hip" (Stross personal communication 2008) or "hip straddle" (Bricker et al. 1998:100), and during this "baptismal" ritual, the family is attempting to symbolically prepare the child mentally and physically for the work they will perform as they mature (Redfield and Villa Rojas 1934). It is a private family ritual. It is performed at three months for girls and four months for boys. The children are given small versions of the tools they are expected to use in life (Chán et al. 2002). In Señor and neighboring villages, as in published ethnographic works (see Redfield and Villa Rojas 1934; Redfield 1941; Landa 1978 [1566]; Gustafson and Trevelyan 2002; and Joyce 2000), the boy is often given miniature farming tools used in *milpa* cultivation and the girl is often given cooking utensils or a small ball of *masa*. They symbolism of the ceremony revolves around food production and preparation in these cases. The timing of the ceremony indicates the continued ties of female with the three-stoned hearth and male with the four-cornered *milpa* and reinforces the delineation of female vs. male work (Clendinnen 1982; Redfield and Villa Rojas 1934; Sharer and Traxler 2006).

Redfield (1941:114–117) observes that for the Maya of the Yucatan, food maintains relations with people and gods. This, combined with the marriage symbolism of male and female work, illustrates the continued dependence on complementary dualism in gendered foodways where from infancy the role of male as *milpero* and public provider and female as creator and domestic provider is reinforced (Cohodas 2002). Rituals such as these were seen to "cook" the "raw" child into its fixed adult state (Joyce 2000:479). The division of labor by gender as demonstrated by the *Hetzmek* is evident in the archaeological record. *Metates* and spindle whorls are buried with female bones, and weapons are evident in male burials. This shows us that material objects are associated with proper gendered labor (Chán et al. 2002).

While there is a delineation of sacred space with respect to gender for a few rituals, for the most part they involve both genders. Men are responsible for roasting meats in the *pib*, while women prepare the tortillas and stews over the hearth (Bevington 1995). Throughout Maya history, public ceremonial occasions seem to be punctuated with special breads served with dishes of meat. These public ceremonies tend to utilize food cooked inside a *pib.* This goes back at least as far as the sixteenth century when ceremonial breads with meat were made in an earth oven (Landa 1978 [1566]). However, there is also evidence in pre-Mayan Olmec art of the *tamal* (Alarcon 1999). Somewhat later, in Maya art at San Bartolo (approximately dated to 100 B.C.) found on the North wall, women are seen offering tamales to a deity identified as the maize god. These *tamales* consist of a *masa* ball with some sort of filling, typically shown as red (when color is still preserved), a color associated with blood (Martin 2008), and possibly signifying meat. Maybe this is an ideal offering, signifying the work of man and woman as joined in offering to the deities. However, a few agricultural ceremonies tend to be public and dominated by men.

For example, the *Wahil K'ol* ceremony is officiated by men who bake four breads in a *pib* (Love 1989). The *Ch'a Chaak* is also exclusionary of most females, which I found true in fieldwork as well as in ethnographic sources (Bevington 1995). Women who are not of child bearing ages, and therefore not menstruating, can participate. A menstruating woman is seen as contaminating when dealing with water spirits (Redfield 1941) and since Chaak is a rain deity, one can only assume this leads to their exclusion from his ritual.

Even though menstruating women are excluded from some public rituals, they were not excluded from the majority of them. In fact, women are the main officials and maintainers of rituals and shrines honoring domestic and lineage deities, who require significantly more intercession (Clendinnen 1982:428–429). Also, female skills shared equal importance with those of the male population. Once again, this is evident in the production and preparation of maize. This all-important staple is paramount in its reinforcement of the complementarity in Maya married couples. The male is responsible for *milpa* corn, called by the Spanish term "*gracia*" (Redfield 1941), while the female cares for the maize once it is brought into the village or domicile (Clendinnen 1982:430), where it is called by its Yucatec name, "*ixim*" (Redfield 1941). "[Separating labor into] these two zones did not imply that women were subjugated or inferior...[these] zones were linked by multiple bridges of mundane and ritual action expressive of that interdependence and within them each group could move with equal assurance" (Clendinnen 1982:431)

Men are only involved with cooking when it pertains to a ceremonial offering (Hamman 1998) or when food is for public consumption, such as the vendors I witnessed roasting pigs in the morning for sale during the lunch hours. When cooking required an ingredient not found in domestic gardens, the male was in charge of retrieving it; for example, wild game or forest leaves (for wrapping food for steaming) were ingredients men were responsible for providing (Coe 1994). Popular festal dishes included layered breads. These layers were typically representative of the heavens. Although the dough was made by women, putting together the breads and filling was reserved for male participants (Coe 1994). These breads are referred to as *tuti-wah* and are made from *masa* and ground toasted squash seeds. Their names and shapes vary from ritual to ritual, and they are usually served with turkey or chicken in non-Christianized ceremonies (Redfield and Villa Rojas 1934). The offering of food is seen as equal to sacrifice (Fischer 1999). Flesh, whether of humans in Pre-Colombian times or of animals, is seen as equivalent to sacrifices or offerings of *masa*, since it was the substance used to create the first humans. These foods are set on an altar, arranged as a cosmogram, and offered to the gods (Sullivan 1989). Once they have cooled, signifying the gods have "consumed" their spiritual essences, then these foods are eaten by the participants.

The "Modern" Maya

Having reviewed the ethnohistorical accounts of past activities and events that support the ideas still maintained by some of the Maya with whom I worked, I would like to take a closer look at the "modern" world of the Yucatec. The long-standing influence of creation mythology and responsibility to the community is dying out. The culture is not static, but through food and its ability to convey meaning (Messer 1984), one can view ideas that seem to be changing or even lost. This is true of most societies. Our own culture seems to recognize ideology more through food than through many other media of cultural expression. As a child, my immediate family was not religious, but we learned about the religion of my extended family during the holidays over meals.

In the Yucatan, more food is being purchased, rather than being produced in the *milpa* due to increases in wage labor. This leads to diminished enculturation of families by the female head of household (Counihan 1999). The respect and authority women received by being good cooks (Robin 2006:237–238) are in part replaced with a world of coercion (Counihan 1999:60). Women are showing concern about labor-saving devices and how their use will impact female identity (Bordo 1997:235). Reciprocal exchange and interdependence is falling by the wayside, replaced with hierarchical structures found in wage-labor societies (Counihan 1999:36). This leads to a devaluation of traditional cooking and, therefore, of female identity (Bordo 1997:237). Part of the power women had in Maya society was based on the time spent performing hard labor. The hours each day spent grinding corn to make *masa* was seen as equal to the hard labor of men in the *milpa*. This gave them equivalent status within the family and community, but as this work has been replaced with labor-saving devices, a woman's value has decreased (Bordo 1997:237).

When villages grow into cities and people leave villages in favor of city life, the gendered division of labor changes and becomes less organized. Food is purchased and Mother is replaced by paid cooks. Nonetheless, recipes and preparation techniques are among the last things in a culture to change (Redfield 1941). This helps us to understand the roots of a specific culture's ideology, because food practices capture some of the most vital beliefs of a society. However, as women enter this world of wage labor, they are cooking less and leaving their community more. This does lead to changes in behaviors when interacting with those outside of the Maya community. It is cheaper and easier to buy "junk" foods than it is to spend hours grinding corn. On the other hand, women who still work in the home continue to teach core values, particularly through food found at traditional meals (Little 2004).

The failure to uphold cultural norms is still frowned upon by conservative communities where women are expected to be nurturers and men are expected to leave the village to make *milpa* (Chirix 2004). The idea that wage labor improves the lives of women in "developing" countries may be ignoring the big picture. Wage labor may afford women a choice in whether or not to be a mother and stay in the village, or to leave and make money, but these jobs tend to be the lowest paying with the least benefits. They have not led to improved social capital or living conditions for women (Leacock and Safa 1986). In fact, women who work for wages are often shunned by their traditional communities and therefore lose the support of their extended families. In most cases, their status at best remains the same, but in many cases it is diminished because of traditional social pressures being at odds with the culture of wage labor (Leacock and Safa 1986). Women's status is damaged not only by prepared foods and labor-saving devices but by working for less pay than that of her husband outside of the home. Now she is seen as an unfit partner because she does not provide equal contributions to the home (McIntosh and Zey 1998:134). More people are leaving for the city as tourism and roads have brought easier access to paying jobs (Anderson and Medina Tzuc 2005), primarily for men. This was illustrated in Señor by large buses owned by the costal resorts that would come pick up many of the men in their 20s and transport them to work a few days at a time or for large banquets and then return them.

Another major Maya tradition that may soon be lost is the consumption of maize. As previously stated, Anderson found that a Yucatec farm worker received most of his calories from maize. The pressure for renewable resources such as corn to take the place of fossil fuels is leading to an increased price associated with corn production. Access to corn products is on its way to being a status symbol for those who can afford it. While these arguments point to the fact that food is indeed beginning to change for the Maya of the Yucatan, it is changing slowly, and in a way that has the community of Señor concerned. It was here that I was informed that the younger generation doesn't understand the symbolism and significance of the corn they consume, but that still most of the food they eat is corn from local *milpas*. They are trying to create programs that not only teach their younger generations English so that they can obtain better paying jobs, but they also have sessions where the local elders teach traditional ways of weaving hammocks, farming, ecology, and knowledge of medicinal plants. It may seem to be a clash of cultures, but the Maya seem to have a goal of progressing while maintaining tradition. This is possibly another riddle of "Maya cultural logic" (Fischer 1999), but probably a healthy way to see their future in the face of globalization and decreased land availability. The conservation practiced by today's Maya is not always due to a belief that it is an important cause, but because they are still tied to the land via their religion and because abuse of the land leads to starvation, thereby implying that ideology based on agriculture seems to provide ecological rewards in the long run (Anderson et al. 2005).

Concluding Thoughts

I do not imply that Maya women should not be given options to perform wage labor, but I do believe that as globalization and activism encourages women to leave their homes in favor of wage-labor jobs, more information should be available to these communities. We are not finding that wage labor leads to continuation of culture, nor does it always result in better living situations or prestige for the females involved. Therefore, we must try to understand this gender dynamic without a western ethnocentric bias, as it is the value judgments from within a society, not of those judging externally, that determine whether the division of labor is complementary or hierarchical (Counihan 1999).

In summary, I will reiterate four main points. First, in Yucatec society, woman is identified as the "cooked" gender, which in turn relates her to a culture where man is identified as "raw" identifying him with nature. Second, these two structural opposites of man and woman are seen as equally important providers of one whole economic unit due to a married couple being seen as one individual unit not as two separate ones. Third, according to the Yucatec, and those who have studied them, the continuity of this societal structure has avoided hierarchical gender roles longer among the Yucatec Maya than is the case with people in other societies. Finally, foodways and the important symbolic means by which they embody traditional social roles and relationships, have provided a particularly useful way to study societal structure; specifically, they helped me understand an interesting gender dynamic *potentially* unique to societies which are not yet dependent on wage labor and have a religion based in agricultural deities.

This division of labor is seen neither by the people studying it nor by the people practicing it as a structure used to oppress women, but a cultural construct necessary in populations that are based in subsistence agriculture. Children are required for manual labor (among other things); therefore women must spend significant time to enculturate and care for their offspring. By finding a pattern that allows women to stay near the domicile, this allows woman to be the central cultural influence of the family. In turn, men can provide the labor that requires travel, whether for trade of agricultural products with nearby villages, or because of increased distance to their *milpas* due to deforestation and population growth. As many "traditional" Maya continue in some practice of honoring agricultural gods, men still hold the *habitus* of providing food for these public ceremonies while the women provide the food for family gatherings. More recently, ethnographers have identified the gender parity of the Maya not as involving structural opposites, but rather as complementary units that encompass each other (Cohodas 2002:28), which probably stems from the fact that Maya ideology is not seen as manipulated by elites. It acts as more of a community conscience (Anderson et al. 2005).

In conclusion, my work supports Redfield's belief that this division of labor has been resistant to change. However, as their labor inevitably does change, so will their gender roles. The more "modernized" communities definitely show a trend away from the balanced social organization and toward women's loss of social capital when a household is dependent solely on wage labor. Foodways have been a particularly fruitful way to explore gender roles of the Maya of Quintana Roo, and I find, like Counihan (Counihan and Kaplan 1998:1), that gender models their food activities as it structures society, history, and ideology.

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Part III
Food as Metaphor: Mythology and Iconography

The Axolotl as Food and Symbol in the Basin of Mexico, from 1200 BC to today[1]

Carolyn E. Tate

Introduction

A strange creature, known for its regenerative abilities, formed part of the edible resources of the Aztecs in the Basin of Mexico (Fig. 1). Alexander von Humboldt, who was instrumental in the European collection and study of the creature, described the Aztec consumption of the comestible as follows:

> *In the year 1245 (according to the chronology of the Abbe Clavigero) they arrived at Chapoltepec. Harassed by the petty princes of Zaltocan… the Aztecs, to preserve their independence, withdrew to a groupe of small islands called Acocolco, situated toward the southern extremity of the lake of Tezcuco. There they lived for half a century in great want, compelled to feed on roots of aquatic plants, insects, and a problematical reptile called axolotl, which Mr. Cuvier[2] looks upon to be the nympha of an unknown salamander*
>
> (Humboldt 1966 [1811]:Vol. II:16–17).

Since 1245 up to the mid-twentieth century, when urban sprawl drove the axolotl to near-extinction, dwellers of the Basin of Mexico have eaten axolotls. (This Nahuatl word is pronounced ah-SHO-lotl). What this chapter explores is the possibility that by 1200 BC the Early Formative[3] inhabitants of Lake Chalco also exploited the axolotl,

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[1] This article is dedicated to Megan Maura Grann.

[2] Georges Cuvier (1769–1832) was a highly regarded French naturalist. Among his many theoretical discoveries and accomplishments was the four-volume *Règne Animal distribué d'après son Organisation pour servir de base à l'Histoire Naturelle des Animaux et d'Introduction à l'Anatomie Comparée (1817).* It covered both living animals and those known through fossilized remains and was translated into English and other languages as a fundamental text in natural history.

[3] In a recent book on the Olmec of Mexico, Christopher Pool dates the Early Formative Period in Mesoamerica from about 1500–1000 BC. The Middle Formative runs from about 1000 to 400 BC. The other temporal period this article refers to is the Post-Classic, which dates to approximately AD 900–1521.

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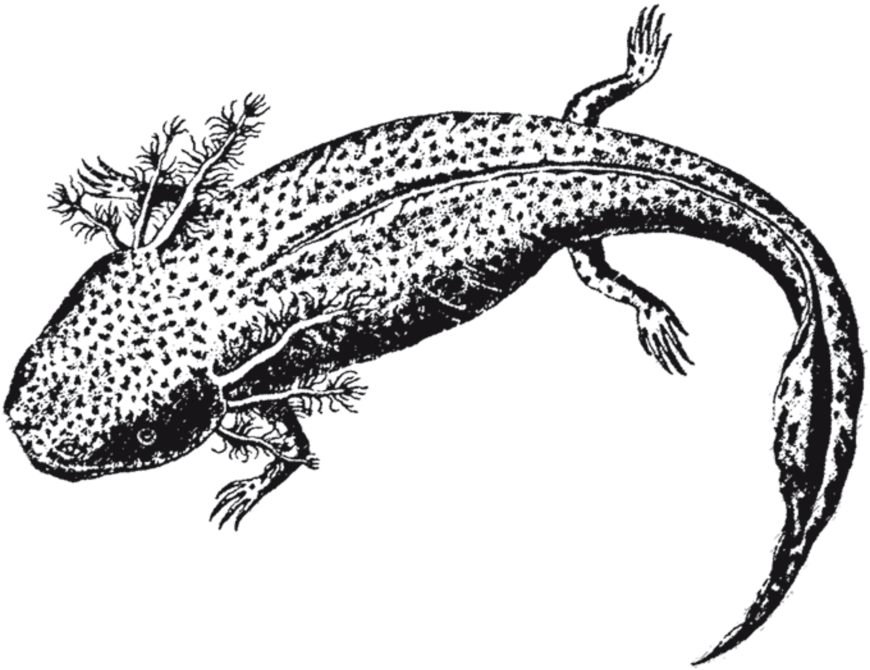

Fig. 1 Drawing of axolotl, after an illustration from Humboldt (1811)

probably for food. It suggests that the Formative Period dwellers of the Basin of Mexico devised a graphic symbol for the axolotl – in the form of its branchlike gill stalks. As the following study explains, the symbol may have referred to the axolotl as a food. It also may have signified the regenerative ability of this perpetually embryonic creature or the mistaken notion that the aquatic axolotl can transform into a terrestrial salamander. But before considering the early prehistory of the axolotl, the chapter looks at its "history" – what has been written about it since 1521 including its enormous bibliography in today's scientific literature – and its role in Aztec mythology.

Perpetually Embryos

The axolotl is native exclusively to the freshwater Lakes Chalco and Xochimilco in the southern portion of the lake system that occupied the Valley of Mexico (Fig. 2). Its appearance is bizarre and its biological properties are uncommon as well (Fig. 3). For one thing, the 25–30-cm (10–12-in.) salamander possesses three striking branch-like gills that project from each side of its head. These filiated, branch-like gill stalks can be vividly pink on white axolotls, orange on the golden albinos, or dark brown on the dark, speckled axolotls. For another, the axolotl is perpetually in the embryonic state, a phenomenon called neoteny. It remains in the larval form even as it becomes a sexually mature adult. For this reason, it consists of embryonic

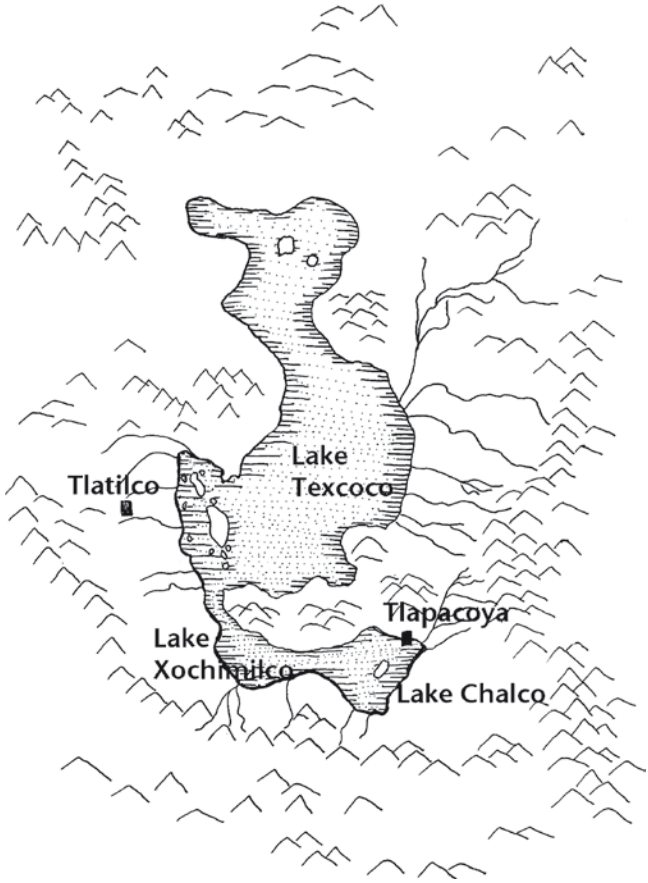

Fig. 2 Map of the Basin of Mexico in the Early and Middle Formative, showing only two of many population centers

cells that are capable of regenerating a foot, a limb, and even parts of its brain or spine. It does this without the production of scar tissue.

Possible Transformations

This is rare enough, but there may be another reason that the axolotl was prominent in ancient myth and art. In the laboratory, given hormone treatment, some axolotls can develop rudimentary lungs and can actually transform into terrestrial salamanders. Although for quite a while scientists thought that, given environmental stress, the wild axolotl could achieve such a transformation, it is now highly probable that this is not the case. However, the average human observer in Lake Chalco might easily confuse the axolotl, currently classified as *Ambystoma mexicanum*, for the

Fig. 3 Photo of axolotl

"deceptively similar" tiger salamander *Ambystoma tigrinium*, which does progress from an embryo to an adult and from aquatic to terrestrial (Smith 1989). *Ambystoma mexicanum*'s capacity for regeneration, its dual branch-like head structures (the gill stalks), and its service as a source of food became symbolic elements in the Aztec stories of Xolotl, the twin of Quetzalcoatl. Other authors have suggested that its presumed ability to transform from an aquatic to terrestrial dweller was also an important element in the construction of myth, but, clearly, this is a problematic interpretation. It depends on whether the ancient people distinguished between the axolotl (the perpetual embryo) and the tiger salamander, which they might not have done. It is also possible (although there is no evidence to support this) that Aztecs or their predecessors might have bred axolotls in captivity and managed to induce a transformation.

The Raw Or the Roasted

That the Aztecs used the axolotl for food, even after they became established in Lake Texcoco, is well known. They also ate lake shrimp, frogs, tadpoles (Hernández 2001), spirulina algae, and small fish. Few large species of fish lived in the lake, making the axolotl useful in terms of protein. In its original habitat, Lakes Xochimilco and Chalco, the axolotl reproduced in February, attained full size in June, and was captured in July (Niederberger 1987:121). In midsummer during the nineteenth century, vendors offered both roasted (ready to eat) and live axolotls in the markets of Xochimilco, Zumpango, Toluca, Pátzcuaro, and many other cities and villages (From Bullock, cited in (Smith 1971). As recently as the 1960s, people in Xochimilco incorporated the flesh of the axolotl into delectable tamales (Niederberger 1987:121). Now, due to the severe intrusion of urban development into Lakes Xochimilco and Chalco, they are nearly extinct in the wild and are on the United Nations Convention on the International Trade in Endangered Species list. There are some efforts to restore their population in the remains of the lakes.

Early European Reports of the Axolotl

Across the centuries, the strange axolotl has fascinated several individuals. Sahagún, Hernández, Clavigero, Humboldt, and Bullock are among the early commentators on the axolotl. Shortly after the Spanish invasion of Mexico, the Nahuatl-speaking informants of the sixteenth century Spanish priest-ethnographer Bernadino de Sahagún wrote:

> AXOLOTL: iuhqujnma cuetzpali, mamae, cujtlapile, cujtlapilpatlachtic, camacoiaoac, papaoa, tzotlactic, vel nacaio, nacatetic, nanacaio, haomjo, amo cenca omjo; qualli, iectli, qualonj, aviac, tetonal (Sahagún 1950–1982 [1590]:#861:vol. XI, 64). Illustration 218 of that volume says "after Paso y Troncoso."

The translations of this passage vary. Dibble and Anderson say,

> Like the lizard, it has legs, it has a tail, a wide tail. It is large-mouthed, bearded. It is glistening, well-fleshed, heavily fleshed, meaty. It is boneless – not very bony: good, fine, edible, savory: what one deserves.

Martínez gives this:

> "*Hay unos animalejos en el agua que se llaman aXolotl, (que) tienen la cola como lagartitos, y tienen la cola como anguila, y el cuerpo tambien; tiene muy ancha la boca y barbas en el pesquezo. Es muy bueno de comer; es comida de los señores*." (Sahagún 1981 [1590]:#862:24).

> (There are some little animals in the water that are called axolótl, [that] have a tail like a lizard, and have the tail like an eel, and the body also; they have a very wide mouth and beards in the neck. It is very good to eat; it is the food of lords. [Author's translation]).

Assigned by King Phillip II to undertake the first scientific mission to New Spain, sixteenth century court physician Francisco Hernández de Toledo spent 7 years studying plants and animals as well as interviewing indigenous people about illness and medical practices.[4] In *Obras Completas* Vol. III, he described the axolotl

[4] Hernández' work was gratefully received by King Phillip II then elaborately bound and put into a storeroom. In other words, it was not published. Some years later, Father Francisco Ximénez (or Jiménez) translated parts of the manuscript and published it in Latin and Spanish under the title *Plantas y Animales de la Nueva Espana, y sus virtudes por Francisco Hernandez, y de Latin en Romance por Fr. Francisco Ximénez*, published in Mexico in 1615. A fire in the Escorial destroyed some of the original manuscript. Several later versions have been published, based on Ximénez.

or *juego del agua* as a delicious food, like the meat of eels. In terms of preparation, they could be fried, grilled, or boiled and dressed with peppers and spices. Oddly, his description of the form of the animal contains strange omissions and inaccuracies. Relatively correct is his observation that it is a kind of lacustrine fish with four feet like a lizard. However, Hernández remarked that it had a vulva like a woman's and could be observed emitting menstrual flows as well, characteristics that have not been reported by modern observers. Also, he failed to mention its most salient feature: the branchlike structures that emerge from each side of the head (Hernández 1959:III, 390). Clavigero (1979 [1787]:plate IV) included axolotls in his survey of animals in Mexico, but his illustration is quite inaccurate. He wrote that they looked disagreeable and ridiculous but said, "The axolotl is wholesome to eat, and is of much the same taste with an eel. It is thought to be particularly useful in cases of consumption" (Clavigero 1787:66). This was a favorable assessment of the taste of the axolotl, for he appreciated some of the eels in Mexico, particularly the Huitzitzilmichin, whose flesh he found very delicate (*ibid*.:64).

In 1803, Humboldt spent a year traveling through Mexico and observed the axolotl, as previously mentioned. The passage above, which incorporated the comments of the insightful naturalist Cuvier, appeared in his book of 1811. In 1822 and 1823, William Bullock traveled through Mexico and included in his report these remarks:

> Fish is scarce and dear, the lakes producing but few species: the *pesca blanca*, or white fish, resembling in appearance and taste our smelts, is the best. Tortoises, frogs and the axolote, a species of salamander, (an aquatic animal much resembling a water-newt or lizard,) are abundant in the market, and all good eating; the latter have been the subject of dispute among naturalists since the discovery of America, and we are still in obscurity with respect to their doubtful history. They were so plentiful in the time of Cortez that his army principally subsisted on them, and I have seen them by thousands in the markets of Tolluca; yet they have never been discovered in a young state, nor has any sexual difference yet been noticed. I brought several home in spirits, which are now under the inspection of Sir Everard Home, from whom the public may shortly expect much information respecting this obscure species (spelling and punctuation as in the original).

Modern Scientific Attention to the Axolotl

Alerted to the axolotl's existence, in 1863, General Forey of the French Expeditionary Forces in Mexico shipped 33 black and one white axolotl to Paris (Smith 1989:5). Six of these plus another donated by someone else were given to zoologist Auguste Duméril. Two years later, some axolotls that had been bred in the Jardin de Aclimatación in Paris transformed into salamanders, much to the surprise of Duméril (Moreno 1969:158). A specialist in amphibians and reptiles, Hobart Smith, describes the event:

> What excited such immediate interest in this case was what then seemed to be an amazing phenomenon: This animal in sexual maturity bred successfully in a seemingly

> terminal, gilled, aquatic form, thought to represent one genus; then it transformed into an equally successfully breeding terrestrial form thought to represent another genus (Smith 1989:7).

However, the original stock sent by Foray contained both the axolotl and its "cryptic mimic," the tiger salamander. Until the experimental stock could be restricted to the *A. mexicanum*, it was unclear whether transformation could occur in the wild. The question is still inconclusively answered, but it seems that axolotls do not transform outside the laboratory (*ibid.*).

Once Duméril suspected that the animal transformed from gilled to terrestrial, he bred thousands that he sent all over Europe for study (*ibid.*). This engendered an explosion of research publications that has continually increased and become an international research phenomenon. For over 100 years, axolotls have been bred in captivity for scientific and educational purposes. In 1971, Hobart Smith published an analysis of the preceding literature on the axolotl. It is now classified as *Ambystoma mexicanum*, a salamander, within the class Amphibia, which includes frogs, toads, and eels (Smith 1971:vii). When Smith's volume was published, it listed over 2,000 scientific articles that contained studies of the axolotl in terms of the process of embryonic induction, of pattern formation, and of the regeneration of many biological structures including axons, tissue for wound healing, organs, skin, limbs, and heart cells. Recent studies have isolated the DNA of the axolotl and determined which genes play a role in regenerating limbs (Lévesque et al. 2007). Researchers are also looking at the axolotl to better understand how blood stem cells are created (Bachvarova et al. 2004).

The Axolotl in Literature

The axolotl has inspired fictional works as well. There is a novel, from Finland, *Elmo* (Peltonen 1987). The axolotl (ajolote) shape shifts in Octavio Paz' poem, *Salamandra* (Paz 1971:p. 78):

> …Xólotl la larva de la mariposa
>
> El doble de la Estrella
>
> El caracol marino
>
> La otra cara del Señor de la Aurora
>
> Xólotl el ajolote)
>
> Salamandra…

It is also the subject of a rather famous short story. It was in the Jardin des Plantes in Paris, near the original European laboratories of Duméril, that the Mexican writer Julio Cortázar began his absorbing relationship with the axolotl. He wrote a short story in which a man, through sharing the gaze of the golden orblike eye of the axolotl, changed places with the creature in the aquarium.

> Empecé viendo en los axolotl una metamorfosis que no conseguía anular una misteriosa humanidad…No eran seres humanos, pero en ningún animal había encontrado una relación tan profunda conmigo…Ahora soy un axolotl [5]
>
> (Cortázar 1994:381–385).

To me, Cortázar's notion of a human merging with the axolotl is very provocative. As we will soon see, a symbol representing the axolotl, an embryo, appeared in what may have been Mesoamerica's earliest graphic symbol system, along with another symbol for the human embryo. Could the Formative Period inhabitants of Lake Chalco also have felt a profound relationship with the axolotl?

Xolotl Transforms into Food

Before turning to the Formative Period, it is essential to consider the role of the axolotl in Aztec mythology. Historian Roberto Moreno, in an article in the journal *Estudios de Cultura Nahuatl*, proposed that the Nahuas may have observed the process of transformation of some aquatic axolotls into terrestrial salamanders and used this observation as a basis for the myths about Xolotl, the canine twin of the mythical hero Quetzalcoatl. The word *axolotl*, he maintains, refers to a Xolotl of the water.[6] What *Xolotl* means is less clear. Exploring the myths surrounding the poorly understood god, Moreno looked at a version of a prominent myth in which there was a link between the edible axolotl and the deity Xolotl.

Xolotl appears in two versions of an important Aztec origin story. In one of these, Xolotl transforms into an axolotl. In the version of human origins recorded by Andrés de Olmos and published by Gerónimo Mendieta in *Historia Eclesiástica Indiana*, the celestial goddess Citlalinicue suggested to her lazy offspring that if they wanted humans as servants they had better ask Mictlan Techutli, the lord of the underworld for a piece of bone or ash from the previous race of humans, then sacrifice their blood on the remains. Among her children, the gods, it was Xolotl who descended to the underworld and retrieved the bones. He dropped them and they shattered, but he rescued the fragments and ascended out of Mictlan with them. On these shattered bone bits, his siblings sacrificed their blood. This mingling of bone and blood brought forth man and woman. In another part of the story, Olmos also relates that when the gods had to sacrifice

[5] "I began seeing in the axolotl a metamorphosis that might not accomplish the negation of a mysterious humanity… They were not human beings, but in no other animal had I encountered a relationship with myself that was so profound…Now I am an axolotl." (author translation; I changed the order of phrases in the selection).

[6] Karttunen (1983:330) cites Molina in defining *xolotl* as "page, male servant" and sees "no obvious connection in sense" to explain the similarity in form between axolotl and xolotl. Karttunen, F. (1983). *An Analytical Dictionary of Nahuatl*. University of Texas Press, Austin.

their lives for the movement of the sun, Xolotl killed the other gods, then himself. However, in Sahagún's version of the story, Xolotl refused to be killed. When death approached, he cried out "Oh gods! I won't die!" and then he fled. First he hid among the maize plants and transformed himself into a plant with two canes but death spied him there. Then he ran and hid among the magueyes, metamorphosing into a plant with two bodies (*meXolotl*), but he was found again. Finally he hid in the water and transformed into an axolotl. This did not save him. Moreno sees his flight from death as a pathetic resistance. Xolotl possessed the ability to transform but only into aberrant double forms of plants and into the axolotl (Moreno 1969).

This story suggests some other insights into the ways in which the Aztec conveyed the ineluctable necessity of death in order for the generation of new life. It demonstrates how the Aztec conceived vital energy as able to move from one material form to another in the cosmic crucible, effecting a "transformation." Since each of the things into which Xolotl transformed is a form of food, perhaps the story underscores the metaphoric relationships in Aztec thought between humans, food plants, and animals. The conceptual equivalence of human and plant life, particularly that of trees and maize plants, is well known. As Johanna Broda and Philip Arnold have shown, when the Aztec sacrificed children in the ceremonies associated with the month I Atl-cualo, the children were called "human paper streamers" (Arnold 1991). The children, selected for their two cowlicks (not unlike the two stalks of maguey and of maize into which Xolotl transformed) and for their day names (those that were names of comestibles) were taken to seven potent mountaintops and watery sites in the Basin. Sahagún's text refers to the children: "they are indeed most precious debt-payments [to Tlaloc]" (cited in (Broda 1991:61). The children were conceptually equated with the paper, made from pounded flesh of trees, and spattered with rubber, which is conceptually equivalent to blood and semen. In the ceremony, both tree flesh (paper), budding tree branches (living trees), and children (living humans) were sprinkled with seminal fluid in the form of tree fluid (rubber). Actual poles of freshly cut budding branches were planted in each home and festooned with paper streamers and splashes of rubber. These ceremonies occurred at the end of the dry season, as advance payment for rain. Broda states: "Evidently, the child sacrifice represents a calling up of the water, the initiation of the process of fertilization…" (Broda 1991:61). Sahagún's text specifies that"The sacrifices continued for several months until the rains began in abundance" (Sahagún 1950–1982 [1590]: II, Chap. 4). These rains were considered as bringing male fertilizing energy to a female earth surface, which then caused seeds to sprout and plants to flourish. So the sacrificed children, with their double cowlicks and food-related names, were "food" for, or provided vital energy to, the spirits of rain.

Xolotl transformed into maize and maguey in the origin story. In Aztec ritual life there were many "deities" of maize at its different stages, including Xilonen of the tender ear, Centeotl of the mature plant, and Ilamateuctli, the noble old woman. With her 400 or innumerable breasts, Mayahuel was the supremely fertile goddess of maguey. Prayers and rituals to the “gods” or spirits of maize and maguey constituted the majority of ceremonies that focused on the abundance of life force in agricultural crops. Xolotl’s metamorphoses brought extra vitality to the most important plants, causing them to create double forms. What was the story’s message when he transformed into an axolotl? As an embryo or seed, the axolotl contains the extraordinary capacity to regenerate itself. The emphasis on transformation in this story provokes the suspicion that either the Aztec conflated the *Ambystoma mexicanum* (aquatic axolotl) with the *Ambystoma tigrinum* (terrestrial Mexican salamander) and thought that the former transformed into the latter, as the early European scientists thought, or that the Aztecs bred them in captivity and somehow produced the stresses that caused some *A. mexicanum* to produce their lungs and become terrestrial. Like the axolotl, Xolotl had powers of transformation. But everyone, even the gods, eventually became transformed into food – sustenance for the earth, the sun, or creatures on earth. The children in Aztec rituals died to feed the process of fertilization of the earth by rain. Similarly, Xolotl died as an axolotl, an embryo. The axolotl was a regenerating creature and a source of food, a sustainer of life.

This often-cited quotation explains this process in the words of the Nahua of San Miguel:

> “We live HERE on the earth
>
> We are all fruits of the earth
>
> The earth sustains us
>
> …and when we die we wither in the earth
>
> …we eat of the earth; the earth eats us”
>
> (Broda et al. 1987:107).[7]

For the Nahua or Aztec, becoming nourishment for others was the destiny of animals and humans alike.

The story of Xolotl also suggests the shifting sense of identity between beings. Quetzalcoatl can take the form of Xolotl, who can transform into doubled maize, doubled maguey, or the embryonic axolotl. Identity flows like vital energy, life force, or in Nahuatl, *teotl*, from one being to another. With its ability to regenerate, the axolotl is a renaissance being. From stem cells it rebirths that which has been severed from a nascent stage to an adult one, but it too eventually pays its debt to life by becoming food.

Now we turn from the textual evidence about the axolotl in the era of contact between the Aztecs and Europeans to the earliest visual record of the inhabitants of the southern lakes of the Valley of Mexico. They seem to have considered the axolotl important as a symbol and possibly a food source as well.

[7] Anthropologist Tim Knab recorded this statement in the course of his fieldwork among the Nahuatl speakers of San Miguel.

The Axolotl in the Early Formative Period

The floor of the Basin of Mexico is at about 2,240 m elevation and the peaks surrounding it rise as high as 5,500 m. Although there is a possibility of rain from May through October, the onset of summer rains is unpredictable, and in October, frosts can kill any annual plants. This made agriculture particularly unreliable and increased the value of wild sources of food. In pre-Hispanic times, the interconnected lake system covered about 1,000 km^2 on differing levels. The higher lakes were in the south, Lakes Chalco and Xochimilco. These were freshwater lakes, while the low-lying central lake Texcoco was saline and the northern Xaltocan-Zumpango lakes were brackish to saline. Humans may have occupied the shores of Lakes Chalco and Xochimilco by 10,000 BC, and were clearly at the site of Zohapilco by about 6000 BC. Experiments with maize and amaranth gradually yielded more productive forms of these plants and others by about 3000 BC. By 1400 BC, there was a substantial increase in population along the southern lakes. People continued to rely heavily on lacustrine resources for food. Around this time, during the Ayotla phase (1400–1150 BC), hollow ceramic babies and ceramic vessels with incised graphic symbols appeared (Pool 2007:206).

The Ayotla phase graphic symbol system included over a dozen motifs that were found on several ceramic types: Pilli White, Coapexco Beige, Paloma Negative, and Volcan Poli (Niederberger 1987). Although the scope of this chapter does not allow a thorough treatment of the motifs found in Ayotla phase ceramics, it might be helpful to consider the structure of the graphic system. This allows us to distinguish between independent and co-occuring motifs. Independent motifs may have several constituent features but they can stand alone. They may refer to an entity, a concept, or a process. Independent motifs with some frequency of occurrence include (1) hands/paws of a variety of creatures, (2) crossed bands, (3) an anthropomorphic head in profile or frontal form, (4) a four-pointed "star" which may also refer to the fontanel on a newborn, (5) the so-called "fire dragon" with "flame brows,"(6) rare images of maize cobs or sprouts, (7) some decorative motifs in reticulated zones, and (8) a six-pointed curvy form surrounded by hooked U-shapes.

An example of an independent motif is the anthropomorphic head. I have proposed that this symbol is based on the form of the human embryo[8] (Tate 2008).

[8] In humans, the embryonic stage stretches from approximately three to eight weeks of gestation. While we are in the embryonic stage, we are visible to the naked eye at about an inch long. Proportionally the head is about the same size as the torso. Our eyes are lidless and positioned at the sides of the head. During the embryonic stage the upper lip and palate form, separating the nostrils from each other and the mouth. Prior to that we have a single oral-nasal cavity. Limbs are just beginning to form and rudimentary digits are webbed. Sexual organs have not yet developed but the spine protrudes at its base, making it seem as if we have a little tail. About 25% of recognized pregnancies today spontaneously abort between weeks 6 and 8, or at the end of the first trimester. This means that in any ancient population, there would have been a frequent opportunity to observe the human embryo. Once the first trimester has passed, the embryo begins to take on more human appearance and we call it a fetus. In modern research, embryonic stem cells are usually obtained from the blastocystic stage that precedes the embryonic stage of gestation.

As a symbol on the Ayotla phase pots, the embryo seems to indicate the metamorphic capacity of the embryo. By this I mean that the Formative Period people must have recognized that the embryo of a human does not yet look human. It has a protruding spine, like the stub of a tail, vestigial gills structures on the side of the head, bulges in the head that result in the fontanel seeming to be a cleft, and tiny budlike limbs with webbed fingers (Fig. 4). The human embryo looks a lot like the embryos of other creatures, including mammals and even reptiles. The Formative people of Lake Chalco stylized the embryo when they formulated it as a symbol and sometimes included elements of other animals, especially their teeth. The heads on Ayotla phase pots consist of an outline of the shape of the head (usually cleft) in profile, in which are the eyes, nose, mouth, a projecting upper lip, and other variable features. This independent motif can be used in conjunction with other symbols in a diagrammatic manner to convey a meaning. One incised vessel shows the embryo head alternating with a disembodied human hand (Fig. 5). The head sprouts from a cleft basal band that probably represents the earth. The embryo, as a metaphoric human seed, is shown sprouting from the earth. Although this head is not infixed

Fig. 4 A human embryo of 56 days within the sacs that surround it. Drawing: Patricia Koemel. Used by permission

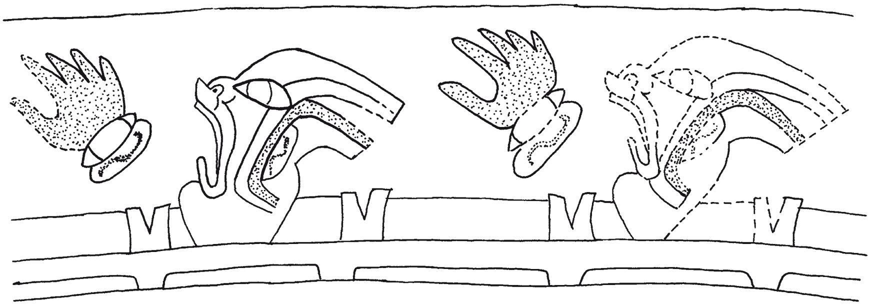

Fig. 5 An Ayotla phase vessel reportedly from Tlapacoya showing the head of a human embryo sprouting from an earth band. Alternating with the embryo symbol is a hand with a possible eye infixed. Private collection (after a drawing published by Joralemon 1971)

with maize sprouts or other maize symbols, it may also refer to the seed of a food plant since it sprouts from what seems to be an earth band. As an independent symbol, it may function as a logographic "stem." Another such independent symbol, the hand, with outstretched fingers, may be scattering the seed.

In the Ayotla phase graphic system, certain motifs did not appear alone, but were conjoined with independent motifs as modifiers. I call these "co-occurring." By focusing on one of these, the "flame brow," which occurs with a variety of other symbolic "stems" – both zoomorphic and anthropomorphic forms – we may find evidence that the Formative Period dwellers of the Basin knew the axolotl and used its unusual gill stalks as a prominent symbol.

In his 1971 monograph on Olmec iconography, anthropology student David Joralemon considers the flame brow as diagnostic of some sub-categories of his "God I" (Joralemon 1971). He later revised these ideas, but still categorizes the flame brows as part of God I, the Olmec Dragon, a hybrid beast with "caiman, eagle, jaguar, human and serpent attributes." He associates this "god" with fertility, earth, water, as well as fire and royal lineages (Joralemon 1976). He sees God I as appearing on three-dimensional effigies, such as the La Venta Monument 6 sarcophagus, on small greenstone objects, and incised on axes, masks, monuments, cliff reliefs, and vessels, each time in a different guise. Only some images possessed the diagnostic characteristic of the flame brow. Rather than try to unravel the large category he created, I simply suggest that signs that co-occur may have been modifiers. They may have created particles of meaning in the way that Nahuatl language is agglutinative: speakers add many prefixes and suffixes to a stem to create a complex message. Flame brows do not appear independently; they always co-occur with a zoomorphic or anthropomorphic form, as discussed below.

The Ayotla phase ceramics at Tlapacoya includes two vessels that are good examples of the flame brow as a co-occuring sign within a corporeal composition. One is the ceramic effigy vessel considered to represent a jaguar or dragon, and the other is the incised vessel with a frontal and a profile image (Fig. 6).

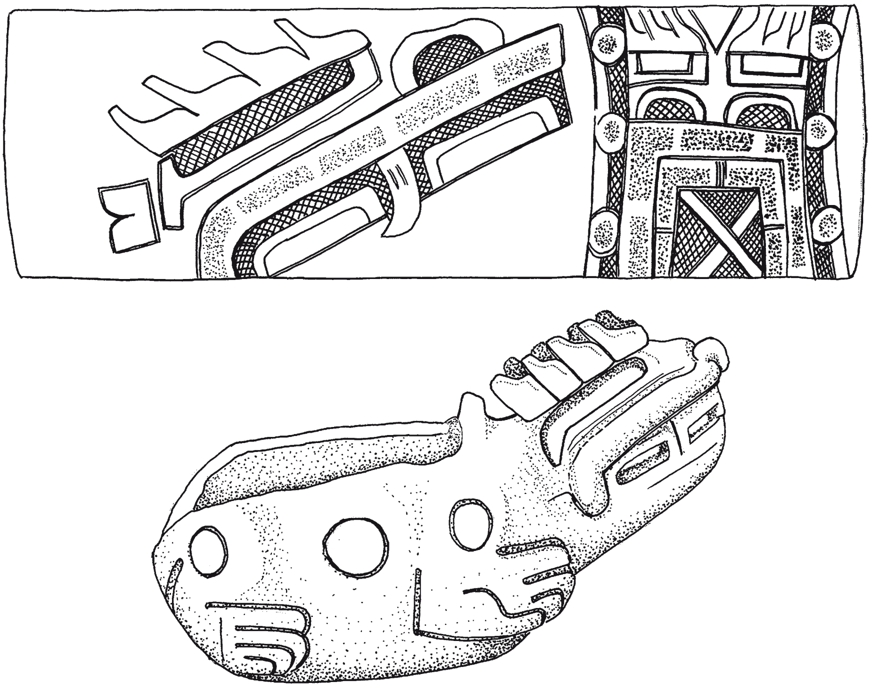

Fig. 6 The gill stalk motif suggestingthat the images on these two ceramic vessels from Tlapacoya (Ayotla phase) portray the axolotl. Above, an incised vessel with a profile and a frontal image.Below, a ceramic effigy vessel from Tlapacoya. Both in the Museo Nacional de Antropología in Mexico

On the effigy vessel, it is clear that there are two protrusions, each with four segments, emerging from the top rear of each side of the head. The creature has a short snout, stub-like teeth, legs that float above the bottom edge of the belly, and some prominent circular spots. All these features are characteristic of the axolotl. The only discrepancy is that the long, transparent tail is absent. (From the standpoint of artisans, is impractical to make a long appendage on a ceramic vessel because it will break off.) Joralemon showed quite a few other examples of designs involving the “flame brow” from Basin of Mexico sites Tlapacoya, Tlatilco, and Las Bocas (Joralemon 1971:Figs. 101–102). The representations are not consistent (Fig. 7). Sometimes there is a “paw-wing” behind the head, with either four or five toes. Usually, teeth are absent or stump-like. The “flame brows” may have two, three, or four “flames.” One interesting point is that some of the “flame brows” are given tiny hairs or filaments. Three or four prominent “stalks” with filaments are definitely characteristic of the axolotl gill stalks and not of any of other animals that have been discussed as the naturalistic basis of the symbol, such as the eagle and the crocodile.

Previously, Donald Lathrap (1973) identified the flame brow as a harpy eagle’s crest (Joralemon 1976:40). Expanding on that idea, Joralemon proposed that the “…Olmec flame brow is a prototype of the later Mesoamerican flame symbol, that

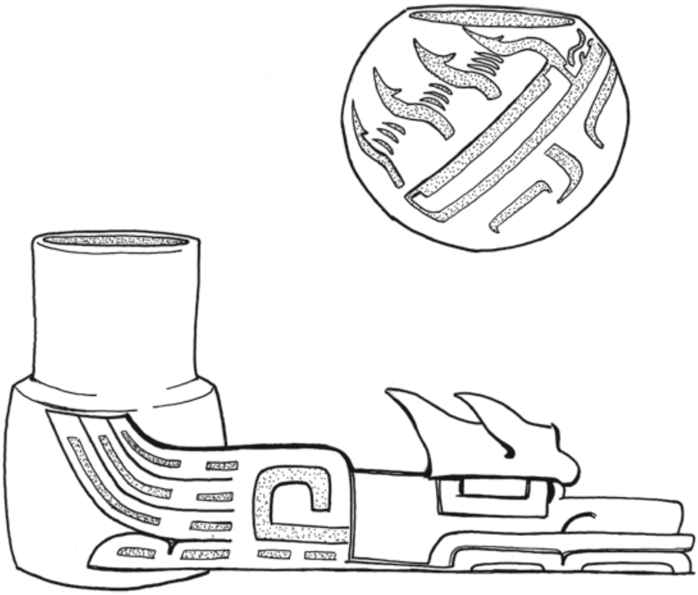

Fig. 7 Vessels from Las Bocas and Tlatilco incised with images that include the axolotl gill stalk. Upper bowl: Cleveland Museum of Art. Lower jar: Museo Nacional de Antropología

the meaning of the motif involves a double entendre between the solar eagle's feather crest and flames…" (*ibid.*) Indeed, some flame brows appeared on compositions with bird beaks, as in some of the objects Joralemon (1976) calls "God III." However, an avian specialist at the Fort Worth Zoo confirmed to me that harpy eagles have a crest on the top of the head, not separate ones over each eye. Anthropologist Karl Taube made the same observation and proposed that the "flame brow" is the fanlike crest of a quetzal (Taube 2000:304). He points out that quetzal feathers were valuable trade commodities and indicators of wealth. While there are some bird images with flame brows, none has the long tail feathers of a quetzal. Nor does the suggestion that this is a bird account for the squat-bodied creature on the Tlapacoya vessel. Quetzals were not native to the Basin. Neither are crocodiles, which have been another suggestion for the source of the "flame brow." While I think that the gill stalks of the axolotl are a more likely source for the branching brow symbol than are the eagle's or quetzal's crest, especially considering it occurs most frequently on amphibian or reptilian creatures than on avian ones, the link to fire is provocative. Fire, of course, causes a transformation. And either transformation or regeneration of vital forms from those that have been damaged could be the fundamental significance of the axolotl gill stalks as a symbol.

As I mentioned, several investigators have suggested that motifs derived from the crocodile (paw, L eye, and the so-called "flame brow") represent the crocodile as a symbol for the earth and its flowering mantle nurtured by rain (Joralemon

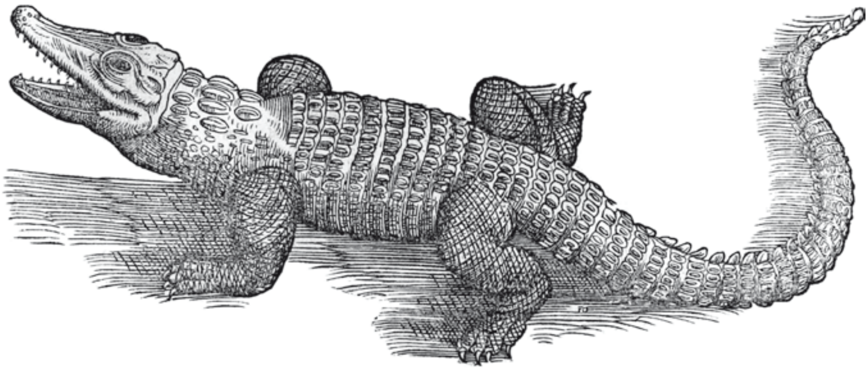

Fig. 8 Drawing of a crocodile from Gesneri, Conradi (1558). *Medici Tigurini Historia Animalium Liber IIII qui est de Piscium & Aquatilium animantium natura*. Used by permission, the Clark Art Institute, Williamstown, MA

1976:37; Stocker 1980:744; Reilly 1994:91–94). To illustrate the crocodile here, I have chosen a drawing from a seventeenth century natural history publication (Fig. 8). Reilly adds the "flame brow" to the inventory of motifs associated with the crocodile and suggests that it represents the scotes or plates on the reptile's back. In constructing his argument, Reilly points out that most representations of crocodiles lack teeth. He thinks that the crocodile's teeth were removed, as were the teeth of the false sun, Vucub Caquix, in the Quiché Maya creation and origins story, the *Popol Vuh*. He concludes that a crocodile with teeth should represent a fearsome, uncontrolled terrestrial environment, while a crocodile without teeth might represent an agrarian, tamed earth (*ibid.*:91–92). However, no myths survive that mention the removal of the crocodile's teeth. Reilly's association of the crocodile with the earth is solid, however. A fundamental notion in much of Mesoamerican mythology and art seems to be that because the crocodile has a rugged top like a craggy mountain range, and because its nose, eyes, and mountain-like upper surface emerge from plant-infested swamps, its form is like that of the earth. For this reason, the image of the crocodile represents the earth, possibly in a previous, watery era. Stocker et al. (1980) and Reilly (1994:100–109) also discuss the crocodile's ability to produce a loud bellow like thunder, the vibrations of which cause water droplets to leap in the air and then to fall like rain. Crocodiles do this in the rainy season as part of a mating ritual. In this way, the "earth" uses sound to call forth "rain." In Sayula Popoluca, a Mixe language, words for earthquake and crocodilian are related: Earthquake is *üs* and Crocodilian is *üs pin* (Reilly 1994:98).

Although in Post-Classic myth the crocodile is clearly related to earth, it seems to me that only a few Formative Period images are irrefutably crocodiles. It seems logical that the crocodile would be a source of imagery in its lowland habitat. The American Crocodile, Morelet's crocodile, and several caimans are native to the lowlands around San Lorenzo. The crocodilian, with its prominent teeth and flat-topped head, was naturalistically represented at San Lorenzo, on a drain stone, now in a European collection (Fig. 9). Several hundred years later, in the Middle

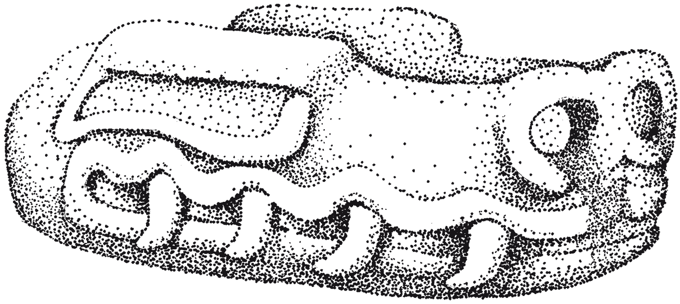

Fig. 9 Crocodilian on drainstone sculpture reportedly from San Lorenzo. Museum Ludwig, Koln, permanent loan to Rautenstrach-Joest Museum

Formative, crocodiles were carved on the cliffs at a highland site, Chalcatzingo (Monument I-B-5 and I-A-6). However, the majority of Early Formative images from the Basin of Mexico that have been considered to be crocodilians simply do not have features that clearly indicate that identity, which would include their huge mouths with sharp teeth, claws, long tail, and scutes, osteoderms, or bony buttons located along the spine.

And although the visual culture of the Basin of Mexico inhabitants could have referenced imported or exotic animals, we should not overlook those native to their habitat. When I looked at Niederberger's discussion of fauna that were native to the Lake Chalco area, I became intrigued, as others have for their own reasons, by the *Ambystoma mexicanum* (Niederberger 1987). Her reconstruction of the Formative Period environment for the Basin first caused me to wonder if the creature with branch-like protrusions from the sides of the head could be a source for the "flame brow.[9]"

Let us return to the Tlapacoya vase as a source of comparison to the form of the axolotl (see Fig. 6). The two images on this vessel have always been considered as frontal and profile examples of the same image. Not all the elements co-occur, so it is hard to be sure. The profile view shows the flame brow with four branching elements. It does seem to be over a trough shaped eye, but perhaps we should read it differently. Perhaps the oval in front is the round eye, behind which the "flame" appears at the back of the head. If the inverted U brackets on the bottom are gums, as Reilly suggested, there are either no teeth or rounded stumps. The latter would be similar to the axolotl. The frontal image has semicircular eye-like elements and concentric circles on the sides, which could represent the axolotl's spots. Since the axolotl swallows its food whole, its mouth is like a portal through which beings pass; perhaps this accounts for the crossed bands in its "mouth."

Several small stone sculptures depict a thick-tailed creature with the gill stalk symbol on its head but without an array of fierce crocodile teeth (see Fig. 10, and

[9] Megan M. Grann, then an undergraduate art history major who was working with me, and were studying Neiderberger's work together as we first formulated this question regarding the axolotl as a possible source for the Basin's flame brow symbol.

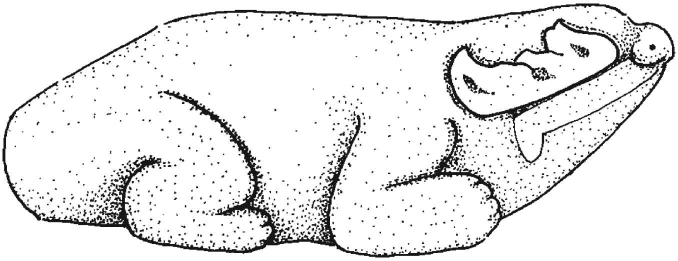

Fig. 10 Greenstone sculpture of creature adorned with gill-stalk. Private collection, on loan to Brooklyn Museum

for another example, see Coe et al. 1995:Fig. 106). Like the Tlapacoya ceramic effigy vessel, these unprovenanced sculptures show a creature with four compact limbs and a button-like nose. While Formative Period artists seem to have readily combined features of one creature with those of another, they did seem to isolate certain striking visual forms to use as symbols. In this case, the gill stalk motif may refer to an axolotl or to that animal's unusual capacities.

Axolotls and Human Embryos

The gill stalk motif must have been the metonymic reference to the axolotl and either its embryonic state or its ability to regenerate. What is rather amazing is that, among the limited set of conventionalized symbols on their pottery, the residents of the Basin may have chosen to represent two creatures that represent the most highly-charged stage of life. The axolotl, a larva, has the power to regenerate, a process that would have been visible to Formative Period people. We now know that the stem cells present in the blastocystic stage of human embryo (first week) also have the ability to regenerate tissue over a lifetime. This early stage of the human embyro of course would not have been visible. However, people would have observed the metamorphosis of embryos that spontaneously aborted at weeks 4 through 9. They would also have been able to observe, in the skeletons of infants who had died, the gradual closing of the fontanel, another symbol related to gestating and infant beings and rapid transformation (Fig. 11). The "star" or fontanel symbol marks many creatures and is found in a variety of contexts and may refer to the concept of birth or rebirth. I suspect the axolotl's gill stalk ("flame brow") represented the potential for or process of regeneration. It could be shown as part of a stylized axolotl or affixed to another symbol to ascribe that power to it.

If the axolotl lives only in Lake Chalco, why is the motif of the axolotl gill stalk found outside the Basin? It was frequently placed in the Middle Formative on votive axes, masks, and other sculptures. In fact, a combination of gill stalks and paw-wings appears on zoomorphic images from a variety of places. One example is on the ceramic human figure from the highland site of Atlihuayan,

Fig. 11 Fontanel designs on a bottle from Tlapacoya and a hollow baby fragment from Tlapacoya. Juxtaposed with the skull of a neonate

Morelos (Fig. 12). This seated figure wears a cape that looks like the skin of an animal. Reilly and others identified the skin as a crocodilian. It has the gill stalks on its head, a tail, and five-toed paw-hands. On its back are U-bracket designs and four-pointed star designs, both standard elements of the Ayotla phase symbolic repertoire, and both, I suggest, associated with gestating creatures. The U is associated with the womb in Mesoamerican art (Heyden 1973; Milbrath 1988). The four-pointed star appears on heads of infants and is clearly based on the fontanel of newborns, whatever else its associations may be. Therefore, in this example, the "skin" worn by this "shaman" may refer to the embryonic, regenerative, transformative qualities of the axolotl. Or his crocodile pelt has been adorned with axolotl gills.

In the sculpture of the Gulf Coast lowlands, where crocodiles lived, there are paw-wing motifs in the Early Formative contexts. These may well be based on the crocodile. In the lowlands, the gill stalk motif becomes more prominent in the Middle Formative, several hundred years after its prominent occurrence in the Ayotla phase in the Basin of Mexico.

Perhaps earlier than the axolotl symbols on Basin ceramics are human embryo images in Oaxaca and along the Gulf. It is quite clear that by 1350 BC, at La

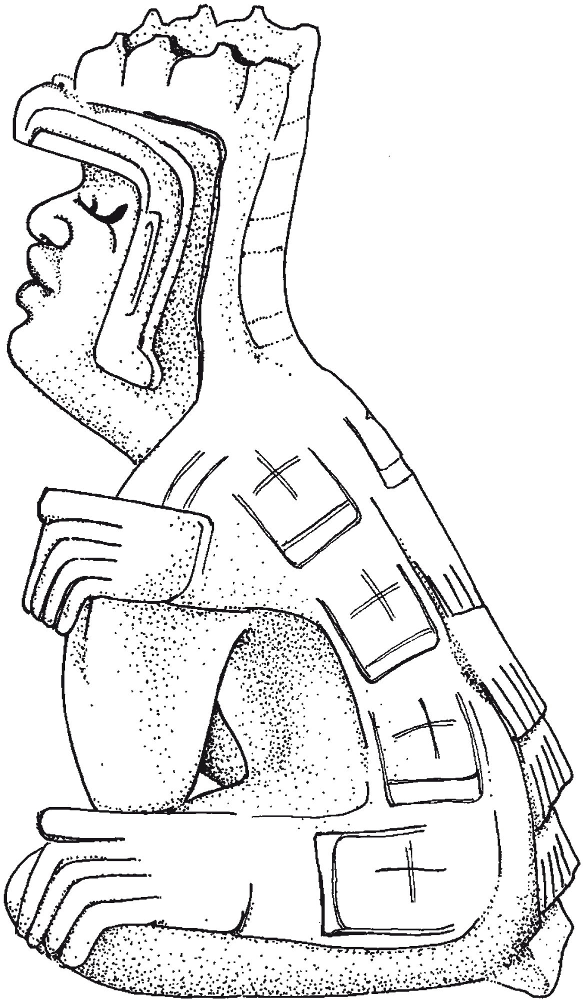

Fig. 12 Gill stalk elements on a cape made from or madeto resemble an animal pelt, worn by a hollow ceramic figure from Atlihuayan, Morelos. Collection Museo Nacional de Antropología

Merced, the Gulf Coast Olmec, portrayed the human embryo (on the large clay ax dubbed "El Bebe"). About the same time, or even earlier, small partially hollow figurines from the Tierras Largas phase in Oaxaca represented a human female with a fetus in an abdominal cavity (Marcus 1998). Depending on how scholars date the Ayotla phase, the embryo images on its pots may be as early as 1350 BC. Although it is difficult to pinpoint which group first made visual expressions of pre-birth beings, these images prove a very early interest in and knowledge of gestational development. Knowledge of the (approximately) 260-day human gestation cycle was clearly instrumental in the creation of the Mesoamerican 260-day calendar.

Unfortunately, the current state of the chronology of Early Formative Mesoamerica still does not permit me to say with absolute certainty that the "flame brow" (now "gill stalk") motif developed in the Basin on Ayotla phase ceramics. If it did, it makes sense that it was based on the form of the perpetually embryonic axolotl and indicated its capacity of regeneration and the kind of energetic potential (now understood as embryonic stem cells) that enabled this miraculous growth. It also makes sense that, about 1200 BC, the Formative Period inhabitants of the lakeside sites Tlapacoya-Zohapilco, Tlatilco, and others took advantage of the tasty axolotl as a food source.

Middle Formative Transformations

By 1000 BC, the Middle Formative, the gill stalk and the embryo image had begun to spread through Mesoamerica. It is difficult to say how the meaning of the axolotl gill stalk changed as it moved across time and space. In some cases, the gill stalk served as a modifier on zoomorphic forms. It also appeared on embryo images in the form of axes and celts, most of which are unprovenanced, and on stone "masks" and face panels (Fig. 13). In other words, it described a quality found in, associated with, or attributed to certain humans. When humans wore a mask upon which gill stalks were incised, it may have enhanced the transformational or regenerative significance of the ritual. Or it may have reinforced the idea that humans, too, are eventually food

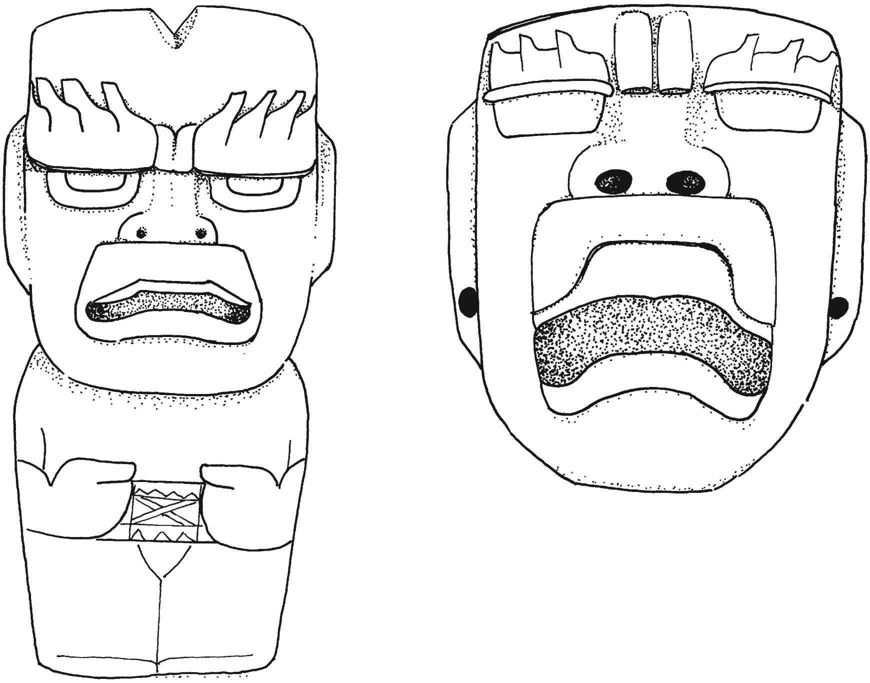

Fig. 13 A "Votive Axe" of greenstone in the form of a stylized human embryo adorned with axolotl gill stalks and other regalia and a greenstone mask from Costa Grande, Guerrero. Axe in the collection of British Museum

for the cosmic processes. In this cosmic food chain, all the food was sacred and transformative. Similarly, all the regalia on which the axolotl gill stalks, the human embryo images, and the maize seeds were carved were probably ultimately cached in the earth, like seeds, to fill the sacred earth or water with regenerative vitality.

Final Thoughts

Why is it important to this volume that the Formative Period inhabitants of the southern Basin of Mexico used the axolotl as food and symbol? We can see that early Mesoamericans keenly scrutinized the biological processes and the living things that formed their environment. Instead of maintaining that creatures and processes were discrete entities, they preferred to identify patterns of parallelism among the biological trajectories of humans, plants, and animals. They must have realized that the embryonic axolotl shared qualities of pluripotency with the human embryo. The idea of constant transformation that is inherent in both gestation and cooking as well as in flowering, death, consumption, and regeneration formed the theme of an early foodway and the earliest graphic symbols of highland Mexico. Little is yet known about class differentiation in these villages. However, the symbols referring to the processes of gestation and regeneration may have encoded the esoteric knowledge of the era. These symbols seem to have been placed on ceramics that were used by an elite class or in specific ritual contexts. When Sahagún's collaborators wrote that the axolotl was food for the lords, they may have meant that there was a sumptuary code restricting its consumption. Similarly, the axolotl symbol may have marked an object as "fit for lords" or perhaps, "fit for those who understand the mysteries of life's transformations."

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Topophilia: A Tool for the Demarcation of Cultural Microregions: The Case of the Huaxteca

Lorenzo Ochoa

> It is not necessary to take our memories as far back to that stewed venison with rabbit stuffed with pheasant enriched with shellfish, that dish wrapped in *hoja santa* and baked in the ground the Huaxtecs offered to the Aztec monarch as a peace offering, to recognize the cosmopolitan role of Mexican cooking and of each of the country's regions. (Boehnm de Lameiras 1996:14)

Introduction

It is a real shame that Boehm's description is only a fictional recreation of an episode from Mexica's conquest of Huaxteca. It gives us an account of the ample variety of food products that Huaxtec offered their conquerors and how this was recorded in some historical sources (Durán 1995 [1580]:Chap. XIX; Alvarado Tezozómoc 2001 [1598–1609]:Chap. XXI). If a narrative scene such as this is not found verbatim in the chronicles from the sixteenth century, Boehm's recreation does not depart too radically from the actual food products that the Huaxtec offered the Mexicans as payment after their conquest. And although historic reality does not play out exactly as in Boehm's imagination, her interpretation and the data recorded in the historical sources prompted me to propose this research paper. Further, two other reasons encouraged me to begin this project. The first was having found in Don Carlos de Tapia Zenteno's (1767) linguistic analysis of Huaxtec vocabulary the first clues to begin considering the characteristics of some foods that he mentions; or, in any case, of ingredients used in Huaxtec cooking. Second, given the lack of information on the subject of foodstuffs in connection with this culture, I deemed it relevant to call attention to this particular issue. Due to these limitations, I tried to approach the subject with the utmost caution, given that the foods that Tapia Zenteno mentions, directly or indirectly, exist in a geographically restricted area.

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For the purposes of this work I have circumscribed the aforementioned area to a landscape of rivers, lagoons, and mangrove swamps (Fig. 1).[1] This information is complemented by my ethnographical notes. In order to carry out this work, I attempt an approach borrowed from geography: *topophilia*. According to Yi-Fu Tuan "*topophilia* is the affective bond between people and place sentence or setting. Diffuse as concept, vivid and concrete as personal experience…" (Tuan, 1990 [1974]:4), I will address this concept later on. What is important is that I find it can be exemplified by south Huaxtec regional cooking; although it is also possible to use this approach in other cultural situations.

In order to give a concrete example of my application of the concept of topophilia, I will explore some examples related to foods unconnected to the coast. This will be reinforced by another set of examples taken from the coastal region. Because one of the purposes of this paper is to test topophilia as an approach in anthropology to delimit cultural regions at a microlevel, I will only introduce the problem. And, although, I will mention several specific examples, to illustrate the issue I will only concentrate on one of them: the *tocón*. I will do so, not because I consider that this particular dish can characterize a microregion, but rather because it is better known than others; also, because, given its ingredients, its pre-Hispanic roots are unquestionable.

Fig. 1 Aerial view of the mangrove swamps in the environs of the Tamiahua lagoon

[1] Plural of "mangle": tropical plant that grows in low terrains and in swamps, some variations have superficial roots or roots that stem from the trunk like tentacles. It belongs to the family of *Rhizophoraceae*, with an ample variety of species. One of these is used in house construction.

However, I want to make clear that the main idea of this paper is not to discuss culinary recipes per se. Indeed, this has been done on many occasions by several experts in the field in a punctual and pleasant way. My objective here has to do with the issues relating to the distribution of certain dishes and how their native ingredients identify a given landscape. It is because of this that a reduced region can be delimited. In no way do I pretend to go beyond this, given that the delimitation of a region is always far more complex from any particular point of view. In fact, I consider that a careful analysis of the coupling ingredients-dish can give cause to circumscribe a microregion. Even though, today, with the presence of globalization, in some cases the microregion can be surpassed by that coupling. I decided to carry out thus the present paper, given that this circumscription, as I said, can be delimited if it is analyzed through the concept of *topophilia*. This is a neologism coined by Yi-Fu Tuan that, among other ideas, holds that a link is established with a landscape based on harmony and sensibility. Such a link can be formed either by having a direct contact with the landscape in question (1990 [1974]:92 and 113), or by visual and aesthetic experience: an interrelationship of man as creator of culture with his geographical environment[2] (op. cit.:93).

But one must be careful because the concept of *topophilia* reaches beyond the simply visual and aesthetic sensations of landscape. One must take into account that this concept also holds connections with the physical and people's well being; and then also the urban impact upon the natural landscape. All in all, it is not the human emotions that predominate, every time when it is necessary the geographical environment strengthens the emotional charge being perceived through symbols that, in the case that I will discuss, identify certain aspects of cooking with an environment of lagoons and mangrove swamps; that is, with humidity. In this way, given that in the examples that I will present this type of landscape is predominant, it is in this environment where the landscape's relationship with man is outlined in order to delimit a microregion. From my point of view, this microregion can only be fractured by the modern world. In this sense, Yi-Fu Tuan considers the natural environment, and not the rural aspects, as that opposed to the urban, because: "wilderness' is now a symbol of the orderly processes of nature" (op. cit.:112).

I would also like to emphasize that for the aims of the present paper I must consider as secondary the implicit geoeconomic and even geopolitical aspects that the approach to this problem entails. As I have already said, I attempt to demarcate this problem from the perspective of the *topophilia*, limited to a microlevel. It seems to me that this concept (Tuan 1972:538; 1990 [1974] op. cit.) can be adequately applied to the problem of cooking in relation to the landscape, and also for the construction of a microregion. And although I have already articulated a couple of ideas regarding the meaning of *topophilia*, it is not my intention to define it, but to move around the content of a geographical environment without separating it, in this case, from culinary taste. I must further clarify that I use this concept here in

[2]For a discussion about the difference between landscape and geographical environment, see J. Pagán Jiménez 2002.

relation to the affect or fascination that food has upon a group, as well as that of its main ingredient or ingredients which correspond or are identified with a particular landscape that does not exceeds the reaches of a small region. In this sense, I follow Gaston Bachelard (*apud* Giménez Montiel 2005) in his images in his book *L'eau et le rêves*. There Bachelard maintains that it is not water *per se* that identifies a landscape, but rather its texture, color, odor, freshness, indescribable to one's eyes and feelings. This means that the landscape, in the case of cooking, also forms a close link with the physical stimulus of the sense of taste. Indeed, this physical experience provokes an emotional relationship between the inhabitants and their geographical environment.

Now, it seems to me that with its content of knowledge and practices related to the identity of a given culture, on the subject of the kitchen there has been given good accounts in every sense – of the influences in certain types of cooking, using and consuming food, as well as of the ingredients, there is an abundant literature. And no less important or numerous are the works relating to the benefits of hybrid cooking, nor of the more orthodox position of those who interest themselves in the exquisiteness and purity of old cooking, falling back on town and family anecdotes. In Mexico in the last years this has been analyzed by state, regions and ethnic groups. However, I think that even though several aspects of our particular issue have been studied, there are still several others to be considered. Precisely one of these aspects has to do with the limited distribution of certain cooking and its main ingredients. As I mentioned, these aspects can come to characterize a determinate space, which is constructed unconsciously. In no way is this univocal or extraordinary, but it is relevant enough to demand our further attention in subsequent works, or to let it be lost as something alien to a part of ideological culture.

At this moment I will leave aside this aspect in relation to cooking since it is only an exercise with which I do not pretend to explain the implications they had nor how certain ideas are preserved, issues feel too complicated and alien for the purposes of these pages. For now, even if tangentially I will touch upon an important figure in the ideology of the Huaxteca. It should be noted that the landscape of the coast where I center my attention plays a determinant role in connection with the flavors of this particular cooking. About the landscape of the coast of the Gulf of Mexico (Fig. 2), coauthored with Olaf Jaime Riverón I have published some considerations on the subject, which are pertinent to the present context (Ochoa and Jaime 2000:16–20 and 2005:22–26).

The Landscape of the Gulf Coast

Before the European contact, for the inhabitants of what later would become Mexico the Gulf Coast came to represent the archetype of abundance, life, and wealth; an earthly paradise or *Tlalocan*. A mythical history tells, that in ancient times *Quetzalcóatl*, an important leader and sage left the barren land of magueys and *nopales* where the model of the city of the highlands was raised – *Tollan Xicocotitlan*

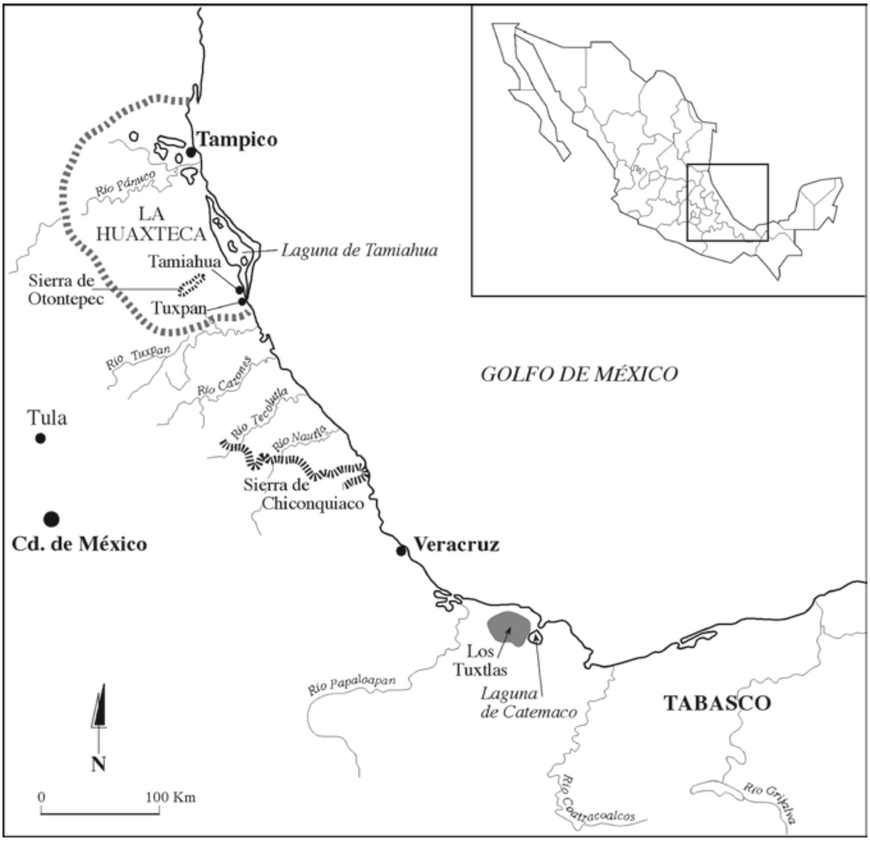

Fig. 2 Map of the Gulf of Mexico and the location of the Tamiahua lagoon in the Huaxtec area of Veracruz state

– in order to take refuge in the low coastal lands in search of *Tlapallan* (cf., *Anales de Cuauhtitlan*, 1992:10–11; Torquemada 1976 [1570]:book VI, Chap. VI:83).

And about the Huaxteca in particular, fray Bernardino de Sahagún wrote that it was a:

> lugar [donde] hacen grandísimos calores, y se dan muy bien todos los bastimentos y muchas frutas... Hay también todo género de algodón, y árboles de flores o rosas por lo cual le llaman *Tonacatlalpan*, "lugar de bastimentos," y por otro nombre *Xuchitlapan*, lugar de rosas (2002 [1590]:book X, Chap. XXIX).

In this area fishing in the pre-Hispanic epoch was, and is still today, a fundamental part of the local economy. With this purpose, the interior currents and even the sea were taken advantage of and used as ways of communication and cultural exchange, as well as of primary materials and luxury goods. These ways intertwined with trails, paths, roads, and thoroughfares of different makings which became a complex system of communication with the interior of the territory. Today all of this forms part of the cultural history, as much as the original landscape is part of the historical geography: the flora and fauna have practically disappeared. Today the monotony of the extensive pastures and the expanded coastal plains are only broken up by various low hills: the one from Otontepec that rises before the lagoon of Tamiahua, and the one from *Chiconquiaco* by the south of the Nautla River. It is toward the Veracruz-Tabasco region that the geographical situation changes. This one is formed by low terrains, where rivers, lagoons, and swamps intertwine capriciously weaving their water threads of diverse widths that create an intricate hydraulic net of several thousands kilometers of navigable waters. The last significant elevations known as Los Tuxtlas appear shortly before arriving in this region. These rise to a summit of little over 1,500 m above sea level and are flanked by the Papaloapan and Coatzacoalcos rivers. There, among the solid mountain range, appears the lagoon of Catemaco (Ochoa and Jaime Riverón 2000:23).

The Huaxteca

Given that my area of expertise is the Gulf Coast and the Huaxteca in particular, I will illustrate the present issue with the figure of *D'hipaak* or *D'hipak*. This is perhaps the most relevant ideological concept in the cosmogony of the Huaxtecos-*teenek*, mainly because of the relationship it has with maize, one of the principal ingredients of Huaxtec cooking. It seems relevant at this moment to clarify that the Huaxteca is a cultural area in the Gulf Coast of Mexico where several ethnic groups are to be found: *teenek*, nahuas, otomíes, pames, tepehuas, and totonacos. Of these, the first three groups played a significant role in the configuration of the cultural and ideological culture of the area. And from the perspective of the historical sources and linguistics, it is from the *teenek* that the name was taken (cf., Ochoa and Gutiérrez 1996:99). In contrast, I presume that the extent to which the Pames had an impact in the configuration of Huaxtec culture is still ignored. I also suspect that in some historical passages of the written sources the Pames are mistaken for the Huaxtecos. The role of the Totonacos and Tepehuas, I believe, was extremely marginal in this regard.

Among the *teenek* it is believed that *D'hipaak* is the universal soul of maize. It is also the "maize that it is not yet maize." In the past, it was identified as the *pejelagarto* – garpike – first day of their calendar, and in the 1990s a hypothesis was put forth that this passed over to the Mexica calendar under the name of *cipactli* (Ochoa and Gutiérrez, op. cit.). What does the idea of *D'hipaak* have to do with food? I deliberately took this figure, precisely because it has been related with the earth; *tzabal* in Huaxteco, word that bears a correspondence with the *nixtamalización* of the maize grain[3] (cf., Tapia Zenteno, op. cit: p. 72). I opened this parenthesis with

[3] *Nixtamalization* typically refers to a process for the preparation of maize in which the grain is soaked and cooked in an alkaline solution, usually limewater, and hulled. The process is employed, using both traditional and industrial methods, in the production of tortillas, tamales and many other items. [TN]

the purpose of suggesting that this physic and chemical process was not known until the second half of the last millennium BC (Ochoa 2005:283–284). It would be a long time before this grain became an unquestionable figure in their religious ideology as well as a central character in their cosmology. *D'hipaak* is the alpha and omega of Huaxtec cosmogony. It seems evident that if I were attempt an explanation of this idea it would divert me toward a complicated maze of which I would not be able to reemerge without having moved away from the main purpose of this essay. Therefore, I will refer to the research done in 1996–1999 (Ochoa and Gutiérrez, op. cit.), as well as to the work of Alcorn et al. (2006) where, rightly, it is suggested that the Huaxtecos-*teenek* consider this character as the cultural hero who first gave them maize. Although it is unknown if *D'hipaak* performed this role in pre-Hispanic times, he also appears as child-hero in a myth that I gathered among the *teenek* of Tancoco, in Veracruz (Ochoa 2007).

Today the Huaxtec use the term *D'hipak* to refer to maize and to the soul of maize. This is the same *Zipac* that according to Carlos de Tapia Zenteno in his vocabulary of the eighteenth century meant "new green maize," but also "sword fish." This name was also given to the "pejelagarto" or catán, which was the symbol of the first day of their calendar; this symbol is also present in the Mexica calendar as *Cipactli* and in the Maya as *Imix* (Ochoa and Gutiérrez 1996:99). It is this image which frequently appears in the Huaxtec pre-Hispanic monuments. *D'hipak* was and can still be taken for the Alpha and Omega of Huaxtec cosmogony. In some places of the Huaxtec area it is believed that the maize is the flesh of *D'hipak*. He is the one who has to defeat hunger, which means death. This is very well described by Marcela Hernández Ferrer (2000:110, *apud* Ochoa 2007:29). Maybe because of this among the Huaxtec of Tancoco, *D'hipak* without losing its character of green maize, takes on the role of cultural hero in their mythology.

Indeed, I found that in Tancoco the Grandfathers tell that many years ago in a place called *Mirador*, found in the hill *Pochteco* or *Pochtequitla* (broken hill), lived a horrible monster. They named it *Chapocóklthiu*, and it was like a huge sparrowhawk or eagle with two heads. This monster terrified the town's inhabitants; they had to offer a sacrifice to it: each family, every time a child was born it had to be given to it by placing the child upon a stone. The one in charge of this task was an old man, a priest named *Pubikinik*. Shortly after the child was left there, the monster arrived to eat the newly born. Several years passed like this. In the town all was sadness. There were no young people, much less children. The elder were powerless in the situation, they did not know what to do with that horrible being. When the desperation was becoming overwhelming there came a child, but nobody new where he had come from. Passing in front of one of the houses, the unknown child (who was non other than *D'hipak*) saw a woman crying while tucking a new born baby in his clothes. He asked her what was wrong and the woman told him what had been happening in that place for so many years. After listening to her the unknown child comforted her and told her not to cry anymore. He asked her to gather a lot of wax from the hills (*tullik*) that was made by the black flies while they are nesting in the tree trunks where they make honey. Once he had enough wax, the unknown child made a puppet (*shulcucht*) in the form of a child which he gave to the priest so that he would leave it in the usual place where the monster went to claim his due. Meanwhile, the child *D'hipak* was going to hide under a stone armed with a club. After having left the wax puppet the priest then retired from the place. When the monstrous animal took the puppet with its talons and began to strike with its beak he found itself glued to it. *D'hipak* taking advantage of this delivered a deadly blow with his club. There laid the monster slain. *D'hipak* took a stone (*taj*) that looked like a knife, he opened the monster's beak and cut its tongue off. He then went back to town without saying anything about what he had done. That afternoon a man passed by the dead monster, picked it up and walked toward town yelling that he had killed the monster. Everyone came out joyously to show him their gratitude. Among the people was the child *D'hipak*, but no one paid attention to him. Seeing that people were beginning to believe the lies of this man, the child *D'hipak* asked him to open the monster's beak. He did so and everyone saw that its tongue was missing. The child asked him what had happened to it. The man could not answer and *D'hipak* took out from among his robes the missing tongue. He told everyone that the man was lying to them and that it had been he, *D'hipak*, who had slain the monster. All the people of the town were grateful to him and asked him what was there to be done. The child said that from that day forth they would be happy and that they would have to work and help their children. As a sign of gratitude the people of the town gave *D'hipak* new clothes; these became the leaves of the maize cob. The child *D'hipak* disappeared and no one heard from him again and people thought that the "the spirit of maize," D'hipak, had taken a child's form to save the Huaxtec people. It is because of this that tribute is given to maize, and they dance in the time of sowing[4].

Following the meaning of the word *D'hipak*, or *zipac*, it would mean the very being of maize itself since this word is used to refer to the *ehatal*, "the soul of maize"; to the *ts'itsin*, "the spirit of maize"; and to the *ichiich* of maize, that is, the "embryo inside the seed" (Alcorn 1984, *apud* Ochoa 2007:31). The nexus formed by the maize and the soil is also found to a certain extent, in a second acceptation of the word *zipac* en Huaxtec language, which is "sword fish." This can indeed be identified with the *pejelagarto*, if we consider its physical characteristics; and conceptually this is also the monster of the earth as the Mexicans described the *cipactli*.

I would like to emphasize that I do not propose the question from an ideological perspective, but rather from the sphere of cultural geography, not alien to the anthropological framework, what I intended to stress by this was the role played by maize both in Huaxtec cosmogony and cooking, as I will now go on to show in the examples that follow.

[4]This Spanish version was collected by Lorenzo Ochoa in April of 2000. It is the result of an interview between Mr. Lucas Marcial of Tancoco, Veracruz, and Professor Francisco de la Cruz Labastida, who made the transcription from Huaxtec to Spanish. I have rewritten it in order to give it more fluidity while trying to maintain the meaning of the original.

Cooking and its Ingredients

At this point I must make a clarification, although the purpose of this work is to show the possibilities of delimiting a microregion through the distribution of certain dishes and their ingredients, it is in no way my purpose to play with the idea of the cultural construction of territoriality. This has no place in the present essay. According to Giménez Montiel, this idea of territoriality is a concept that "*resulta indisociable de las relaciones de poder*," even though a territory can have diverse functions, such as pragmatic and utilitarian or cultural and symbolic (Giménez Montiel 2005:31). In spite of this, it would be pretentious to discuss the idea of a "culinary territoriality" in relation to power, as it is frequently done with other concepts. In fact, in this case, the distribution of food in the Tamiahua lagoon does not depend on the influences relating to either politic or economic power. A cultural region has to do more with the way in which its residents behave among themselves rather than with those of other regions (Grave Tirado 2003:31). Therefore, Grave Tirado states that: "*tenemos que buscar hasta dónde llegan las semejanzas a lo largo del tiempo, pero también las diferencias que los separan de su vecinos, para llegar a establecer los límites de una región*" (ibidem).

I have resorted to this conceptualization because the idea of territoriality within a landscape can be understood on different levels within the geographical scale, as well as from a local to a world scale (Giménez Montiel, op. cit.:482). In this way, I again follow Bachelard (*apud* Giménez Montiel, op. cit.). Taking the example of the house-abode as the most intimate and immediate space. This space continues on the nearby territories such as the neighborhood and town, and to these follows the local and regional levels. These are frequently matter of affection and attachment, and it is here where incorporate the concept and idea of *topophilia* for the descriptions of practical order becomes feasible.

It is perhaps in this sense that it will not be lost if I begin by making a reference to the consumption of specific foods in the troubled landscape of central Mexico. To try to propose how some particular ideas and ways were preserved without being incorporated to those of the Europeans; or why certain practices or uses of the Old World did not take hold in the preferences of the Mesoamerican groups are questions that are not possible to answer at this point, although it is reasonable to bring them to the forefront. Thus, to the contemporary inhabitants of what used to be the lake region of the Valley of Mexico, images of the ways of catching and cooking certain basic ingredients for "traditional" dishes, as it was recorded in the historical sources, are no longer in their minds. I give the case of a small, very popular crustacean, the *acocil* (*Cambarellus montezumae*). This was baked or boiled regularly eaten in *tacos*[5] (Fig. 3). This crustacean was closely related to a lake region landscape that has been practically lost for the great bulk of the region's population. It is a truism to consider the depletion of the lakes' aquifer and uncontrolled urban

[5] It is a rolled up tortilla filled with the *acocil* drenched in a chilly and tomato sauce.

Fig. 3 *Acociles*, a species of lacustrine shrimp that is still consumed in some markets

sprawl as the causes for this loss. However, the *acocil* are occasionally still found in the markets of Mexico City, where they are still eaten in the same fashion.

As it can be seen by this previous example, where before there was a marriage between food and landscape there is now an evident divorce. Something similar happens with the landscape where the *jumiles*[6] are gathered (from the Náhuatl *Xomitl*); as well as the way in which the *escamoles* (eggs of the ants' larvae) are gathered is being lost, mainly in the state of Hidalgo. This not very pleasant task since it entails taking the larvae out of the anthill while enduring the ants' bites and the sun. The people who perform it not only must they live with a landscape but with a calendar that determines the collection days according to the weather. Only those who still live there where this type of activity continues to be practiced can recreate and feel the landscape that is slowly disappearing without divorcing it from a specific epoch and culinary taste. This has also changed in a determinant way, since now the objective of these tasks has primarily an economic character given the high value that this product bares in the marketplace. Thus, what use to be an important part of the indigenous groups' diet, now has become far more profitable to take it to the cities. Those who consume such products, buy them at the markets or in the streets unaware of the difficulties that their recollection implies; or, much less, are they worried about the loss of a landscape that is totally unknown to them.

[6] According to Santamaría, 1974, it is an "*insectillo muy abundante en la Mesa Central que los indios comen seco y tostado. Es una especie de hemíptero pentatómido, muy abundante en la Mesa Central.*"

Something similar occurs with the gathering of maguey worms, which now takes place more with an eye on the market. Just as it happens with the *escamoles*, the maguey worms have ceased to be a dish consumed by families in the midst of a landscape full of magueys and *nopales*, to become part of the exotic Mexican gastronomy now consumed in "authentic" restaurants in cities the world over.

It is different in other latitudes that without having to do directly with the practice of gathering, or in the sow and harvest of vegetables, the joy of consuming certain food items remains immersed in the landscape from which these were obtained. But the space where these are found and consumed can be smaller than the extension of a cultural area. With this I mean to signal that the dominance of a landscape coincides with the distribution of certain produce, although the latter does not necessarily correspond to a cultural area. In this way, from a gastronomical perspective, a microregion is conformed by a particular cooking that comes to define it.

With two or three examples from the cooking of the Gulf of Mexico's cultural area, and some others from the Huaxteca in particular, I will seek to illustrate how these types of issues have been relegated to the background. I will show those foods that have been restricted to an area practically without going beyond those limits marked by distribution and consumption of certain dishes and their ingredients that where "produced, collected or caught" with little or no dependency in long distance exchange, as suggested by Sidney W. Mintz (2003).

How can we speak of certain customs and make this suggestion extensive, as if these customs belonged to a macroregion. Beginning from south to north along the Gulf Coast, I will set as an example the consumption of foods that have their origin in lakes. If I mention the capture and eating of the *pejelagarto* (*Lepidoseus viridis*), one does not think of the tropical regions where it lives, but it is rather unfailing connected with Tabasco. And a very specific way of eating it: baked (Fig. 4). It is also consumed in *tamales*.[7] It seems to me that with this image it is possible to visualize how a dish corresponds with a particular landscape, as the *pejelagarto* with the low tropics, full of mangrove swamps, lagoons, swamps, and rivers. As I have suggested, this species, which is by the way is overly exploited, exists in other places of the low tropics. Although it has become a product identified with a region circumscribable from a culinary point of view. Without a doubt, this is a product that the Spanish conquistadors knew, as much as all the voyagers that traveled those regions. And we can say with some certainty that they ate it, albeit more out of need due to the circumstances than out of taste for it. Maybe its aspect was never agreeable to them; or the flavor or texture of its flesh was not among their gastronomic preferences, as neither the dishes related to the center of Mexico. If perhaps I have not found it being mentioned by some conqueror-chronicler or a traveler, of the *pejelagarto* I have not found a single reference in relation with Tabasco's cooking; nor, much less, with the way it was consumed and it still is consumed today. Other dishes of that region could be mentioned, without defining it, in relation to the

[7] Tamal, from the Nahuatl *tamalli*. A kind of roll made of maize flour to which lard is added, stuffed with stew, in this case the *pejelagarto*. It is then wrapped in banana leaves or those of the maize itself and steamed cooked.

Fig. 4 Roasted *Pejelagarto* in a market in Villahermosa, Tabasco

consumption of certain vegetables, as the *tamales* of *chiplinín* (*Crotalaria striata*), or maize *tortillas* mixed with *yuca* (*Manihot dulcis*). There are other examples but it seems to me that the first one is sufficiently precise to exemplify the way in which the culinary taste of a cooking magnifies a region.

The Construction of a Microregion

For practical reasons I must take a big geographical leap, not because the middle section of the Gulf Coast lacks microregional cooking, but rather for the difficulty that its detection presents, besides it would prove a tedious journey. Despite that fact, only in passing I will mention an exceptional example related to the Catemaco lagoon. There a small mollusk is consumed that is not found in other areas, the *tegogolo* (*Pomacea patula catemacecis*). This is a culinary complement of a microregion circumscribed to this lagoon and it can hardly be said that it can be found outside of Los Tuxtlas.

Finally I arrive in my journey to the Huaxteca; specifically to the south of this cultural region, where we find diverse dishes and snacks that are consumed, like in other areas, at a macroregional level. All in all, others come to characterize the microregion. Following Tapia Zenteno I will point to the *pemoles*, a type of bread roll made of maize flour mixed with lard and a kind of dark sugar (Fig. 5). However, today the eating of *pemoles* exceeds the limits of this cultural area and does not attend a specific landscape. Tapia Zenteno writes (1767:84) about a large *tamal* called *bolín*, also known to people as *zacahuil* (Fig. 6): "tamal muy grande, que

Fig. 5 *Pemoles*, a type of doughnut made with maize, lard, and sugar

Fig. 6 *Zacahuil*, large *tamal* of pre-Hispanic origin; traditionally made with turkey or chicken covered with maize dough

tiene dentro un Huaxolote y también lo cuezen en hoyos." As in the previous case, its preparation and consumption have practically gone over the limits of the Huaxteca. And if originally its preparation and consumption had a ritualistic character, today is a dish that it is regularly eaten particularly in the markets of the Huaxteca and Totonacapan; although, in some places for determined *fiestas* it still has its ritualistic character.

On the contrary, other dishes have a more limited distribution, as the *huatape*; the roe of *liza*[8] (Fig. 7) with *pipián enchiladas* (*Cucúrbita moschata*) (Fig. 8); and the *tocón*. This last one will be useful to characterize a mircoregion. *Huatape* (*huatap* in Huaxtec) is the name of a savory *atole*[9] whose principal ingredients are: maize dough, tomato, chilly, and *epazote* (*Chenopodium ambrosioides*). Shrimp or fish is added to this mixture (Fig. 9). While the *huatape* is related more with a landscape of lagoons, mangrove swamps, and the coast than with inland environments, and its distribution is very limited even within the Huaxteca itself, it is possible to find it in some restaurants beyond the said area.

The two other dishes mentioned allow me to set the foundations of my proposal. The first one, a hybrid, is the result from the combination of the cake of liza's roe and the *enchiladas* of *pipián*. These dishes are indefectibly related to images of a particular landscape that corresponds to south coast of the Huaxteca and to the Tamiahua and Tampamachoco lagoons. The cake of liza's roe barely moves beyond

Fig. 7 *Liza* roe cake; made with egg, cilantro, and *Liza's* roe

[8] A fish of the lagoon of the north of the coast of the Gulf of Mexico.

[9] From the Nahuatl *atolli*, a thick beverage made with maize flour.

Fig. 8 *Pipian* seed *Enchiladas*; made with maize *tortillas*, folded in half, drenched with a sauce made with toasted pumpkin seeds crushed with chilly

Fig. 9 *Huatape*, stew of pre-Hispanic origin made with fresh shrimp or fish, maize dough, tomatoes, *epazote*, and chilly

the limits of these lagoons. This is prepared by mixing the roe of this fish with eggs and cilantro (*Coriandrum sativum*). But here a fundamental role is played by the *enchiladas* of *pipián*. These are prepared with sauce made with chilly and *pipián* seeds, roasted and grinded, with which the maize *tortillas* folded in half are drenched. The interesting fact is that this type of *enchiladas* is unknown outside those limits; although, with the presence of globalization, it can now be found in other places of the south Huaxteca.

The second dish that characterizes this microregion is known as *tocón*[10] (Fig. 10). It exists at a local level and it is associated with a lagoon and mangrove swamps landscape and with the smell of bananas. This one, like the *huatape*, has pre-Hispanic roots. It is made with dry *trotillas* (*tochón*) and dry shrimp, these main ingredients are cooked with *epazote*, onion (*xonacatl* in Nahuatl), *ancho* chilly and tomato. This dish, almost extinct, has in its distribution and consumption a territory limited to the Tamiahua lagoon. It is unknown beyond its limits.[11]

The intention of this essay, as I initially pointed out, was neither to present abundant examples or cooking recipes. Its purpose was not either to exalt the goodness of a cooking that recreates the exquisiteness and purity of ancient cooking, nor,

Fig. 10 *Tocón*, stew of pre-Hispanic origin made with stale tortillas, dry shrimp, *epazote*, tomatoes, and chilly

[10] It seems to be a corruption of the pronunciation due to Nahuatl influence, because Tapia Zenteno wrote *tochón*: dry *tortillas*, one of the main ingredients of this dish.

[11] The circumscription of this dish does not include the immigrants who recreate it in the places where they establish themselves. However, unlike *huatape*, it is not found in restaurants.

much less, to present anecdotes from families or towns. On the contrary, the objective of this short paper, from the perspective of culinary culture, was to propose how it is possible to delimit a cultural microregion within an anthropological perspective, based on the distribution of certain dishes and their ingredients. If I was able to manage this, I did from gathering news related to Huaxtec cooking in Tapia Zenteno's vocabulary, my ethnographic notes, and an approach based on the proposals of Yi-Fu Tuan. In the case that occupies me, the territorial delimitation has been determined precisely by a landscape, a culinary style and its ingredients. All this based on a geographical scale that barely exceeds the local, for it is practically independent of external markets.[12] The principle that delimits a microregion has an ecological character. Thus, given the homogeneity of a particular microregion it provides a basis to disregard the political principle, even perhaps the economic principle, but certainly not the cultural one (cf., Grave Tirado 2003:21). This microregion has left in its residents a footprint of affection and care toward the landscape of lagoons and mangrove swamps. These feelings can only be understood and felt in themselves and their study is possible from the perspective of the *topophilia* for the descriptions of practical order. After all, "we certainly have no obligation, to describe any area other than the one for which we have a special fondness or inexplicable fascination" (Tuan 1972:538).

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[12] Mintz underlines: with little or null dependency on far distance exchange, op. cit.: 2003.

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This World and Beyond: Food Practices and the Social Order in Mayan Religion

Brian Stross

Introduction

When ethnographers study the foods and food practices of a community or a people, even when they concentrate their efforts on everyday foods and their production, distribution, preparation, and consumption in this world, they usually find that there is much more to describe than they had anticipated. When the study embraces religious uses of foods, and therefore includes foodways pertaining to the otherworld(s) as well as food practices involved with transitioning between worlds, the description becomes even more complex, for it must then include food for the deities and food for the soul, among other categories of foods along with such other food practices as those discussed below. Foodways that are part of religious practice are generally more ritualized, specifying also in greater detail the performers, practices, and paraphernalia involved than would be done with secular foodways. I hope to present, in a programmatic way, without dealing with the secular foodways and everyday foods of people in *this* world, some of the complexity of foodways involving consumption and religion.

The focus in this paper is on religious uses of foods and consumption food practices by the Mayans of Mesoamerica. Therefore it is important to be able to distinguish, at least operationally, between the religious sphere of cultural activities and the secular or non-religious sphere. Definitions of "religion" for anthropologists abound in the literature, and students of the anthropology of religion continue to express a variety of opinions about what sort of cross-culturally valid operational definition might profitably be used in studying the cultures of others (Winzeler 2008:3–22; Stein and Stein 2008:18–27). One of the most common and simplest definitions of religion cross-culturally is something approximating, "human ideas and practices relating to the supernatural." This definition is inadequate, and in particular it appears inadequate to a student of Mayan cultures who might respond that the Mayans they know consider entities that westerners refer to as supernatural

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beings, or other "supernatural" concepts, as entirely natural and completely part of everyday life (cf. Wisdom 1940:401; cf. Evans-Prichard 1937:81). This could lead one to a conclusion that since some Mayan groups do not differentiate between natural and supernatural beings, therefore they either have no religion, or else everything about Mayan life involves religion.[1]

In considering a discussion of food in Mayan societies and presentation of a scheme for identifying and classifying some of the forms and functions of Mayan foodways with respect to religion, I wanted to note that in addition to simple nutrition, food and practices associated with its production, distribution, and consumption play an important part in reflecting, maintaining, and re-creating the social order. Furthermore food is a vital consideration in Mayan religion, including food sacrifices to deities, feeding the ancestors, and provisioning of food for the souls of the dead in their journey to the otherworld. It was at this point that I recognized the need for a simple operational definition of religion that would allow for a discussion of food in the context of Mayan religion as distinct from secular life.

While food is produced, exchanged, and eaten in this world by people in various contexts and for various purposes, it is clear that Mayan peoples had and still have traditions in which food is produced, exchanged, and/or consumed in the world(s) beyond death, by deities, ancestors, and other occupants of the otherworld(s). In this world food is placed in caves and on altars, burned, or consigned to bodies of water for the consumption of beings we call deities and ancestors who spend most of their time in another world. Food is also buried with the recently dead to accompany and sustain them on the long, arduous journey to the otherworld. This separation of worlds, and the interpenetration of one world by another forms the basis for a working definition of religion, that is to say, a definition based on this world and another world or worlds that can be identified by individuals in a society as part of their cultural heritage and traditions. "Death" is likely to be translatable into any language in the world, and although the totality of what the word means is certain to differ even between any two people in the same society, not to mention people in different societies, one can always ask what happens to a person after they die and get a response. I'm suggesting that any cultural tradition in which some aspect of the person is thought to end up in a different place or world after death can be said to maintain a form of religion or to involve religious beliefs. Within a particular cultural tradition it is the totality of those beliefs and practices that relate this world with the other world(s) after death, that constitutes the society's religion.

[1] The concept of "supernatural" is where the definition breaks down, as it is difficult to operationalize. For any given culture, who is to say what is natural and what is supernatural, especially when a word easily translated as "supernatural" is not present in the language? Another definition foregrounds the activity of worship, as in "beliefs held by people concerning the existence, nature, and worship of a deity or deities, including divine involvement in the universe and human life." While defining "deities" and "divine" is difficult enough, the weakest definitional link here is that of the nature of "worship". Yet another definition of religion sees it a system of beliefs and practices relating to the divine. Here the concept of 'divine' (not to mention the word encoding it) is too culture specific to be of much use, as also is the notion of 'soul' employed in some other definitions of religion.

Religion, for purposes of this exposition, then, can be considered ideology and activities associated with a cultural tradition in which there is an otherworld, or otherworlds, implied by the separation of life and death and that relate those worlds to one another. In other words, a societal tradition in which there is an afterlife, whatever its actual nature is the basis of that society's religion. Alternatively using the same criterion of dual or multiple worlds, one might say that religion requires a traditional cosmology that minimally posits another world or worlds beyond our own, separate for the most part from it, but connected in some ways, such that travel between them can be accomplished in certain contexts of time, place, and ritual action (e.g., after death, through secret portals, and at traditional places of interpenetration of the "membrane" separating this world from others, such as, for example, altars, trail crosses, mountain peaks, springs, cemeteries, etc., at noon and midnight, on all souls day, with dancing, music, or prayers, etc.). By the simple criterion of traditional multiple worlds it is clear that Mayan societies, like western societies have religious traditions that can be fairly clearly delineated and profitably studied.

Defining religion is not simply an academic exercise; there are real world instances where drawing a distinction between religious and secular behavior has real world consequences. Among other things, distinguishing religious motivations or activities from secular ones has long been of practical significance in the conduct of colonial rule. For example, coca cultivation in colonial Peru was encouraged by law and its secular use as a stimulant permitted, but its religious use was seen as sacrilege by the Spanish Crown and therefore prohibited. Guidelines were even developed in order to identify and punish "sacrilegious" coca use (Cleaver 2008). On the other hand, the practical distinction is made in quite the opposite direction in the United States, where members of the Native American Church are allowed to ingest the hallucinogen peyote during religious observances, but for persons not belonging to this religion, the use of peyote is prohibited.

For analytical purposes I will focus now on Mayan food in religious contexts rather than secular ones, presenting a schema of how religious foodstuffs and food practices fit into the cosmos encompassing multiple worlds, after which I discuss some of the implications of this schema for understanding the place of food in Mayan religion. The data derives from a few of the approximately thirty extant Mayan language communities as well as from some archeological investigations and ethnohistoric sources.

Numerous consultants in many Mayan communities are likely to agree that the cosmos includes three worlds or spheres of potential occupancy that can be inhabited by beings that now or once lived here on earth, which we can call the world. Other beings inhabit each of these worlds, though their precise world assignments are sometimes problematic. While each of these worlds can be internally differentiated geographically and in other ways, a minimal conception of the cosmos so divided would be seen as involving the world in which humans live, a world below it that can be called the underworld, and a world above it that can be called the upper world or the heavens. For Mayan peoples the underworld is often associated with dwarfs, with water, and with the numbers nine or seven (Stross 2009).

This world is of course associated most clearly with living humans, animals, and plants as well as a wealth of topographic features extending out from a center. Our world is particularly associated with the number four. The upper world is often associated with giants, air, asterisms, and the number thirteen.

Schele and Freidel have reconstructed and vividly conveyed the nature of these worlds and their interrelationships for the Classic Maya, and, referring to the underworld by the K'iche' Maya term Xib'alb'a, they maintain that "like the world of human beings, Xibalba had animals, plants, inhabitants of various kinds, and a landscape with both natural and constructed features. At sundown Xibalba rotated above the earth to become the night sky" (1990:66). They further specify that the three realms (or worlds) are linked by means of a central axis manifested as a tree whose roots extend into the underworld and whose branches reach into the skyworld. The vertical and horizontal planes are placed together as analogues, in that the northern direction is associated with the heavens and the south with the underworld (1990:67), leaving the center as a conduit between worlds in all directions.

Contemporary Mayan communities appear to recognize as conduits between worlds a number of natural geographic features (caves, sinkholes, springs, mountain peaks, and lakes), and constructed features (altars, trail crosses, temples, and cemeteries), all of which become in a sense the center when space and time are in some sort of existential harmony (Vogt 1976), such as at certain times of the day or night, and particularly at noon or midnight. Ritual action conducted correctly in the right places and on appropriate occasions can accomplish the opening of these conduits or portals, allowing for communication between worlds, and even the movement of entities between worlds. Ritual actions of the sort frequently seen to be most efficacious in opening the portal include chanting/praying, dancing, music, libations and imbibing of alcohol, and offerings of food.[2]

[2] One could speculate that the dancing and making music require coordinated action which helps to create community, while the sound and visual effects inspire community by their affective appeal to deeply felt sensory modalities that connect another sort of viscerally sensed coordination through rhythm. Likewise chanting maintains a rhythmic cadence that can have a powerful, almost hypnotic, effect. Inspiring community among those present could be extended, by some principle of "like produces like" (akin to Frazier's imitative magic), to a presumption that it can inspire feelings of communion or reciprocity between entities on both sides of the conduit linking worlds. Similarly food offerings – much as the sharing or gifting of food in this world produces community, obligations for reciprocity, and alliances –might on the principle of "like produces like" be seen as an important means of bridging the gap between worlds and inspiring the cooperation of entities (deities presumably) on the other side. Interestingly drinking alcohol appears frequently to inspire feelings of community in many individuals, possibly related to a lowering of inhibitions allowing for freer communicative expression, and possibly also to the altered state of consciousness that might mimic or produce feelings that one has entered another world and that others with whom one is communicating have too.

Food in Mayan Religion

A complex variety of food practices can be seen to accompany the religious observances of Mayan peoples. From one language group to another, even from one household to another, meaningfully different amounts and proportions of different foods and attendant food practices are employed on different occasions and in different temporal contexts during these occasions, accompanied by different ritual actions and often for different stated purposes. Ideally we should have descriptions for all the Mayan groups concerning what, where, when, how, and how much food should be eaten, and in some cases even why particular preparations are made or preferred. We could benefit too from descriptions answering similar questions concerning the production of foodstuffs and its distribution as well. We do not have such descriptions, a fact suggesting there is much yet to be accomplished in studying foodways, even of a single Mayan society. Scratching the surface of questions relating to Classic Maya foodways, for example, Houston et al. paraphrase some of Jack Goody's questions, "What was the unit of consumption? What was the Maya concept of portions or servings, of satiety or abundance? What was their sense of when to serve foods and in what order" (2006:113)? We still don't have good answers in the ethnographic literature for any Mayan society.

Still, Mayan religious foodways have been described enough at least to give tantalizing clues to the nature of Mayan ideologies and social structures as they relate to food. Many of the foods and the practices relating to them follow from, and thus indicate, social differentiation that forms the basis for social organization. Many also reveal things about religious ideology.

Furthermore at least a rough classification of approaches to food by way of religion can be projected onto the variety of food practices already known and described, and while this classification has been developed from an attempt to organize knowledge about Mayan religious foodways, at least some of its components can be seen as useful for organizing information about any society's foodways concerning religion.

The first part of the classification references broad categories of practice with respect to food consumption, categories that function to describe differences in practices within both the secular arena and that of religion. These are Food for People, Food for Otherworld Inhabitants (most of whom are deities), and Food for the Soul. In the category of Food for People, three general practices stand out; feasting, fasting, and forbidding of foods, the latter sometimes being referred to as food taboos.

In the category of Food for Otherworld Inhabitants, we must take into account food and food practices believed to take place in the upperworld, and also food and food practices delivering offerings by people in this world to inhabitants of the upper world, mostly to deities. Then too we must take into account food and food practices believed to take place in the lower world, as well as food and food practices delivering offerings by people in this world to inhabitants of the lower world.

Finally, the category of Food for the Soul can be seen as comprising both food practices concerning the soul's travels to the otherworld(s) and food practices relevant to the soul's visit to this world from the otherworld(s).

All of these categories are briefly discussed and exemplified below with data from Mayan societies, followed by a schematic table of categories (see Table 1) and a synthesizing conclusion.

Food for People

Feasting

Sometimes people indulge in feasting just because food is available, freshly harvested, or abundant, to celebrate the return of a family member, or for a number of other reasons that appear to be separable from religion. On the other hand, much feasting is done explicitly to pay, to thank and/or to please or entertain deities from the otherworld, hoping to elicit thereby favorable responses from them. Such feasting is then of course religious feasting.

A Ch'orti' rain bringing ceremony, for example, involves people from all over the municipio gathering around the neighborhood ceremonial house on April 25th in which the *padrino* leader of the ceremony has just buried food for the earth-god. These participants bring "large quantities of chicken tamales, cacao, *chilate*, *atol*, fruits, and *chicha*" (Wisdom 1940:338), and the food is given to the leader as payment for conducting the ceremony. Additional food is brought to be later "cooked by the women in the ceremonial house kitchen and eaten by everyone" (Wisdom 1940:439). Following the leader's prayers the "Indians then return to the ceremonial house, where feasting, drinking, and dancing go on throughout the entire night. A large group of women prepare tamales, *atol*, *chilate*, *tortillas*, meats, and coffee, using the sacred water for this purpose" (Wisdom 1940:439). It is through these practices that communication is established on a group level between this world and the otherworld.

That ceremonial offerings to "the gods" differ from everyday food, and therefore need to be carefully described, is made clear by Redfield and Villa Rojas in discussing the Yukatek Maya community of Chan Kom, where they say that for important ceremonies there are four characteristic kinds of food offerings: "zaca, balche, boiled fowl prepared in a certain manner, and breadstuffs cooked in the earth-oven. Although the ingredients of this sacred cookery (with the exception of balche) are common to the secular cookery, not one of the dishes offered to the gods is a part of common fare" (Redfield and Villa Rojas 1962:128). They go on to specify in some detail just how each of these foods is made (*ibid.*:129). People end up eating these ceremonial offerings, but only after the gods have taken the spiritual essence from them.

> Essentially the ceremonies consist of an offering of certain special foods and drinks to the gods. Most of them fall into three parts: an invitation to the yuntzilob to be present at some later hour to receive the offerings; the actual delivery of the prepared foods to the gods, including a short invocation and a short period when the men retire to allow the gods to take the spiritual essence (*gracia*) of the food; and the concluding feasting of the devotees on the food from which the *gracia* has been taken (1962:128).

Table 1 Schema of Mayan food practices

Secular	Religious	Practice and place		
Food and food practices in this world that don't relate to the next world.	This world	Feast – Carnaval, Saints Days, Day of Dead maize, alcoholic drink		
		Fast – planting, hunting, curing, making pottery		
		Forbidden – certain animals, maybe a plant or two		
Diet and cuisine have multiple functions, with nutrition being most basic	The world above	Food in upper world Unknown		
	The world below	Food in underworld: Flies for Beans Horse Urine for Rum		
Practices include modes, contexts, and associated ideology; of production, storage, distribution, preparation, consumption, and waste disposal.	Food in transition	Food for journey of the soul To otherworld	Elite *ul*, *kakaw*	
			Commoners *ul, kakaw*	
		Food for consumption by ancestors' souls on day of the dead	Symbolic food	
			Actual food	
Foods for celebration Ordinary foods Foods for famine times		Food for offering the gods Candles for Tortillas Incense for Tortillas, cigarettes Tobacco Maize gruel Tamales Chicha Rum Blood	House	Altar
				Hearth
Foods for nobility Foods for commoners Male food practices Female food practices			Milpa	Center (planting, harvest offering) Corners
			Caves & other conduits (trail crosses, springs, peaks)	

It is possible that the "essence" or "gracia" of the food may reference the souls or spirits of the ingredients, but further study on this point is necessary to validate such speculation.

It is not just the ceremonial foods themselves that must be described in a full accounting of food in religion; it is all relevant food practices, and these are many and varied. Such things include the fact that a Yukatek fowl that is to be sacrificed must have *b'alche'* inserted into its beak just before being strangled, or that a pinch of ground squash seed inserted into the maize dough prior to flattening into a tortilla is spoken of as the "heart" (Redfield and Villa Rojas 1962:129).

Houston et al. discuss feasting from the perspective of the Classic Maya, noting a Piedras Negras panel where subsidiary lords are sitting before a seated ruler in the act of drinking at what must have been a memorable feast; an act mentioned in the glyphic text above it (2006:127–129). If this cannot be demonstrated to have a religious function, then perhaps the suggestion by Fox that feasting was linked to the ballgame is more clearly indicative of that function given the ceremonial religious function often imputed to the ballgame itself (1996), though Houston et al. discuss the evidence and demur, even about it being feasting at all (2006:130).

The most obvious aspect of religious feasting involves drinking alcoholic beverages, usually *chicha* and/or rum. Foam or froth, possibly because of its association with fermentation, appears to play an important symbolic role in Mesoamerican ceremonial traditions, including those of different Mayans.[3] Fermented and distilled alcoholic beverages are seen as a ritual food that opens channels of communication between occupants of this and the other world, whereas salt does quite the opposite, creating an insulating barrier between worlds, closing off communication (Vogt 1998:29; Stross 1978:36, 37). Although females on some occasions, especially when older, do drink fermented and distilled alcoholic beverages (McGee 1990:80), such drinks are primarily for adult males.

Fasting

Humans have various reasons for fasting, which is a procedure that can be characterized as the voluntary abstention of some or all food for a period of time. These reasons include body detoxification, medical diagnosis or treatment, and as a means of protest. Fasting is also done for religious reasons by adherents to most major and many minor religions, and that includes Mayans. Ch'olti' speakers during the colonial period in Guatemala, for example, abstained from eating fruits from

[3] In addition to chicha, it is notable that chocolate beverages are often beaten to a froth. Furthermore it has been noted that Coca Cola and or Pepsi have been adopted as ceremonial drinks by Tzeltal, Tzotil, and other groups, and this has been attributed in part to its carbonation. Huichol speakers (a Uto-Aztecan group located in the Nayarit-Jalisco-Zacatecas region of Mexico, extol foam, and especially the foam of the ocean, in their religious chanting and prayers.

specific trees during fasting, including the *ha'as* (*Pouteria mammosa*), a kind of *zapote* (Stross 1990). Although Moran's dictionary leaves unspecified the actual reason for the fasting that involves such fruit abstention, it is more likely that they have to do with religion than, for example, the varying period of weeks that a Tzeltal or Tzotzil mother must abstain from "cold" foods after childbirth, which can more clearly be viewed as medicinal (cf. Vogt 1976:20).

Tzeltal Mayans and speakers of many other Mayan languages fast primarily for reasons of religion, reasons often having to do with attaining a kind of ritual purity allowing for communication between inhabitants of this world and deities inhabiting another world. For example, Ch'orti' diviners may fast for 4 days before a divination, eating only maize and abstaining from sexual intercourse during this time (Wisdom 1940:345). Fasting may also be done by the Ch'orti' patient, restricting intake to maize preparations during treatment, but this is said to keep the body in good condition and is thus not necessarily related to religion (Wisdom 1940:362). Tzotzil Mayans from San Pedro Chenalhó provide another example of religious fasting. Husband and wife both fast for 2 days before planting (Guiteras-Holmes 1961:43). They also abstain from intercourse during this time. The abstention from both (certain kinds of) food and sex, behavior found in tandem so often in Mesoamerica, is given added meaning in Alcorn's explication of Huastec Mayan fasting. "The term for fasting and sexual abstention when sick or before ritual (preparation for transformation of state of being – sick to well or a ritual change of state) is pabil, the word for the pupating stage of the butterfly" (1984:92).

Houston et al. refer to "arresting evidence that fasts were a central preoccupation of the Classic Maya, just as they played a pivotal role in later periods" (2006:130), referring by the latter comment to such evidence as Landa's references to fasts that preceded calendar linked feasts (Tozzer 1941:103, 152), clearly religious in nature.

Religious fasting is a common ritual practice pertaining to effecting a successful conclusion to activities such as curing, hunting, fishing, planting, calendar festivities, and so on, that are otherwise more likely to have uncertain outcomes. The practice is usually seen as creating a ritual purity in the practitioners that will facilitate communication with deities or that will incur the favor of such deities.

Forbidden

Some (parts of) plants and animals, potential foods, are considered inedible or forbidden by tradition because they are known to be poisonous or conducive to illness, or contaminated (like the vulture). Such food practices are not directly relatable to religion and are therefore not discussed here. On the other hand there are some animals, and perhaps some plants or plant parts that are considered inedible or forbidden for reasons that are religious, specifically because they relate to the other world. For example, the Tenejapa Tzeltal are forbidden by tradition to eat several bird species known to be "birds of evil omen (*hlabtawaneh mut*)" (Hunn 1977:136) and hummingbirds, which are “messengers of the gods” (Hunn 1977:136). The black rat (*Rattus rattus*), known in Tzelal as *karansa ch’o*, is inedible because these rats are believed to embody the souls of Venustiano Carranza’s revolutionary army soldiers (Hunn 1977:208).

Food, in its eating or its denial among other things, appears to mark the passage of participants into or out of a ritual state or phase thereof. Denial as in fasting creates ritual purity for activities requiring communication with deities. Denial through food taboos avoids ritual impurity or interference with communication with deities. Feasting appears not to mark impurity, but rather the communion of related beings in this world signaling an ending of the state of ritual activity.

Food for Otherworld Inhabitants

As noted above, while upper and lower worlds are distinguished in most Mayan cosmologies, the distinction is not always clear, assignment of specific inhabitants (deities, ancestors) may be ambiguous, and the two can be seen in some contexts as one, with the lower and upper worlds being simply different parts of the otherworld. Nevertheless, these worlds are distinguished here for purposes of exposition.

Food in the Upper World

Little information is available on food practices in the upper world. Guiteras-Holmes makes it explicit that for the Chenalhó Tzotzil “No living beings have ever visited the Winahel [upper world], so there is no description of it available” (1961:143). Vogt provides some insight into the possibilities when he characterizes the upper world <vinahel> for the Zinacanteco Tzotzil as “much like an earthly Zinacantán with similar social responsibilities” (1998:29), and in more detail he describes activities of the civil-religious hierarchy of ancestral gods inside the “Senior Large Mountain,” which we may assume exists in the upper world (although the actual peak by that name is present in what we would call this world, near Zinacantán, and inside the mountain might be considered the lower world) (1976:27). It is possible that Mayan traditions rarely concern themselves with what is eaten in the upper world by the deities and ancestors, but to the extent that Vogt’s characterization can be generalized to the other world(s), one might expect food practices to reflect social differentiation in the same ways that they do on earth. Among other things, females would do the cooking; higher status individuals would be served first, seating would be based on social status and on importance in context.

Food Offerings for Upper World Deities

Teenek Mayans, according to Alcorn, serve up a variety of foodstuffs, among other offerings to the deities, on a cloth covered table in front of the altar or on a cloth on the ground (in the milpa or in a cave), including *aguardiente* (distilled sugar cane liquor), beer or bottled soft drinks, coffee, water, bread rolls (purchased), and boliims (large ceremonial meat tamales, steamed and wrapped in banana leaf). The boliims and the *aguardiente* constitute the nucleus of the offering, which may also include tobacco (usually in the form of cigarettes), eggs, flowers, and burning beeswax candles,[4] and music. Speech is always part of the offering. The spoken part of the ritual is what determines which godpowers are being addressed with the offerings (1984:198–200). "It is speech that drives the movement of the offering, taps the godpowers, and argues the supplicants' case" (Alcorn 1984:199).

For rain-making ceremonies a Ch'orti' *padrino* (native "priest" or "wise man") selected as leader digs a hole about two feet deep at the foot of a nearby sacred hill or at a sacred spring, and pours into it a jar of chicken and turkey blood taken from a male and female chicken and a male and female turkey the day before. The bodies of these birds are thrown into the hole, followed by about 200 coin-shaped pieces of copal. The copal is payment to the sky deities for the rain. The blood and the birds' bodies are "an offering of food to the earth-god so that he and his consort may be able to give growth to the maize soon to be planted" (Wisdom 1940:439). At sunrise on that same day, the *padrino* had dug smaller holes in the four corners of the neighborhood ceremonial house and buried a cupful of cold maize gruel (called *chilate*) prepared with ground cacao and sugar in each.

McGee, speaking of Naha Lakantun food for the gods, notes that pine resin incense when burned in the god pots (censers) is transformed into tortillas that are consumed by the gods (1990:76). Additionally in religious ceremonies, the Lakantun make a special meat or bean-filled tamale (*nahwah*) that for the Nahwah ceremony comes with a bright red sauce, atol sweetened with honey (*säk ha'*), and a frothy drink made from cacao beans (*käkäob*), all specially prepared in the god house. These are delivered in small quantities to the mouths of the modeled images on the clay god pots, after which they are consumed by the men in the god house (1990:48).

The Zinacanteco Tzotzil see incense as "cigarettes" of the gods, whereas it is white candles that are "tortillas" for the gods, though some consultants say they are chicken for the gods. Tallow candles are seen as "beef" for the gods. All of these as they burn are consumed by the gods (Vogt 1976:50).

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[4] Whereas in Zinacantán the candles are made of imported wax and tallow (Vogt 1976:47), Ch'orti' candles can be made of beeswax or from the fruit of the "cera vegetal" tree (Wisdom 1940:183). In Chan Kom, Yukatek Maya ceremonial candles are made of beeswax (Redfield and Villa Rojas 1962:49). One can see a neat division of usage for food here. Of the bee products, honey is for people to eat and beeswax becomes food for the gods. This corresponds to the use of flesh as primarily food for people and blood as primarily food for the gods.

Like other Mayan peoples, Lakantun Maya speakers make a point of sharing their sacred meal with occupants of the other world, and this includes their alcoholic beverage. The Lakantun sprinkle libations of *b'a'alche'* to the four directions with their fingers and feed all the god pots with sprigs of the *xate'* palm. The deities represented by the god pots are also being fed their "tortillas" with blazing braziers of smoky copal incense (McGee 1990:96), and on occasion with rubber figures that have been "brought to life" by the recitation of a special chant, and then placed on the burning braziers. No more than a few years ago, Lakantun men would paint the rubber figures with their own blood (McGee 1990:91) (Figs. 1–3).

Fig. 1 A ritual specialist and self-described *sacerdote* or *h-men*, Don Luis holds up a burning copal censer over the altar in a Yukatek thanksgiving ceremony at Sahkabmukuy, Quintana Roo, Mexico. The altar always faces "our Señor" the sun (Photograph courtesy of Amber O'Connor)

Fig. 2 Sacerdote Don Luis holds rattle and purifying incense in a Yukatek thanksgiving ceremony. Honoring all five directions is very important. While the village members were invited to attend the ritual, only the extended family ate the food (Photograph courtesy of Amber O'Connor)

Fig. 3 Ritual assistant blowing on conch shell horn in Yukatec thanksgiving ceremony. Specialist Don Luis is censing. Music facilitates the ceremony, and includes rattle, drums, and horn (Photograph courtesy of Amber O'Connor)

Food in the Underworld

McGee explains how the underworld lord Kisin, who burns them, then freezes them, horribly mistreats souls going to Metla'an, the infernal underworld of the Lakantun Maya. Nothing is said of food in the underworld despite the fact that like most Mayan societies, the Lakantun have stories about how an individual from this world missed his wife after she died, and went to the underworld to visit her, saw what it was like down there, and then returned to earth to tell of what he had seen. Those who avoid Metla'an (because of good behavior in this world) go to the home of the rain god (Mensäbäk), where beans and tortillas are all there is to eat (1990:111).

The Tzeltal underworld is called Burning Bones (K'atinbak) and here we see some of the food eaten in the lower world participating in symbolic inversions. Night and day are reversed in K'atinbak for one thing. Time goes faster too; a year in K'atinbak is a day on earth. In the underworld men are horses and women are mules, and they carry loads of firewood that are actually bones. When they eat, they eat beans that are actually flies of the sort that emerge from grave sites (Stross 1977b:12). The souls of men, who don't drink rum at the fiestas, will at fiesta time in K'atinbak drink horse urine (Stross 1977b:4; cf. Guiteras-Holmes 1961:260).

Food Offerings for Underworld Deities

One of the more important foods offered to deities on the other side is blood, which we sometimes forget is a food. Not only is it a secular food for various human populations on earth. It is clear that the Maya of the past as well as Mayans of today see blood, or perhaps rather the animating spirit that resides in blood, as a vital food to be offered to the gods, and especially the earth gods.

The San Antonio Teenek Mayans of San Luis Potosí have not been observed ritually distributing blood as an offering to deities (Alcorn 1984:200), but the Zinacantán Tzotzil definitely do so. For example Zinacanteco house dedication activities include a ritual in which a hole is dug in the center of the new house and black hens and roosters corresponding in sex and number to the members of the family are hung by their feet over the hole. Their heads are severed and the blood drains into the hole as an offering to the Earth Lord. After the bodies are prepared for eating by the house owners, the heads and feathers are buried with the blood in the hole (Vogt 1998:23)

Along with some other foods, blood is offered by the Ch'orti' to their most important deities, the Chicchans. Generally conceptualized as giant serpents, the Chicchans of the sky are four in number, each living in the bottom of a large lake in one of the four directions. There are innumerable Chicchans of the earth, and one or more constitute the essence or spirit of every body of water, including streams and springs, as well as in the earth under trees. In the Ch'orti' region of Quetzaltepeque, the padrinos, asking for rain, pour the blood of a male and a female turkey into a spring (the source of the Río Conquista) and pour *chilate* (maize gruel) all around the spring as an offering to the Chicchan living in the spring and the nearby hill (Wisdom 1940:440).

In the Jocotán Ch'orti' rain asking ceremony mentioned above, it will be noted that the flesh and blood of the chickens and turkeys are specifically designated for the earth-god (an underworld deity). A Ch'orti' planting ceremony illustrates again the use of blood and flesh as offerings (referred to in Ch'orti' as "payment") to the earth-god, and it also illustrates several interwoven aspects of the ritual importance of food and its relation to religion and the sacred.

On May 3 rd the planting festival begins, along with the vitally important planting rituals.

> They are done usually by the milpa owner himself, although a *padrino* may be hired to do them for a fee…and a great quantity of foods, especially *chilate*. The latter is for the padrino to drink before performing the ceremonies, as a means of rendering himself sacred… At sunrise the milpa owner goes to his cleared milpas and digs a small hole at each corner of one of them. In each he buries one fowl, preferably a turkey. The head is pulled off and the neck gashed with a knife; the body is then held over the hole so that the blood drips into it, after which the body is thrown in… He then digs a small hole in the center of the same milpa and throws into it an olla of unsweetened *chilate*. This and the fowls are food for the earth-god… On the north side of the center hole…is dug an oblong one, about six inches wide and a foot deep. In it is placed about two pounds of a thick maize gruel. On the south side of the center hole… a similar hole is dug, and in it is placed a package of copal pesos, wrapped in a cloth. These two offerings are the payment to the earth-god (Wisdom 1940:442).

The Ch'orti' earth god is spoken of as a pair of dual-sexed beings, and the pair of food offerings (copal and maize gruel) reflect this duality, facilitating their sexual union from which maize plants are born (Wisdom 1940:442 f. 15).

Following prayers, the milpa owner returns home, where friends from the neighborhood are invited over to feast on tamales, tortillas, meats, *atol*, *chicha*, and coffee (made by the women in the kitchen, eaten by the men). At sunset the owner goes back to the milpa, digs another hole and deposits tortillas and *chilate* in it while reciting a prayer. Later that evening the seed corn is consecrated in front of the family altar, now symbolically representing the milpa, a ritual accomplished by the owner and a few close friends who ceremonially eat and drink *chicha* (a fermented sugar cane drink). The planting is done the next morning (Wisdom 140:444).

Even from the examples given of feeding the earth god, it is clear that blood is not the only food offered to this deity. Maize and blood are both given over and often seen as payment. It may be further noted that an alcoholic beverage (fermented and/or distilled) is often dedicated to the earth god; spilled as a libation and often immediately imbibed and shared by humans present. It appears to be satisfactorily interpretable as a required payment to the earth god, as an invitation or means to open up communication between this world and the other, and as a means of achieving communion extending over relevant inhabitants of both worlds.[5]

Food for the Soul Traveling to the Otherworld

A newly deceased individual's soul will need to leave the body and travel to the other world. Whether that otherworld is the lower world or the upper world depends on how they died, how old they were, whether they were married, how they conducted their lives, and/or whether or not they left things unfinished in this life. This journey of the soul is seen by Mayans to require various provisions, and notably food for the soul. To this end Mayans place food and drink, and bags and bowls to hold them, in the coffin or separately in or on the grave.

In Zinacantán, Chiapas, Tzotzil speakers place a rooster head in a bowl of chicken broth in the coffin next to the head of the deceased, along with some tortillas and salt. At the feet are placed a little bowl and a gourd containing water, along with a "small sack of charred ground tortillas (food unlike that consumed by the living)..." (Vogt 1998:27). Once the soul has completed its journey either to the underworld (*k'atin bak*) or the upper world (*vinahel*), the deceased becomes an ancestor. In Tenejapa, Chiapas, Tzeltal speakers also place charred tortillas in a small and flawed net bag with the body of the deceased as food for the soul's journey. The tortillas are placed on one side of the body in the grave, while a small bottle of water is deposited on the other side (Stross 1998:36). When the deceased is a man, a small container of distilled sugar cane rum (*pox*) is added.

Ch'orti' Mayans of Guatemala bury their dead without food for the soul's journey being placed in the grave. Water from the river is placed on the grave after burial, in a large gourd vessel that is tied to the cross at the head end; and this is said to be for the soul to drink (Wisdom 1940:304). Following the burial a funeral festival begins, lasting for 8 days, and during this time the family of the dead individual "eat only maize preparations, principally *atol* and *tortillas*"(Wisdom 1940:305). One might refer to this as a partial fasting for the family members, and apparently with religious motive.

On the morning of the ninth day a table is set in the kitchen with a great variety of foods, among them those of which the deceased was especially fond. The food is left untouched until about ten in the evening, during which time it is believed the

[5] An illuminating comparison may be drawn with a food offering given by Nahuatl (non-Mayans of central Mexico) speakers to dwarf beings living in the underworld cave of the rain deity through a shaman intermediary. "When a person suffering from '*aire de cuevas*' does not improve… the enanitos must be placated with a food offering called a 'tlacahuili' in Nahuatl… The meal for the enanitos is prepared by a female relative of the patient. Such a meal may consist of soup, rice, mole verde, tamales, tortillas, and a little bottle of pulque. The tamales and tortillas are tiny, and the other foods are served in small portions on child-size dishes. Don Soltero takes the food to the cave of the enanitos who sent the sickness (Madsen 1955:53).

spirit of the deceased returns to partake of the feast set out for him (Wisdom 1940:305–306).

Afterwards the food is taken from the table and divided among all persons present. In this case, as with the Tzotzil and Tzeltal, the soul of the deceased is provided with food for the journey, and it is provided in the deceased's house on the ninth day, which is when the soul is supposed to leave this earth on the long journey to the other world. Interestingly, it is this same food that is distributed as a feast among the living attendees for their own consumption.

Northern Lakantun leave maize gruel and tortillas in the grave of deceased adults as food for the soul's journey, and sometimes a gourd of *b'a'alche'* as a gift for Sukunkyum [lord of the underworld], and these items for the soul are also suspended over the grave from the small thatched roof built over the burial mound (Boremanse 1998:94). Boremanse notes that similar practices were recorded in the seventeenth century by Franciscans and attributed to highlanders. "It was believed that the dead man would drink the gruel on his way to the world beyond and give the corn dough and the tortillas to the animals and dogs he had killed and eaten during his lifetime, so that they would not bite him nor harm him in the afterlife (López de Cogolludo 1955:3:347, De Vos 1980:231)" (1998:95). Age and gender differentiation has been noted for food related material goods placed in traditional Lakantun graves. For example a boy was buried with a slingshot and stones with which he used to hunt birds. Had the deceased been a woman, she would have been accompanied by a grindstone and her pots (Boremanse 1998:94; McGee 1990:118).

Age and gender distinctions are made not only in the material goods placed in a Lakantun deceased's grave, but also in food for the soul's journey. When a small child dies, a "goddess carries the soul in her arms to the underworld and from there to Hach Ak Yum's heaven… Instead of corn gruel and tortillas, Pablo put two baby bottles containing milk in the hammock of the dead infant. In the old days, the child's mother would drop some of her own milk into a small container made of a piece of reed sealed with beeswax… The same item of food is also placed on the grave and must be renewed every day during the 3 days" (Boremanse 1998:96)

A Maya cave burial provides information on apparently food related mortuary practices during Classic times in southwestern Belize, by which the soul is given food for its journey to the afterlife. In a small burial chamber within the cave a decapitated individual was found, accompanied in the pelvic region by a small bowl with five cacao seeds and, where the head used to be, a larger bowl containing a single jade bead (Prufer and Hurst 2007). Jade pieces have been found in the mouths of individuals buried in central Mexico, and interpreted as either symbolic maize (jade was a metaphor for maize), or as symbolic water – Teenek Mayans speak of a fabled small green stone used by the ancients that could be placed in a hollow, which would then miraculously fill up with water (Alcorn 1984:60). Prufer and Hurst noting that cacao is a vital ingredient of such rites of passage as birth, marriage, death, and shamanic initiation, concluded that its "presence in a burial likely indicates that it was either an important possession of the deceased or intended to provide ritual sustenance during the passage into the afterworld" (2007:273). We can see, therefore, that the soul may have been provided with food and drink for its journey, or perhaps with just food (cacao and maize).

Grube has argued that pre-Columbian iconography associates cacao with elite prestige and rulership (2001), and epigraphy associated with the burials of rulers indicates a similar association (Stuart 1988, 1989). Houston et al. opine that while the Roman ruling elite ate a great variety of food and drink, they "monopolized few foods yet still had greater variety, quality, and quantity of foods than did the low-ranking people…[whereas] in texts, imagery, and ritual practice the Classic Maya largely reduced that variety to a basic duality of the two exemplary foodstuffs: either tamales and water or water based chocolate beverages" (2006:108). They also suggest that there may be epigraphic evidence for fermented cacao beverages in Classic Maya mortuary ritual, along with the evidence for other cacao drinks and maize gruel drinks (*atole*) as well (2006:108). It is assumed that most of our information on pre-Hispanic food practices gained from archeological investigation refers to elite burials.

When food is buried with an individual, it is not always food for the soul of the deceased; some traditions hold that there are obstacles in the journey that must be overcome by feeding different animals' spirits. For example, among the Lakantun, "To further aid the soul in its encounters, a corpse is buried with an ear of maize to give to the chickens in the underworld, a handful of hair for the lice, and bones to throw to the wild dogs so that it will not be eaten" (McGee 1990:112), and sometimes a bowl of *b'a'alche'* is left for the lord of the underworld (Boremanse 1998:94).

Food for the Soul Visiting This World

Every year during the festival of the Day of the Dead, ancestral souls are believed to visit the living here on earth. October 31 is for souls of children who died, and November 1 is for the souls of adults. All over Mesoamerica, food is brought to home altars and/or to cemeteries, including some of the favorite foods of departed loved ones, and often their favorite songs are played. This Catholic ceremony is not part of traditional Lakantun Mayan religious activities, but appears to be present in other extant Mayan traditions.

Despite not having a Day of the Dead ceremony, after a burial, according to Lakantun tradition, the soul of the deceased is supposed to "return to the burial site and partake of the food left at the grave for 4 days, and fresh food is left for the soul daily. On the fifth day, the soul no longer returns and the period of ritual danger ends (McGee 1990:117). Boremanse accompanied a Lakantun man to his son's grave, where he replaced food previously left with corn gruel, corn dough and large tortillas. He scattered bits of tortilla and drops of corn gruel on the grave mound over the head area, telling his dead son to 'take and eat the pixan of this tortilla; take and drink the pixan of this gruel.' The old food is brought home and is consumed by all the members of the household" (Boremanse 1998:95).

In Ch'orti' hamlets that have cemeteries, the Day of the Dead ceremony takes place in the cemetery. Elsewhere the ceremony is done in the house. In the latter case "[a]nyone who so wishes may give a feast, and anyone may come without invitation. At about four o'clock in the afternoon the table in the house is spread with tamales, *atol*, *chilate*, coffee, and *tortillas*. These are left untouched for about 2 h, so that the dead may eat them, while the group are waiting outside…the interior of the house is darkened, so that the spirits of the dead will not be afraid to enter" (Wisdom 1940:455). After a *padrino* comes and prays the food is divided among those present, who take most of it home and then return to the house to drink and dance all night long. In the cemetery the food is brought and deposited in front of large crosses and candles are lit. This takes place earlier in the day than the house ceremonies. Again the food, consisting of tamales, atol, chilate, meats, fruits, and *chicha*, is left for about 2 h before the people spend the rest of the afternoon feasting on it (Wisdom 1940:455).

San Pedro Chenalhó Tzotzils leave food offerings to the souls of the dead overnight, "It is only the following day that the living partake of the food and drink of the dead. All must eat and drink of the offerings as a manner of paying tribute to the dead" (Guiteras-Holmes 1961:146). In addition to the regular food and drink of this world from which the dead souls skim off the essence, (black) candles serve as food for the dead (Guiteras-Holmes 1961:145).

Yukatek Mayas of Chan Kom, like almost everyone in Mesoamerica, set out food for the souls of the dead on October 31 and November 1, when these souls return to earth for a week to eat and commune with their living relatives. The preparations are painstaking, beginning before midnight on October 30, at which time the souls of dead children commence their arrival, and the foods for the returning souls begin with a chocolate beverage, breads, and candles. After a prayer, the assembled kinsmen eat the food prepared as breakfast for the souls. Later the souls are given their main meal, which includes boiled chicken (only hens are used), squash, chayote, pork, rice, macaroni, and atole. Following a prayer recitation and invocation, this food is eaten by those persons present. The next day is for the souls of the adult departed, and similar food is prepared and eaten after the souls have consumed their essence (*gracia*).

In one way or another, all Mayan societies have traditions involving the soul's journey after death into another world. The journey involves a number of obstacles or hazards and requires some food for the soul on this journey. The food provided is usually symbolic, even if presented through synechdoche, and is not eaten by the providers. All also have traditions involving a return of the souls of the dead to this world where they are fed by kinsmen either real food from which they take the essence, or symbolic food (that we would consider inedible) such as candles transformed into a maize based food for their delectation. The real foods are afterwards generally eaten by the kinsmen.

Summary and Conclusions

Because it is difficult to say what is natural vs. supernatural in non-western (and perhaps also in western) societies, perhaps it is more useful to operationally define religion as a society's concern with and construction of a dichotomy entailing this world and the "other world(s)" and activities and concerns relating to the character of the "otherworld(s)" and to the relationship between the different worlds, including, when appropriate, manifestations of the inhabitants of the one within the other.

The foregoing examples and discussion of Mayan foodways relating to religion can be analyzed into three primary categories of representation: (1) food in this life/world, (2) food in transition, and (3) food in the next life/world.

Food in this world and Mayan practices surrounding its consumption pertaining to religion can be placed in three sub-categories for separate treatment: (a) feasting, (b) fasting, and (c) forbidden food. We can infer from examples given above that feasting may have ultimately derived from secular origins in the abundance of the harvest but that, because of uncertain future outcomes, developed religious rituals of thanking deities and soliciting their assistance with coming harvests. Fasting may have secular origins in pre-planting times of want, exaggerated as deliberate fasting to persuade the gods that one is ritually pure through a form of sacrifice and therefore deserving of their intervention to ensure successful planting outcomes. Forbidden or taboo food may also have secular origins in avoiding foods that have proven to be poisonous that were in some cases extended to the religious sphere because of the inherent uncertainty in predicting ingestion outcomes of particular food items that in part because of useful properties attendant to their toxicities were seen in some dosages to have curative powers. We have seen from the examples given, not abundantly found in ethnographies, that animal "messengers from the otherworld" may thus be rendered taboo as food, and these beg an explanation rather different from one derived from pharmacological use or outcome uncertainty.

Outcome uncertainty recalls the fact that divination is done by some Mayan groups with maize kernels, beans, eggs, or other food materials. While involving religion, this relates not to consumption (preparation, ingestion, or waste disposal), but to a non-food use of what usually is used as food. Similarly the constellation of Mayan food related sayings and behaviors, particularly related to maize and beans and suggesting a deep respect for these food products, while clearly dependent upon the notion that these foods have souls, are not part of consumption. Furthermore, the blessing of the seed corn that is done by Mayans, while clearly part of religious exercises, pertains much more clearly to production than to consumption.

The religious consumption of food in this world is quite clearly done in ways that are gender specific, relative-age specific, and social status specific (especially with respect to participation in the civil religious hierarchy in today's world), as noted especially in the work of Vogt (1998) and Wisdom (1940). Social organization is reflected in at least two of the three subcategories of food and religion in this world. Most immediately one notes the complementary dualism with respect to gender (involving each gender being privileged in different and complementary contexts), in which females usually prepare most of the food and the males provide most of the raw materials for it, for example (O'Connor 2008). Vogt references social differentiation in ritual drinking and ritual meals (feasting) when he says that the "drinking emphasizes social continuity, serving all from same shot glass; but, at the same time, hierarchical discontinuity of age and sex through the order of serving and the bowing-and-releasing" (1976:41). He also emphasizes the role of the Ladino as mediator between Zinacantecos and the supernatural in explaining that chickens, "probably replacing turkeys as the staple for ritual meals after the conquest, are 'food for the gods,' and the substitute for the life of a patient in the curing ceremonies. The bird thus assumes a symbolic meaning as a mediator with the gods. Chickens, coffee, which probably replaced chocolate in recent decades, and wheat-flour rolls all come from the ladino world" (Vogt 1976:42; cf. Stross 1977a:281–285). With respect to fasting one also finds social differentiation, curers and office holders being more frequent fasters, and males in general being presented with more occasions than females in which fasting is necessary. Similarly adults fast more often than children.

Food in the otherworld(s) and practices by the inhabitants regarding its consumption are different, depending on which world is concerned. There is both an underworld, which today seems to partially embody Catholic notions of Hell, and an upperworld that is known to be inhabited by deities and ancestors, but which apart from the deities and their functions remains quite unknown in other respects because nobody who has been there has ever returned to earth to tell about it.

In the upper world, according to some accounts, social differentiation in this world finds direct reflections. First, with respect to deities, male and female deities do different things with some consistency across the range of Mayan traditions; there is an expectable parent / child power hierarchy, and relative age involves a hierarchical relationship (though contrary to the situation in this world, the younger sibling in the upperworld is apparently privileged over the elder in the oral narratives of Lakantun, Tzeltal, Tzotzil, and K'iche' peoples among others). Evidence is lacking, however, concerning any reflection of this kind of social differentiation in food consumption patterns. Second, with respect to the ancestors, the social structure of this world is replicated in the otherworld according to some (Vogt 1976), and sometimes one can see the ancestors when they are manifested in this world, and note that such beings occupying the various cargo offices – positions in a civil and/or religious hierarchy occupied by individuals in unpaid service to the community – are represented as maintaining the traditional hierarchy of authority present in this world. We can only guess as to what foods are consumed in the upper world and how.

In the lower world, at least in the part that is suspiciously similar to Catholic notions of Hell, social differentiation reflects gender and guilt status (based on behavior on Earth) minimally. There is also a two tier hierarchy with San Pedro as the master of K'atinbak, the place of burning bones, in charge of all those people who have been consigned to its hellish misery. In some Mayan narratives men turn into horses and women into mules, and only persons who are guilty of misdeeds are required to stay in K'atinbak. In Tzeltal stories maize tortillas are eaten by the inhabitants, who are ancestors of modern Mayans, but the beans are actually flies, and the *chicha* is actually horse urine. One can see the symbolic inversions here, and McGee offers an insight into the transformation of materials proceeding from one world into another that suggests itself as related to these symbolic inversions. "The Lacandon believe that death is caused by the gods, although it is not an end to life but a transformation to another level of existence. This follows the same principle of reversal that causes transformations in the ritual offerings. For example, a small amount of sour balché becomes a large amount of sweet balché and copal incense is transformed into tortillas when fed to the god pots. The ritual principle operating in this belief system is that reversals occur when an object changes levels of the universe" (McGee 1990:107).

The fact that a woman in K'atinbak serves her visiting husband flies for beans, rather than him serving her, suggests that gender based social differentiation remains the same as in the world above. Similarly, Ix Kik' of the K'iche' Popol Vuh (Christenson 2003), who like Eve was tempted by the forbidden fruit of a tree, and was to be sacrificed by order of her father, one of the Underworld lords, suggests that the parent/offspring hierarchy in Xib'alb'a is like that of this world.

Food in transition goes from this to the other world, and never the other way around. In the first case human souls need food for the journey to the otherworld. Here the food sent with the departing soul is in portions that render its inclusion in mortuary circumstances purely symbolic, although it is usually small portions of actual food, almost invariably including a form of maize preparation. Cacao is often included, and for the elite of the Classic Maya, both cacao and maize gruel were frequently if not always included. Water and/or an alcoholic beverage is/are also likely to support the journey of the soul to the otherworld. Gender and age distinctions are seen in present day soul voyage support, and it seems indisputable that class or caste distinctions (between the nobility and the commoners minimally) were present in the past.

In the second case souls of the departed (whether recently or long ago) visit this world and partake of food offered up by humans. Here the food is both actual food of this world, often including some favorite foods of specific departed ones, and symbolic/metaphorical foods such as candles and perhaps incense.

In the third case it is deities that visit this world and partake of food offered up by humans. Here too the food is both actual and symbolic. As in the second case, the essence of the actual food is taken, and afterwards the actual food is sometimes eaten and drunk by the people who left it as offerings. Food offerings to the gods left at caves, on altars, at trailside crosses, or with other conduits to the otherworld are usually not eaten after the gods have enjoyed them. Such sacrifices to the deities include tortillas, blood, chocolate, copal incense, and candles. Food for the sky deities generally involves burning and for the underworld deities it generally involves burying. Offerings to deities seldom reflect gender differences (and in fact some of the deities, like the Ch'orti' earth god and the god of sleep are dual sexed (Wisdom 1940:398, 402), as, it may be noted, are maize plants.

Studying foods can be instructive in dealing with relationships between this world and the otherworld(s), the essence of religion. Social differentiation in this world is reflected in food practices involving other worlds, and such fascinating concepts as transitions, translocations, transformations, boundaries, and inversions come into play and can sometimes be problematic. Time and space are seen differently in the three different worlds, as are size, and sometimes orientation. A thorough description of food practices should illuminate our understanding of all these things because they go to form the model of reality that can be called culture and that exists in somewhat varying form in the minds of all members of a society.

The foregoing illustrations and discussion of foodways relating to religion are further schematized and contrasted with secular foodways in Table 1.

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Maize Was Their Flesh: Ritual Feasting in the Maya Highlands

Allen J. Christenson

Recently I accompanied a Tz'utujil-Maya *ajq'ij* (traditionalist priest) and six of his companions on a pilgrimage high in the mountains above Santiago Atitlán, Guatemala, to visit a ritual cave. The cave is considered one of the most sacred spots in the Lake Atitlán region and is seldom visited without first carrying out a series of ceremonies to petition the gods and ancestors who are believed to live there to purify the participants. This particular journey was the culmination of 6 months of preparation to determine the best day on which to visit the cave and to ensure that it was permissible to enter the cave without offending its divine inhabitants. The principal purpose of the visit was to ask for a good harvest in the coming year and for rains to return abundantly in season (that year had been a relatively poor one with regard to the maize harvest and the rains had been unusually spotty).

Through a series of divinatory ceremonies, the day chosen for the journey was November 3, the day after the Day of the Dead, a season in which the *nawals* (powerful ancestors) are said to be particularly close to the world of the living. Before entering the cave itself, one more major petition ceremony was required to ensure that it was permissible to approach the gods and *nawals* of the cave directly. All must have *saq ki k'ux, kanima'* ("white hearts and souls") or they cannot enter the cave. It is somewhat common for the gods to deny permission at the last minute, depending on the worthiness of the participants on that day. It is also possible that the gods and *nawals* may be busy with other affairs that came up since the last petition was granted in the same way that the town's secular authorities often cancel meetings scheduled well in advance if some more pressing affairs come up.

This final petition ceremony took place just above the cave entrance in a small clearing in the pine forest. On that day the clouds were unusually low and the ritual took place in a heavy mist that made it difficult to see beyond the first line of trees surrounding the spot. The officiating *ajq'ij* felt that this was propitious

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because it meant that the ancestors who help to bring the rain had come to join us in the clouds.

Upon our arrival after a long and arduous climb, a fire was built on which to cook a ritual meal, a necessary component of any major Maya ritual. The meal consisted of fried eggs in a heavy tomato sauce, tortillas, salt (used not only for its flavor but also to ritually purify the food before eating), *aguardiente*, and fruit juice. Before eating, each participant raised the food or drink to the four cardinal directions to thank the gods and ancestors, and then to the elder *ajq'ij*, thanking him as well. The *ajq'ij* ceased whatever he was doing each time to individually return the thanks and to urge them to eat and drink. A portion of each course of the meal and each cup of beverage was also offered to the *nawal* ancestors by placing it by the fire or pouring it into the fire near where the altar would soon be constructed for the petition ceremony. The *ajq'ij* told me that this meal was not only to give us strength after the climb, but also to share a meal directly with the gods and ancestors who live in the cave so that we would be *junam pa qanima', pa qa na'oj, pa qa ch'akul* ("united/made one in our hearts, our thoughts, our flesh"). This union was not merely a gesture of courtesy, but a more physical and spiritual bonding by which the food and drink created a shared flesh and blood with the ancestors and patron gods that lived in the cave (Fig. 1).

After the ritual meal, an altar was laid out by clearing a patch of ground beneath a large tree and surrounding it with a carpet of pine needles. Four bundles of white candles were then placed on the ground toward each of the cardinal directions with their wicks pointed toward the center. Another bundle of candles was placed

Fig. 1 Ritual meal offered to the ancestors prior to permission ceremony in the mountains above Santiago Atitlán

upright in the center. Four cigarettes were then placed upright at the intercardinal positions, while a line of white candles were placed around the periphery, forming a rough square. Normally, candles corresponding to the directional colors would have been laid out in their proper positions (red for east, white for north, black or purple for west, and yellow for south), but the *ajq'ij* was concerned mostly that our hearts were *saq* (white, pure, clean) so he only used white candles. A plate of food (eggs and tortillas, each sprinkled with salt) was placed at the east with two bottles of *aguardiente*. A single bottle of *aguardiente* was placed on the north and south sides of the cosmogram, while a bottle of beer was placed on the west. The linear rows of candles were lit first and allowed to burn for a time before the entire offering was burned. According to the *ajq'ij*, the ancestors feed on the light of the candles, and a good steady flame indicates that the ancestors accept the offering and are nourished and strengthened by it (Fig. 2).

As the candles burned, the *ajq'ij* knelt before it facing east and, while waving a censer of copal incense, prayed toward each of the cardinal directions. He thanked a litany of gods and ancestors (including the Heart of the Sky and Heart of the Earth, Navel of the Sky and Navel of the Earth, Lord of the Rain and Lord of the Harvest), the first four founding ancestors, prominent *ajq'ij*s who had died, etc. for giving them their food, their water, their rain, their lives, their children, etc. He called upon them to accept the offering of candles, tobacco, food, and *aguardiente* and to make the hearts, minds, and bodies of those present "white" so that we could visit them in the cave in purity. The *ajq'ij* was a bit anxious during all of this. We had heard a woodpecker calling out on the left side of the trail about half-way up the mountain. Had it been on the right side,

Fig. 2 Offering laid out to the ancestors and deities of a sacred cave, Santiago Atitlán

this would have been fine because the woodpecker is not a death caller. But the left side is more ominous.

At one point, one of the candles (and only one) began to bend from the heat and one of the attendants stepped in to right it during the *ajq'ij*'s prayer. The *ajq'ij* immediately waved him away and watched while the candle drooped over and lit one of the cigarettes. Immediately the *ajq'ij* broke out into a big smile and thanked the gods and *nawal* ancestors for accepting the offering and lighting their own cigarette. From then on, the *ajq'ij* showed no sign of anxiety and was as lighthearted as I had ever seen him. One by one he took the bottles of *aguardiente*, beginning with the south one, and poured out the contents onto the ground at the cardinal directions of the altar, and at the feet of each of the participants – again, a sharing of the offering. He also used one of the lit candles to light the cigarettes and unburnt bundles of candles. Later, as the entire offering caught fire, some of the *aguardiente* was used to feed the fire and make it burn higher.

As a result of the successful petition ceremony, the following day we returned to the cave. At first only the *ajq'ij* entered just inside the mouth of the cave and offered a brief prayer of thanks to the occupants. The rest of us waited cautiously outside. Eventually however he motioned a few of us to join him, put his arm on my shoulder, and said: "This is a very good day. We have come as one to this place. We are all one today."

Food and the Nature of Human Flesh

According to the Popol Vuh, the climactic event in the final creation of mankind occurred when maize was discovered within the cleft mountain of Pan Paxil, from which the grandmother goddess Xmucane formed the flesh of humanity (Christenson 2007:193–195). This mythic connection between maize and human flesh influenced birth rituals in highland Guatemala for centuries. Fuentes y Guzmán wrote in the seventeenth century that when a male child was born the Maya of Guatemala burned blood shed from the severed umbilical cord and passed an ear of maize through the smoke. The father then planted the seeds from this ear in the child's name in a specific area of the maize field. Parents used the maize from this small patch of land to feed the child "until he reached the age when he could plant for himself, saying that thus he not only ate by the sweat of his brow, but of his own blood as well" (Fuentes y Guzmán 1932–1933, I:281).

Mothers in Santiago Atitlán place an ear of maize into the palm of their newborns, and eat only dishes made from maize while breast-feeding to ensure that the child grows "true flesh." Once the child is weaned, it is only given food prepared with maize for several months, and parents avoid giving it maize grown anywhere but in his/her own community. For Atitecos, the maturation of the child must take place by means of locally grown maize, or it will not grow to become a legitimate member of the community (Fig. 3). Nicolás Chávez Sojuel explained to me that a child must also eat maize in order to learn to speak Maya properly:

Fig. 3 Children in Santiago Atitlán

> When a woman prepares maize dough for making tortillas, she repeatedly dips her hands into a bowl of water in order to keep the dough moist. Mothers give this water mixed with maize to their young children to drink so that they will learn how to speak and learn the customs of their ancestors. This mixture of water and maize we call "blood," and it is what makes the blood of the growing child. If an older child can't speak well the mother will also give this same mixture of maize and water. One must be careful, however, because if a child receives too much of this at an early age, he will never shut up. For a child who is powerful, and remembers well the ancestors, a mother will give the same watery maize with cacao mixed in. Cacao and maize are the same food, but cacao is more powerful. It is also our flesh.

This symbolic connection between maize and human beings is an ancient concept evident also in the Popol Vuh. In the account of the creation, the gods came together in the primordial sea to determine how the world was to be made. This creative act is described most frequently as a couplet pairing the verbs *awaxoq* (to be sown) with *saqiroq* (to dawn):

> How shall it be sown? How shall there be a dawn for anyone? Who shall be a provider? Who shall be a sustainer? (Christenson 2007:71).

To sow and to dawn are not considered independent actions, but equivalent expressions for the same generative event, linked with childbirth. Among the modern K'iche's, when a woman becomes pregnant, the event is announced by a respected elder of the community at certain lineage shrines. This ceremony is referred to as "the sowing" of the future child (Tedlock 1992:80). The Maya refer to themselves as *qas winaq* ("true people") because as soon as they are weaned they eat maize; therefore, their flesh is composed of divine substance in a way that people who eat other foods as the principal part of their diet do not. Foreigners from other countries are in many ways seen as a different species. Because they eat bread, they are "wheat people." Maya tradition stresses that the inability to eat maize is a distinguishing characteristic of nonhumans (Sachse 2008:138).

The purpose of the creation was to form "true people" who would act as mediators between this world and the world of the sacred, providing the means to perpetuate life. The two words used to describe these future mediators are *tzuqul* (provider) and *q'o'l* (sustainer). *Tzuqul* is a provider of any kind, although generally in the sense of food. Barbara Tedlock notes that one of the names for priest-shamans in Momostenango is *tzuqunel* (feeder) because they symbolically "feed" the world and the ancestors with their ceremonies (Tedlock 1992:114). *Q'o'l* is also a provider of sustenance, primarily in the form of food and drink, but also one who nurtures in any other way, such as a mother caring for an infant. The implication, then, is that human beings are intended to feed and nurture the gods through their actions. The petition ceremony to enter the sacred cave above Santiago Atitlán centered around a ceremonial meal, shared with the gods and ancestors, followed by the offering of food, drink, and candles, whose light was said to also "feed" the sacred occupants of the cave (Fig. 4).

Through ritual prayers and ceremonies, the gods would be "sustained," literally recreated and reborn as their names are spoken. The authors of the Popol Vuh assert that the gods made a number of unsuccessful attempts to make people who would be capable of remembering their creators and thus performing the proper ceremonies and prayers that would sustain the world and keep it alive. The first attempt resulted in the creation of wild animals – specifically deer, birds, pumas, jaguars, and various types of poisonous snakes. Their inability to communicate with anything but unintelligible squawks, roars, and chatters condemned their flesh to be food (Christenson 2007:76–77).

The next unsuccessful attempt to create people involved a being made from earth and mud: "At first it spoke but without knowledge" (Christenson 2007:78). The word for knowledge here is *na'b'al*. In highland Maya languages, this word also includes the larger concept of the soul, socialization, the capacity to learn, and even conventions

Fig. 4 Ajq'ij from Momostenango

of morality (Watanabe 1992:100). Thus the mud people lacked the essential awareness and understanding that human beings must have to remember and honor the gods properly. The next unsuccessful attempt involved beings made of wood:

> They had the appearance of people and spoke like people as well... Nevertheless, they still did not possess their hearts nor their minds. They did not remember their Framer or their Shaper (Christenson 2007:83).

The word for "remember" is derived from *na'*, meaning "to feel" or "to know." For a Maya to remember a deity or ancestor is to bring him/her forth from his own blood. When viewing an old photograph taken in the nineteenth century, a traditionalist Maya priest from Santiago Atitlán identified a number of individuals by name. When I asked how he knew them he replied,

> We all know them. They still visit us in dreams and in person. We know their faces, they still are very powerful, the soul of the town. White are their minds, white are their souls. This is our inheritance. These people live because I live, I carry their blood, I remember. They are not forgotten.

The Maya do not worship separable ancestors. They recognize the presence of the ancestors within them. It is part of their blood and their flesh, renewed at each meal by the same maize used to create the first "true people" at the beginning of time. As long as they are alive, the ancestors are alive and present.

According to the Popol Vuh, the first truly successful people were created from maize. Because of the divine nature of their maize flesh, these first men had the gift of extraordinary vision whereby they could see all things:

> Perfect was their sight, and perfect was their knowledge of everything beneath the sky. If they gazed about them, looking intently, they beheld that which was in the sky and that which was upon the earth. Instantly, they were able to behold everything. They did not have to walk to see all that existed beneath the sky. They merely saw it from wherever they were. Thus their knowledge became full. Their vision passed beyond the trees and rocks, beyond the lakes and the seas, beyond the mountains and the valleys (Christenson 2007:197–198).

Although the creator gods eventually clouded this vision so that the first men could only see those things, which were "nearby" (Christenson 2007:201), the progenitors of the Maya and their descendants nevertheless bear within their blood the potential for divine sight, bestowed upon them by their creators. Present-day Maya priests, or *ajq'ijab'*, believe that their divine ancestors continue to operate through them as conduits at appropriate times and under appropriate circumstances. It is their ancestral vision that allows the *ajq'ijab'* to "see" beyond the limits of time and distance as the first men once did.

Feasting with the Gods

Prior to the Spanish Conquest, ritual feasting was a major part of the ceremonial life of the highland Maya. The Popol Vuh notes that feasting and drinking were a major, if not the major, function of the Great Houses that each lineage constructed at the capital city of the K'iche' (Christenson 2007:265–267; see also Carmack 1981:160, 294). Ximénez wrote that feasting was an essential part of the great festivals at the K'iche' capital of Q'umarkaj, and that the images of the gods were brought from their temples to join in these feasts, receiving the same food and drink that the mortal celebrants consumed (Ximénez 1929:Book 1, Chapter xxx, 85–86; see also Carmack and Mondloch 1983:196).

Such shared meals between gods and man continue in the Maya highlands today. As Vogt wrote concerning the Maya of Zinacantán, "men eat what the gods eat," and the interaction between humans and gods in such ceremonies is considered essential to good life and the regeneration of the universe (Vogt 1976:1). Food and drink is "the medium of contact with the gods" (Vogt 1976:41):

> Although Zinacantecos of low status may sit around the foot of the ritual table, no one sits at the head. There the ancestral gods preside and partake of the liquor and food served. Their living descendants are arranged in such a way that the elder ones are seated at the sides of the head of the table, next to the gods … With the gods invited to join and partake of the meal, liquor is served from the same glass to all in the house, an action expressing communality and continuity from the deceased ancestors down to the youngest Zinacanteco (Vogt 1976:41).

The seating order at the table reinforces the social system, both uniting the men with gods as mediators as well as reinforcing the hierarchy within that system. As Houston et al. suggest, feasting serves to socially homogenize participants, constructing intimacy, a "sense of social bond and community," and even kinship (Houston et al. 2006:102). Ceremonial feasting unites those who participate in a physical as well as a social way, making the substance of the specially prepared maize part of men's flesh, making them *qas winaq* ("true people"), the living embodiments of their ancestors who share with them the same divine maize flesh and blood. One of the highest titles held by the traditionalist priests of Momostenango is *chuch-qajaw* (archaic form of mother–father) as he represents the living embodiment of his lineage. As such, he is able to act in the name of his ancestors, whose blood he possesses. This title parallels the most common name for the ancestors themselves, which in the Guatemalan highlands is *nantat* (mother–father) or *qa nan qa tat* (our mother–our father). It is essential therefore that Maya priests approach the duties of their office with reverence, humility, and in a state of ritual purity. Prior to laying out the contents of his bundle on the table, the *ajq'ij* always calls upon the essential powers of the world as well as his own ancestors to be present for the ceremony, for without them his prayers have no effect.

In most larger traditional Maya communities, such as Zinacantán, Momostenango, Chichicastenango, or Santiago Atitlán, formal ritual practices are focused on the *cofradía* house, dedicated to the veneration of a particular deity or saint. Although the *cofradías* are ostensibly Roman Catholic organizations, their administration is wholly indigenous and independent of the church's control. Indeed, the ceremonies conducted in the *cofradía* houses retain significant elements of ancient Maya cosmology that run counter to European notions of Christian orthodoxy.

Ritual feasting and drinking in honor of the gods and saints is a major activity within the *cofradía* system. During the Colonial period, Spanish authorities tried to curtail these activities, but found it impossible to do so. On March 20, 1637, the *Audiencia* issued an order to suppress illegal *cofradías*:

> In view of the growing number of *cofradías* in the Indian towns and of the excesses committed during dances and feasts celebrated during the day of the patron saint, it is ordered in the confines of the *Audiencia* … that all *cofradías* not authorized by the bishops be suppressed … for the offenses which are made against God our Lord with drunkenness and feasts which are celebrated the day and night of the fiesta when it is customary for many drunken Indians to gather together in the house of the Indian *mayordomo* of the *cofradía*, … (perhaps I just don't understand your changes. The dots are necessary to mark where I skipped part of the quote) where with dances and fiestas they recall their antiquity and idolatry in scandalous form which devalues their devotion before the images (Orellana 1984:213).

One of the major *cofradías* in Santiago Atitlán is the Cofradía of San Juan. The ceiling trellises of the *cofradía* house are adorned with the symbolic bounty of a fertile mountainside, including numerous stuffed wild animals (peccaries, raccoons, a wild cat), along with examples of tropical fruits; gourds, corozo, pataxte, and cacao pods. Especially prominent are ears of split-cob maize (*yo'x* – "twins") as a sign that maize is born here. These not only reinforce the notion that the *cofradía* house is a source of fertility, but also indicate the presence of the ancestors in their community who continue to use their influence to bring rain and abundance to the earth.

The interior of both sacred mountains and *cofradía* houses is conceived as the birthplace of life-giving power. Maize, incense/rainclouds, water, fertility, earth, all combine to give birth to life itself. Thus, seed maize is brought to the *cofradía* house to be blessed. Many of the most sacred belongings of the *cofradía* are kept in a sacred chest in the house. It is marked with a massive carved ear of split-cob maize flanked by cacao pods. The principal elder of the *cofradía* house explained that split-cob maize is the "heart of maize and of people. It is the source of power for everything" (Fig. 5).

Fig. 5 Sacred chest in Cofradía San Juan, Santiago Atitlán

Important ceremonial observances within the *cofradía* house are accompanied by a ceremonial meal provided by the *alcalde*, or head of the *cofradía*, to the participants. This generally consists of a piece of boiled meat in a peppery sauce, accompanied by steamed corn tamales wrapped in leaves, salt, and a beverage – either *aguardiente*, a locally made liquor called *p'siwan ya'* (canyon water), maize coffee, or a carbonated drink such as Coca Cola. At the most sacred ritual occasions within the *cofradía* house, the elders also prepare a drink called *maatz'*, an atole made from maize that has been toasted, ground fine, and placed in a boiling pot of water, often with small bits of unground maize. When the latter is added the mixture is conceived as a "woman who gives birth to children." Freidel et al. wrote that they were told that *maatz'* is sometimes addressed as mother's milk or sperm, both associated with rebirth and regeneration (Freidel et al. 1993:180). Cacao is often added as well, as this is considered a kind of divine "maize" that the gods and ancestors eat. Bunzel wrote that in Chichicastenango maize atole, often mixed with cacao, is the principal ceremonial drink and that any important ritual includes bringing a jar of atole. It is always the first offering of meals within the *cofradías* (Bunzel 1952:44). Bunzel suggests that such meals are not simply a courtesy, but an essential part of the ceremony and are sacramental in nature. Part of the ritual is the veneration of the food itself. Ceremonial food is brought to the *cofradía* by participants in full ceremonial dress. A rocket is set off when the food leaves the *cofrade's* home and again when the food arrives at the *cofradía* house. There the jars of *atole* are greeted with long speeches, accompanied by music (ibid.:45–46).

At Santiago Atitlán, the preparation of *maatz'* is fraught with danger and must be carried out under the direction of the wife of an important *cofradía* elder. The *alcalde* blesses her beforehand so that she will not be burned in the process. Although *cofradía* members frequently share food and drink in an atmosphere of informality sometimes bordering on raucousness, Atitecos drink *maatz'* with great solemnity and in absolute silence other than to exchange thanks.

Most meals among the Maya are consumed in the cooking area, seated on the floor or on small stools around the fire. Ritual meals in the *cofradía* house are always eaten at a table. The table is itself a sacred object, often mentioned in prayer litanies along with the gods and saints. Throughout the Maya highlands, tables are considered effigy worlds, with the edges oriented to the cardinal directions. At Momostenango, a prominent *chuch-qajaw* (priest-shaman) told me that when he sits at his table he becomes a living representation of the organization of the world:

> When I am seated at the table, I am *aj nawal mesa* (of or pertaining to the ancestral spirit essence table). My body is in the form of a cross just like the four sides of the world. This is why I face to the east and behind me is the west. My left arm extends out toward the north, and my right arm points to the south. My heart is the center of myself just as the arms of the cross come together to form its heart. My head extends upward above the horizon so that I can see far away. Because I am seated this way I can speak to *Mundo* (World) (Christenson 2003:96) (Fig. 6).

When the priest sits at his table he places himself in a transcendent role that bridges the three layers of the world. His legs conceptually extend beneath the surface of the earth/table, his arms manipulate its sacred geography, while his upper body

Fig. 6 *Ajq'ij* in Momostenango seated at his ritual table

rises into the upperworld. In so doing, he is able to "see" all places where the spirit beings live and converse with them. Maude Oakes noted that sacred tables at Todos Santos bear a cross addressed as *Santo Mundo* [Holy World] which represents the first shaman-priest of the world (Oakes 1951a:138). The *ajq'ij (the diacritical after the q is necessary here)* who sits at this table thus acts as the representative of the first ancestral priest who set the precedent for such ceremonies.

In the *cofradía* meals at Santiago Atitlan, individual bowls of meat are brought from the cooking house and given to each of the participants in turn seated at the table in general order of their rank within the *cofradía* system. The tamales are brought in a single vessel and all take from it. Once all have been served, the *alcalde* gives a formal speech thanking first a series of gods and ancestors for providing the food that is to be eaten. He prays that the food will strengthen the participants present so that their minds and hearts will have renewed life, that their arms and their legs will be able to endure the work they are required to do, and that their necks and backs will be bear their weight in their pathways. Often the *alcalde* will speak of their work as a burden that they must bear, no matter the weight or difficulty. This burden is made bearable by the food that the gods and ancestors bring to them. The ritual feast is itself considered an essential part of *cofradía* obligation and is referred to as a "service" (Mendelson 1957:135).

The wording and gestures of the *alcalde* imply that the gods and ancestors are present. Indeed the table where the food and drink are consumed stands perpendicular to the altar and chests that bear the *cofradía's* patron deities and saints. When referring, for example, to the Heart of the Sky, the *alcalde* looks up and gestures in that direction with his hand. He looks down and gestures toward the ground when referring to the Heart of the Earth. When the name of each deceased ancestor is mentioned, the *alcalde* gestures with his hand toward the table, as if they were seated there along with the living. The implication is that in calling upon each deity or ancestor, they are acknowledged as being present. The *alcalde* lists each participant by name and title, and calls on the patron saint of the *cofradía* to bless that individual so that the soles of his/her feet, knees, heart, arms, head, and thoughts will have power and that nothing untoward will happen to them during the year (Fig. 7).

Having finished his formal prayer, the *alcalde* addresses each participant individually by rank and encourages him to eat and take a drink. In turn, those seated at the table, before taking a bite of food or a drink, raises it first toward the altar, then toward the *alcalde*, and then to each participant present in general order, thanking them. This gesture of gratitude is acknowledged by each individual in turn before

Fig. 7 Ritual meal in Cofradía San Juan, Santiago Atitlán

moving on to the next person (making eating rather difficult with constant interruption to thank those present or to acknowledge their gestures of gratitude in return). A bit of drink, and sometimes a morsel of food, is splashed onto the table or floor as an offering to the gods and ancestors so that they may join in the feast (Fig. 8).

Cofradía meals are considered a shared offering between the living participants and their ancestors, presided over by the patron saints and deities arrayed on the altar. Having shared a meal together, there is a common bond between them that both purifies them and strengthens them to carry out their ritual labors. Maud Oakes quotes a resident of Todos Santos as saying that sharing sacred drinks forms a bond with both supernatural beings as well as living participants:

> The gourd cup, or *guacalito*, is used by the *chimán* to put *aguardiente* in; he can drink the spirit of God which presents itself during the hours of prayer. The gourd bowls or cups – *jicaritas* – are used for drinking *batido* [a ceremonial drink made of ground corn, sugar, and water]. When one drinks it, it signifies the union of all the participants, that all are one (Oakes 1951b:122).

Fig. 8 Wife of a *cofrade* giving thanks, Cofradía San Juan, Santiago Atitlán

Fig. 9 Ceremonial table, Cofradía Santa Cruz, Santiago Atitlán

Because *cofrades* eat the same food and drink from the same table, in a sense they share a common body. Of course, ancestors were once living members of the community and their descendents bear their same flesh and blood. Even the saints appear to share this corporeal bond. The wife of the *alcalde* of Cofradia San Juan on one occasion remarked, "We will all one day be saints like these on the altar" (Andrew Weeks, personal communication, 2008). For the Maya, saints and ancestors are not transcendent above the living in material ways. They differ more in rank and status. Nevertheless, on ceremonial occasions they all interact, including the sharing of food and drink (Fig. 9).

Feasting with the Ancestors

Ruth Bunzel noted that the K'iche's of Chichicastenango claim that their formalized speech and ceremonies are attributed to ancient ancestral precedent: And now this rite and custom belongs to the first people, our mothers and fathers.... This belongs to them; we are the embodiment of their rites and ceremonies" (Bunzel 1952:232, 238). To alter the actions of the ancestors would be to change the very fabric of their existence in potentially destructive ways. As mediators between this world and that of the sacred, it is the Maya's obligation to continue the actions of their divine ancestors in as authentic a manner as possible: “It is our name and destiny to repeat and perpetuate these ceremonies before the world” (Ibid., 242). When asking Tz’utujils when certain rituals began, a common response is that they are as old as the world and were first performed by their ancestors who had divine power (Christenson 2001:22–23, 68; Mendelson 1965:91).

The home is the principal residence of family ancestors in K’iche’ society. It does not really belong to its living inhabitants, but rather to their forebears who jealously guard it and work to protect it from harm and illness if their descendants are living in accord with societal norms. Bunzel writes:

> As former owners of the house and land, the ancestors, along with the “idols,” enforce social order within the house. The living inhabitants believe that they merely have lodging (*posada*) in a place that really belongs to the dead, and that they will be ousted from their lodgings if guilty of any misconduct. Adultery, theft, drunkenness, and neglect of ritual obligations are other “sins committed within the house” which the ancestors punish by sending sickness or death, or by loss of property. A man lives in constant fear of his ancestors, and a large part of his personal religion is concerned with imploring them to protect his house and all those who dwell within it (Bunzel 1952:270) (Fig.10).

It is a common topic of conversation when entering a household to review the parts of the house compound, pointing out which of the owner’s forebears built it, and what religious offices that ancestor held in life. In traditional households, a family altar is placed in a prominent part of the house where relics of ancestors are placed as a token of their continued presence in the home. These altars serve as a focal point for prayers and ceremonies to petition the dead for protection and desired blessings. If any part of the house was once used as a *cofradía*, that area is perpetually set aside for ritual uses, or to store maize and other foodstuffs, which are themselves considered sacred to both the living and the dead. The understanding is always that the house is the perpetual property of the ancestors and if any new

Fig. 10 House compound near Cunén, Guatemala

construction takes place, the ancestors must give their permission first and be consulted at all stages. This is particularly true when a new house is constructed. Nicolás Chávez Sojuel described to me the traditional dedication of a new house in Santiago Atitlán:

> When a man decides to build a new house, he must first ask the ancestors for permission, because the land belongs to them and they will punish him if he does not consult them. Once permission is obtained through prayer and offerings, the man and his family and neighbors build the house. Once it is finished, it is blessed like you would bless a maize field. Both a maize field and a house are oriented to the four directions with the center being the most important part. A house is like the world, or a mountain. For a traditional house, the walls were made of stone, like a mountain. The walls were made of *palitos* (sticks, poles), like the trees that grow on the mountainside. The roofs were made of thatch, like the leaves of the trees. To enter the house was like entering a cave into the mountain where the ancestors live.
>
> Once the house is built, it is blessed. The ideal is to sacrifice four hens, one for each of the corners of the house. The blood of the hen would be daubed at each corner and then the body of the hen hung at the top of the corner post. A fifth hen, or even better a turkey, was sacrificed and buried at the center. This then becomes the house's *k'ux* (heart). After the bird is buried in the center of the house, a cross is placed in the doorway to represent the heart of the new house. Eight days later, the man would invite all of his family and his wife's family to eat with them as part of the house dedication. They would drink an atole made of toasted maize as part of the ceremony, the same atole they use in *cofradía* ceremonies, or when asking for a wife, or when a child is born, or when the child gets its first tooth, or begins to walk.

Feasting is an essential part of the house dedication. It is not just a celebratory meal, but a ritual act essential to the future function of the house as a dwelling for the family as well as their ancestors. A portion of the meal is offered to the ancestors at the house's altar, and prayers offered during the feast frequently mention the ancestors who are invited to participate and occupy the new home.

Sacrifices associated with house dedications are an ancient concept in the Guatemalan highlands. Ximénez wrote that it was general practice in the early eighteenth century:

> Thus, when they built new houses they dedicated and consecrated the center to the god of houses which they called CHAHALHA (that is, "the guardian of the house"), and there they made their altar, and there they made their sacrifices, on which they burned incense and killed birds and other animals. They put on the walls the blood which they drew (from their sacrifices) and they placed feathers all around (I refer to rich feathers such as we use for caps and hats), and in the door of the house they did the same, for thus they assured themselves that no evil thing would enter the house (Ximénez 1929:Book 1, Chapter xxxi, p. 87).

Ximénez went on to say that the ancestors of the K'iche's once used human sacrifices for the same purpose:

> Regarding this, they also had an abuse wherein they would bury in the foundations or in the walls of a house a corpse, that it might guard the house. And such was this abuse that when I broke through a wall of the convent of Santo Tomás, Chichicastenango, to build the sacristy, I found the bones of a corpse that had been left beneath the washstand of the ancient sacristy. It is evident that the Ministers would not have placed it there, but rather that it was placed there secretly so that it would watch over the building (Ibid.).

Evon Vogt also noted that the highland Maya of Zinacantán believe that houses and fields are "small-scale models of the quincuncial cosmogony. The universe was created by the VAXAK-MEN, gods who support it at its corners and who designated its center, the 'navel of the world,' in Zinacantán Center. Houses have corresponding corner posts and precisely determined centers" (Vogt 1976:58). As such, house dedications are important events. Similar to practices in Santiago Atitlán, Zinacantecos sacrifice chickens as part of the dedication ceremony:

> Chickens, symbolizing the residents of the new house are offered as substitutes. In the "Holy Candle" rite the chickens suspended from the peak of the house and beheaded over the central hole are a gift of "souls" as their blood flows directly into the Earth Lord's domain. Although their flesh is consumed in a ritual meal, the heads and feathers are placed in the hole, so in the end, the substitutes are the property of the Earth Lord (Vogt 1976:57).

A cross is placed over the center hole where the sacrifices are buried for 3 days, during which time the house is "carefully attended for it now possesses an innate soul and requires special care" (Vogt 1976:55). The cross is later removed and used for various purposes, including placement in the maize field. The cross, as at Santiago Atitlán, represents the soul of the house and thus of the family, and its placement in the maize field marks it as an extension of the household. Both maize field and household are linked in that they are each places where divine flesh is grown. In both Zinacantán and Santiago Atitlán, a ritual meal serves as an essential part of the house dedication. In the case of the former, it is the literal flesh of the chickens, as substitutes for the occupants of the household that is shared between the living members of the family, the house, and the ancestors.

Feasting for a Bride

Feasting is also a means of bringing a new bride into the family, thus joining two separate family lineages into the same flesh. Ancestors are an integral part of this process, and must be included in all aspects of the bride negotiations and eventual marriage. Bunzel notes that feasting marks nearly every ceremonial or formal occasion, particularly the petition for brides. She notes that this is not simply a matter of courtesy or friendship, but rather an essential part of the process. Gifts to the parents of the prospective bride extend over a considerable period of time, and mostly consist of food, particularly maize atole and cacao (Bunzel 1952:25). The following is an account of the traditional ceremony for betrothal at Chichicastenango as told by one of Bunzel's K'iche' collaborators:

> And now our marriage customs. They come to ask for a girl on a Thursday – or else on a Monday, but better on Thursday. The father of the boy comes with the marriage spokesman (*chinimtal*) very early in the morning, about 2 or 3 o'clock. They enter the patio, and stop to salute the four cardinal points, in remembrance of the ancestors of the house, and to ask their pardon in coming into their house to ask for their daughter (Bunzel 1952:113).

It is significant that Thursday is chosen as the ideal day for petitioning a bride. Later in the account, the day Thursday is chosen because it is "the holy day of our Father

Sacramento," the day of the Last Supper observed during Holy Week (Ibid. :115). Throughout the Guatemalan highlands, the Last Supper is re-enacted on Thursday as a token of mortal man's communion with deity. In Santiago Atitlán, it is seen as the crucial midpoint of Holy Week in which sacrificial flesh and blood is eaten, thus bringing new life into the world. On Thursday afternoon, 12 male children, ranging from 6 to 10 years of age, gather in the *convento* of the church to re-enact the Last Supper as "apostles." Each wears a white tunic with purple sashes crisscrossed at the chest and a tall crown decorated with multicolored paper flowers. The children are seated at a long table surrounded by parents, *cofradía* elders, musicians, and municipal and ecclesiastical authorities. Crowds of townspeople fill the *convento* gardens to watch. Twelve courses of food are brought in succession, processed solemnly from the *convento* kitchens to be laid out for each child. The boom of a great drum and a brief tune on a flute signals that the children can eat a bit of the food. Each course is accompanied by a sip of maize atole and a bit of tortilla to reinforce the idea that it is the flesh and blood of maize that is the most essential part of the meal. After a small taste, most of the food is gathered up by the children's parents to be distributed later about the town. One of the *cofradía* elders told me that this ceremony was the Maya version of the eucharist, and that the tortillas and atole were the equivalent of the Roman Catholic Host and wine. Both represent the ritual consumption of the flesh and blood of deity (Christenson 2002:192–197). Holy Thursday is also set aside for general food exchanges among family and neighbors at Santiago Atitlán, reinforcing kinship and community bonds (Mendelson 1957:256) (Fig. 11).

For the K'iche's of Chichicastenango to choose Thursday as the ideal day for bride petitions makes the ceremonial feasting associated with these negotiations all the more significant as a type of ritual communion. Ancestors are called upon by

Fig. 11 "Last Supper," Holy Thursday, Santiago Atitlán

the boy's parents and marriage spokesman to preside over the ceremony as active participants. Thus, it is actually the ancestors that are first petitioned for the girl:

> The *chinimtal*: "My Father Christ, and you also, mothers and fathers, grandmothers and grandfathers of the mother and father of this house. We are about to enter this house wherein we have seen a woman's skirt, a woman's blouse belonging to you, her mothers and fathers. Give us this girl child of yours, mothers, fathers." (This is repeated to the east, west, north, south.) Then they enter the house and the *chinimtal* speaks again.
>
> "Pardon us, madam, pardon us, sir. Please lend me a little table and a bench." If they do not want to give them the girl, for they know that is why they have come, they say, "we have no table," but if they are willing to listen they bring a table and the *chinimtal* puts the cacao on it, and speaks again (Bunzel 1952:114).

Cacao in particular is associated with new life, which is the anticipated outcome of the marriage. The blessing of cacao is referred to within *cofradías* as the "Resuscitation of Christ" and is only served ritually on the most sacred of occasions (Bunzel 1952:46).

Tables are an essential part of the ceremony. Most Maya eat seated on the ground around the hearth. Even today, tables are generally reserved in traditional households for ritual meals or for invited guests who are not members of the family. In families where the head of the household is a traditional priest, the same table is also used for divination and other ceremonies. The four corners of the table represent the four corners of the world and the placement of objects upon it suggests the arrangement of specific locations on the earth such as mountains or shrines. Vogt quoted a highland Maya man from Zinacantán as saying that the universe is "like a house, like a table" representing that which is systematic, and well-ordered (Vogt 1978:11), and ritual meals at all levels emphasize the importance of the table (Vogt 1969, 575). While ordinary meals are served on the earthen floor of the cooking area, a ritual meal is called a VE'EL TA MEXA (meal on a table) (Vogt 1976:38).

Thus, for the marriage negotiator to request a table is essentially to ask for an altar upon which to place his "sacrificial" offering. To refuse is to reject the offering. It is also to deny the petitioner the right to place his "food" on the table reserved for the ancestors of that family. In Chichicastenango, festive meals are placed on low tables reserved specifically for this purpose. On November 2, the Day of the Dead, the same tables are set with a special meal for the ancestors of the family, who are "invited to enter and eat":

> So the room is left all night. The door of the house and the gate to the street are left open, and tall wax tapers are left burning on the altar. During the night the dead are believed to return, each to his ancestral house, to partake of the food, and to be with their descendants at this happy festival. The ceremony is considered the end of the fiesta of All Saints, one of the largest, gayest, fullest fiestas of the year. The dead "come for the fiesta". Next morning the food is removed and eaten by all the inmates of the house, and gifts of food are exchanged between related families (Bunzel 1952:272).

Returning to the marriage petition account, if the table is brought out the marriage negotiator places his vessel of cacao on it and makes his case. In almost all instances, this initial petition is rejected, but if the proposal is worth considering the girl's family will permit them to return on another occasion. In the case described by Bunzel's informant, the boy's father and the marriage negotiator return the following Thursday, giving time for the girl's parents to consult the intended bride and ask if she wishes to marry. The same ceremony is observed on each visit, a process that may be repeated five or six times. If the ultimate decision is to allow the marriage, the marriage negotiator says to the parents:

> Pardon our faults, mother, father. As for us, we have placed here on this table, beneath this table a bit of the shade of Our Father, Christ, this taboo cacao. We leave it here in this house as a remembrance for our girl child whom you have given to us. As for us, we shall be the ones to take care of her since you have given us our desire. Let us now give thanks to God and to your mothers and fathers. Only let us go and present ourselves to them, since now we have been received into this house (Bunzel 1952:115).

Now notice that up to this point no maize has been offered, only cacao, and this has not been shared between the families. The wording is interesting. On each visit, the marriage negotiator places the vessel of cacao on the table. Yet here he says he placed it both "on this table," which would be the realm of the living and thus intended for the parents of the girl, as well as "beneath this table" for the ancestors who live in the underworld. Both the living and the dead must be petitioned for the negotiations to be legitimate. Once the outcome is seen as successful, the negotiator gives thanks to the ancestors within the household for being "received into this house." This is a far more sweeping statement than just having been admitted physically into the household, as this has been done repeatedly already. It means that they have now been deemed acceptable to join the family as an integral part of the household, including the joining of ancestors to ancestors.

Having settled the negotiations, the family of the boy agrees to come to the girl's house in 2 months' time. On this occasion, a great feast takes place:

Now after 2 months they come again. The first time the father and the mother of the boy come, and the chinimtal comes. Then the father of the boy or the chinimtal speaks:

"Pardon our faults, mother, father, that we have intruded in your sacred house and place. Indeed I am not a messenger or a representative of the authorities (even though I have come unbidden). No, it is only that today is the day, the hour which we appointed for this word or two of our traditions. And, indeed, do you think that in coming here we have brought you nothing? No indeed, we have brought our food and drink, our yellow corn, our white corn, prepared with condiments and spiced sauces, bread and chocolate, a few trifles to be divided in this house where lives our girl child, and as a remembrance for our girl child. It is a poor, unworthy offering, but they were poor also, our mothers and fathers, when they went about in this white light of day…. There is nothing for us to do but give you this poor bit, this scrap of food and drink."

> The father of the girl: "Many thanks to you, mother, father, and thanks also to God for this food and drink. Four times, five times thanks. And now pardon us, and wait for us a moment, mother, father, and let us give you something to eat."
>
> So they wait for lunch, and they eat together (Bunzel 1952:115–116)

As Bunzel points out, the K'iche's are not "hospitable" and do not invite strangers to eat with them (Ibid., 44); thus, this is an unusually intimate occasion. The feast specifically involves numerous jars of maize atole, mixed with cacao and other condiments. One of these jars is consumed on the spot, while the rest is distributed among the extended family. On each subsequent visit to plan the marriage, the process of feasting is repeated.

Atole is an essential part of this gift exchange not only at Chichicastenango but also throughout the Guatemalan highlands. While various food gifts may be given during bride petition ceremonies at Santiago Atitlán, maize atole is always included. While wealthy families may give additional gifts as a means of impressing the girl's parents, atole must be given by the family of even the poorest of hopeful bridegrooms (Mendelson 1957:61–62).

The consumption of maize atole is a ceremonial observance, and, indeed, the food gifts brought on this occasion are called "performing ceremonies" for the girl (Bunzel 1952:25). The marriage feast joins the two families in a far more profound way than in most societies. Having eaten maize together, the two families become literally of one flesh and are no longer considered separate lineages. Thus, after the girl enters the boy's home, there can be no further intermarriage between the two families. Such a union would be considered incestuous.

Food was also an essential part of marriage negotiations among the ancient Maya prior to the Spanish conquest. In the Popol Vuh, no other gift exchange than food was necessary or even desirable:

> There were only three divisions of lineages there at the citadel named Chi Izmachi.

And yet again they began to feast and to drink to their daughters. They who were called the Three Great Houses gathered together to celebrate. They would drink their drinks and eat their food, and this alone was the bride price for their sisters and their daughters. There was only joy in their hearts when they feasted within their great houses:

"We give only our thanks and our gratitude as a sign of our agreement; as a sign of our word regarding the boys and girls born of their mothers," they said (Christenson 2007:265).

Later, when the lineages fell into dissension and broke apart, it was the demand for more than food and drink during bride negotiations that was blamed for the split. It is also significant that the outward expression of this dissent was the desecration of the ancestral dead – the most violent means possible of breaking familial ties:

> And yet they were also divided because there began to be contention. They began to envy each other regarding the bride price for their sisters and their daughters. For it was no longer merely food and drink that they demanded. This, then, was the root of their division. They turned on each other, desecrating the bones and the skulls of the dead (Christenson 2007:267).

Feasting with Strangers

It is well documented in highland Maya records that the ancient K'iche's conducted elaborate feasting rituals at their capital city of Q'umarkaj prior to the Spanish Conquest. All the major polities of highland Guatemala participated in these ceremonies, including the Kaqchikel and Tz'utujil, who were otherwise rival states often engaged in bloody conflict. Las Casas and Román describe these festivals as including huge banquets as well as ritual dances and sacrifices in honor of their titular gods (Las Casas 1967:Book 3, Chapter clxxviii, 218–222; Ximénez 1929–31:Book 1, Chapters xxix–xxx, 81–86). Such banquets served to establish mutually beneficial ties among adversarial polities.

This is reminiscent of Zuñi feasting rituals as described by Frank Hamilton Cushing in the nineteenth century. He reported that the Zuñi saw feasting as a way to make the physical bodies of those who participate like in kind, thus establishing bonds similar to kinship ties. Zuñis invited even enemy groups such as Navajos and Apaches to their feasts on special occasions in order to prevent future conflict. This was not conceived by the participants simply as a process of mollifying hostilities by means of a pleasant banquet, but a physical bonding through shared flesh-forming maize that made the participants (albeit temporarily) of the same body.

When Cushing moved in with the Zuñi governor in 1879 (uninvited of course) and the latter realized that he couldn't persuade him to go away, the governor insisted that Cushing eat only local food, particularly maize. He explained that this would make him a Zuñi and he could then learn the language and customs of his people. The implication is that this would have been impossible otherwise. The governor cautioned him in this way:

> You must never go to Dust-eye's house [the Mission], or to Black-beard's [the trader's] to eat; for I want to make a Zuñi of you. How can I do that if you eat American food? With this he left me for the night (Cushing 1979:90).

Once he had remained in Zuñi for an extended period of time, he became accepted as a member of the pueblo community, even by an aged priest who had previously been wary of him. Again this acceptance was associated with eating local maize:

> Now that I wore the head-band and moccasins of his people, his attentions were redoubled, and he insisted constantly that I should dress entirely in the native costume, and have my ears pierced. That would make a complete Zuñi of me, for had I not eaten Zuñi food long enough to have starved four times, and was not my flesh, therefore, of the soil of Zuñi? (Cushing 1979:91).

This is apparently also a Mesoamerican concept. In the Historia Tolteca-Chichimeca, Chichimec messengers from the north arriving at the Nahuatl-speaking court of the Mexica were given a grain of local maize to eat so that they could speak intelligibly in Nahuatl (Kirchoff et al. 1976:169 [211–213]; fol. 19v, n. 4).

I find this intriguing with regard to the Highland Maya. When I first began working as an ethnographer in K'iche'-Maya communities in Guatemala, I found it curious that when I struck up a conversation in K'iche' with someone I didn't know, that person would sometimes interrupt me in midsentence and ask me what I ate, specifically if I ate tortillas or wheat bread. When I affirmed that I ate what they ate, including tortillas, they would nod as if that explained a great deal. After a number of such experiences I asked a friend of mine why people were curious about what I ate. He replied, "You can speak our language. I wondered if it was because you ate maize from here. If so then you have the flesh of the ancients in your flesh and therefore can speak what they spoke."

Conclusions

When asked why the people of Santiago Chimaltenango felt a strong identity with their ancestors and with their community, one of Watanabe's collaborators responded in part, "because of the food that we eat and the land that we work" (Watanabe 1992:25). As in many cultures whose livelihood is based to a significant degree on agriculture, the Maya believe that human birth, death, and rebirth are inextricably linked to the life cycle of sacred plants such as maize or the world tree. Among the Maya, maize is not only essential to survival as a staple of their diet, but also to all aspects of their cultural identity, ritual practices, familial relationships, and even their ability to speak their language properly.

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From Field to Hearth: An Earthly Interpretation of Maya and Other Mesoamerican Creation Myths

Michael D. Carrasco

Introduction

Ancient Maya mythology may perplex the modern student. As recorded in inscriptions, mythological episodes are cryptically short, speak of obscure places and entities, and leave much to the reader who, if Maya, would have been so intimately familiar with the story that the details we find lacking were already deeply imprinted on their psyche. Nevertheless, from these esoteric textual fragments and associated imagery we may redact a rich mythological world whose symbolism owes much to the agricultural practices and foodways surrounding maize, still the staple crop of Mesoamerican peoples (Staller et al. 2006; see Anderson and Tuxill, this volume).

This chapter adds to scholarship on Maya cosmology by proposing that maize agriculture and the activities that transformed this grain into a foodstuff played a major role in the formation of Maya and Mesoamerican mythology. I suggest that like other ancient societies an elaborate tradition arose around the cultivation, preparation, and lifecycle of this crop. In essence, like rice in Asia (Ohnuki-Tierney 1993) or bread in the West (Camporesi 1996), maize and the foods made from it were sacred. The quotidian activities surrounding its cultivation and preparation took on grander proportions within myth than the original domestic act. Nevertheless, it was through myth's clear reference to domestic activities that the metaphors expressed therein had the potential to speak to a wide segment of society and became a useful medium for political and religious propaganda and, more importantly, an explanatory model for life's mysteries.

Much has been written about the importance of maize to Maya and Mesoamerican myth and iconography (Girard 1952, 1995; Taube 1985, 1989, 1996, 1998, 2000a; Fields 1991; Schele and Freidel 1990; Freidel et al. 1993; Stross 2006). As early as the 1950s, and anticipating much of the recent literature on Maya mythology, Rafael Girard (1995, 1952) wrote on the agrarian rites of the Ch'orti'. He argued that these rites were of critical importance for understanding colonial and ancient Maya mythology.

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More recently Karl Taube (1985, 1989, 1996) has outlined the iconographic development of the Maize God and highlighted this deity's important mythological role in Mesoamerican and Maya societies. Aside from these focused studies on mytho-agrarian practice and Maize God iconography, most discussions of Classic Maya mythology have concentrated on astronomical phenomena in a way that suggests that these phenomena were themselves the basis for myth (Freidel et al. 1993; Milbrath 1999; but see Bassie 2002, 2008). This was done out of an attempt as Linda Schele put it, "to look to nature for the source of mythological symbolism" (Freidel et al. 1993:76; see also Lévi-Strauss 1966:1–33). However, astronomical phenomena are not the only natural source, nor are they the root metaphor or metonymic base from which much of ancient Maya and other Mesoamerican cosmologies were elaborated. Rather, I suggest that the pioneering work of Girard in this area is compelling. He asserts that a large part of ancient Maya and Mesoamerican myth was generated through a complex analogy with maize agriculture and associated foodways. Astronomical phenomena were often important hierophanies within agrarian mythic cycles because they marked agriculturally-significant times; however, within the ontology of myth they are secondary to agrarian and domestic practices.

In this chapter I first outline Maya cosmology as it is currently understood from iconography and inscriptional literature, particularly as preserved at the city of Palenque. Within this mythology I focus on three episodes that most specifically speak to the issues of foodways and maize in myth: (1) the organization of the present era and the changing of the hearth on 4 Ajaw 8 Kumk'u (13.0.0.0.0; August 13, 3114); (2) the birth of the Maize God; and (3) the dressing of the Maize God by nude or nearly nude women. Through the examination of these episodes I demonstrate that ancient Maya mythology was part of a Mesoamerican-wide tradition of myth-making closely linked through analogy to the lifecycle of maize and its conversion into a foodstuff.

Maya Cosmology

David Freidel and Linda Schele (Schele 1992; Freidel et al. 1993) were among the first to redact systematically mythological texts to present a unified picture of ancient Maya cosmology. Their work in large part was the result of the intensive investigation of the site of Palenque and the insights gained during the *Mesa Redonda de Palenque* from 1973 through the 1980s (Robertson 1974, 1976, 1980, Robertson and Jeffers 1979; Benson 1985), the groundbreaking research of Heinrich Berlin (1963) and David Kelley (1965) on the patron gods of Palenque, and Tatiana Proskouriakoff's (1960, 1963, 1964) proof of the historicity of Maya inscriptions. Much of the chronology of the Palenque cosmology, especially in regard to the contrast of mythological events with contemporary ones, was elaborated in a series of papers by Floyd G. Lounsbury (1976, 1980, 1985) and continued to be a topic of intensive study at the Maya Meetings at Texas (Schele 1985, 1987, 1988, 1992) and more recently in the work of David Stuart (2000, 2005) and the author (Carrasco 2005a). Others have examined the symbolism of myth in greater detail. For example, a review of the mythological texts at Palenque by Freidel and Macleod (2000; cf. Macleod 1991) presented significant new readings of specific glyphs, such as T153 (*jel* to change; exchange), and the collocation **k'o-ba**, *k'o'b,* as hearth.[1] Karen Bassie's (2002, 2008) recent work on the Palenque patron gods presents intriguing new structural similarities between these deities and the creator gods named in the Popol Vuh (Tedlock 1985; Christenson 2003).

These recent advances in epigraphy and iconography underlie much of the present discussion. I will extend these observations to address issues of meaning beyond the interpretation of individual glyphs and passages, or the identification of specific deities. I take the symbol of the hearth as my starting point to ask questions such as: Why was the metaphor of the hearth chosen as both the visual and literary symbol of the present creation? Within myth why was the hearth changed? Why is the Maize God's birth depicted in ways that differ quite markedly from what we might normally expect from a "birth"? What does it mean to be born from within a mountain? Why do women dress the Maize God? How can we make coherent sense of the symbols within the creation narrative? I suggest that the symbol of the hearth, and much of the other imagery presented in mythological narratives, may be explained by looking to ancient conceptions of food production and the life-cycle of maize common to many Mesoamerican societies. However, before delving directly into these issues I summarize the mythic episodes themselves for those not already familiar with Classic Maya mythology, because earlier interpretations largely persist in the literature (e.g., Rice 2007:40–45), no doubt because newer interpretations of Classic Maya mythology have not been published widely (but see Stuart 2005; Carrasco 2005a).

Mythological episodes in inscriptional literature were used for many purposes beyond simply recording the trials and tribulations of Maya deities. Mythic narratives intertwined descriptions of otherworldly events with ritual and dynastic history that were particular to the individual sites at which they were recorded. Indeed, the majority of creation texts in Classic period inscriptions anchored historical events to a mythological framework, rather than being an extensive exposition of cosmogenesis. Thus, the historical moment and place at which a mythological text was produced heavily inflected its narration. The important point of highlighting the fact that the texts here are interwoven with the histories of specific cities and political agendas is that the latter-day reader is never presented with narratives that are meant to explicate myth or cosmology solely. While the Maya of course had categories that differentiated between deep-time events and contemporary ones, it is the modern researcher who strives to separate Maya discourse into the discrete, familiar categories of myth and history. For the ancient Maya the relationship between these categories was far more ambiguous or simply different. Thus, texts

[1] There are several words for hearth in Maya languages of which *k'ob'* and its family of cognates are the most common (see K'ekchi' *kúb*, tenamaste; K'iche *x-kúb'*; Ch'orti' *ch'ujb'en*; and YUC *k'óob'en*, hearth (Bricker et al. 1998), TZO *ch'ob'*, torch, falling star, and St. Elmo's fire (Laughlin 1975:137). On the basis of Tzotzil *ch'ob'* as numerical classifier for torches and Ch'orti' *ch'ujb*, "to ignite," hearth in both Ch'orti' and Yucatec seems to be a derived noun from a verb that possibly means to "ignite," perhaps specifically with a torch.

discussed in this chapter exhibit this kind of interweaving of myth and history; most are from Palenque and were inscribed from the end of the seventh through the first half of the eighth centuries. The most important date, 4 Ajaw 8 Kumk'u, occurs in texts ranging from the Early Classic to the contact period Dresden Codex.

Much of mythology as recorded at Palenque surrounds the feats of a deity known prosaically as GI, possibly read Ju'n Ye Nal Chaahk. The inscriptions of Palenque frequently mention this deity; however, in the context of myth, the text of the Cross Group and the recently-excavated Temple 19 platform provide the most information (see Stuart 2005). The Temple 19 platform text preserves the earliest events in the life of GI yet known. K'inich Ahkal Mo' Nahb (678–736?), the successor to K'inich K'an Joy Chitam, commissioned the text and imagery of the Temple 19 platform to commemorate the dedication of a series of structures on January 10, 734 (9.15.2.7.16 7 Kib 19 K'ayab [Stuart 2000:33]). In general, the narrative structure of the Temple 19 platform text mirrors that of the earlier inscriptions of the Temples of the Cross Group. That is, the beginning portion of the narrative on the South Panel begins with myth and moves into historical time with the dedication of specific structures (probably referring to Temple 19 itself), which were owned by the patron gods, GI, GII, and GIII. The mythological portion of the Temple 19 (Fig. 1) inscription begins on the South Panel with the installment of GI into lordship (*chumlaj ta ajawlel*) under the auspices (*ukabjiiy*, D6) of Yax Naah Itzamnaaj. This event occurred in the heavens (lit. face/surface of the sky [*uhtiiy ta ut? chan*], C8–D8), a toponym also mentioned at Copan and in the Palace Tablet (P7) in association with different events. Some 11 years (Distance Number 11.1.16) after GI's installment into rulership on 9 Ik' 5 Mol (12.10.1.13.2), the subject of the Temple 19 text turns to a mysterious series of events that involved the possible beheading of the Starry Deer Crocodile and the drilling of new fire on 1 Etznab 6 Yaxk'in (12.10.12.14.18) (Stuart 2005:60–77, Chap. 5).

With this additional documentation of pre- 4 Ajaw 8 Kumk'u events we are forced to reinterpret much of Classic Maya mythology. Until the discovery of Temple 19 it was commonly thought that GI's birth was recorded twice in the Temple of Cross (Lounsbury 1976, Schele and Freidel 1990:246; Freidel et al. 1993:69). However, the date of GI's accession in the text of the Temple 19 platform occurred 960 years prior to his supposed birth (see Stuart 2000:30, 2005; Carrasco 2005a). Stuart (2000:30) has asked: How can this deity be born 960 years after his accession? Indeed, the statement of GI's birth is far from clear in the Temple of the Cross. The ancient author used the verb *hul* for arrive and the "touching-of-the-earth" glyph instead of the more standard *sihyaj* birth verb, which is used in the Temple of the Sun and Foliated Cross to describe the births of GIII and GII, respectively. The traditional interpretation resulted from an incomplete understanding of Classic Ch'olan grammar. Lounsbury (1976) saw the two birth glyphs (at A17 and D2) in the Temple of the Cross (Fig. 2) as a record of two separate statements of birth, rather than as referring to the singular event of the birth of Muwaan Mat. But to whose birth did this second statement refer? The distance number of 8.5.0 years does not lead to the ending of the 13th Bak'tun if counted from the date of the first birth event on 12.19.13.4.0 8 Ajaw 18 Kasew (December 7, 3121 B.C.), which would have

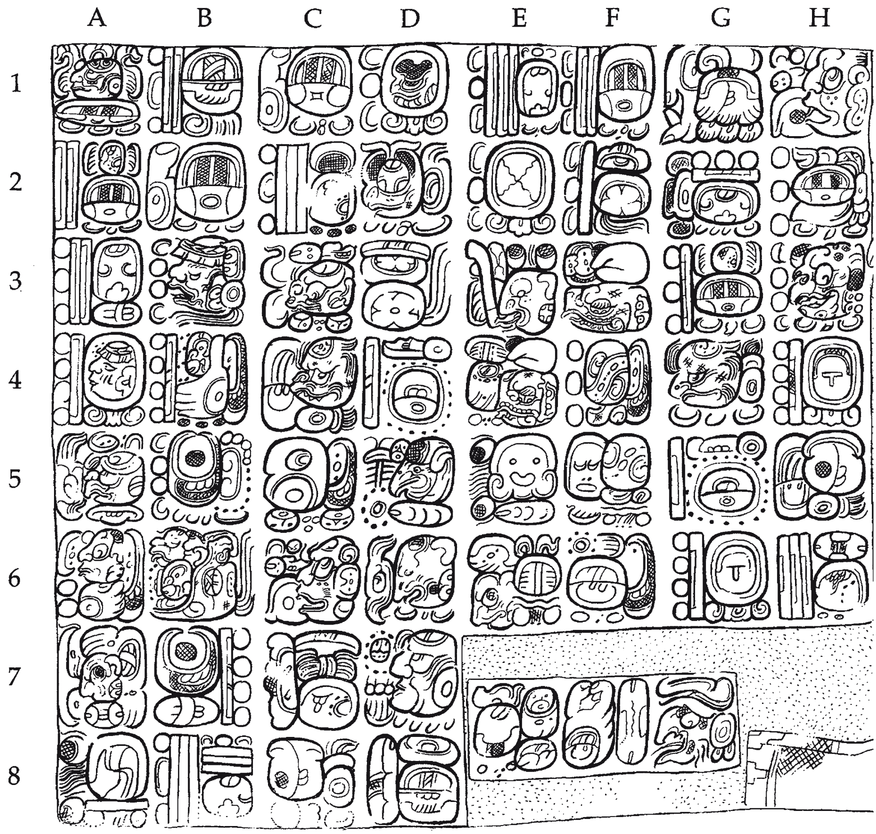


Fig. 1 Palenque, Temple XIX, detail of Platform text, C5-H1. The passage describes the seating of GI under the auspices of Yax Naaj Itzamnaaj as well as the decapitation of the Starry Deer Crocodile among other events (drawing by David S. Stuart)

required a distance number (DN) of 6.14.0 instead. In turn this initial misinterpretation prompted Lounsbury to reconcile the 8.5.0 distance number by subtracting it from the period ending of 13.0.0.0.0. He argued that the text therefore implied the first birth of a "senior" GI on 12.19.11.13.0 1 Ajaw 8 Muwaan (June 16, 3122 B.C.) (also see Schele and Freidel 1990: 246; Freidel et al. 1993:69). The idea of a "second" birth stems from a phrase beginning at C17, now known to refer to GI's arrival (*hul*) to Matwiil, which is reiterated in the following clause with the "touching-of-the-earth" term.[2] It is useful to have the full mythological passage from the Temple of the Cross (C6-F9) in view to clarify these points.

[2] The "touching of the earth" collocation perhaps suggests birth as Lounsbury (1980:112–113) originally proposed, but as this passage is coupled with *hul* (to arrive) the nuance of this term in this case is shifted from birth to the arrival of GI to Matwiil.

Fig. 2 Palenque, Temple of the Cross, *left panel of text*, A1–F17. (drawing by Linda Schele, copyright David Schele, courtesy of Foundation for the Advancement of Mesoamerican Studies, Inc.)

8 ajaw 18 kasew … sihyaj ixim? muwaan mat mi' [k'in] 5 winikjiiy 8 haab sihyajiiy i uk'almay 4 ajaw 8 kumk'u tzutzuy 13 pih

2 [k'in] 8 winikjiiy 1 haab jehlajiiy k'o'b ti' chan yax sim? nal[3] *em ta chan GI 13 ik' ti' haab mol* "God N head" *6 ? chan nah nal 8 chaahk naah uk'aba' yotoot xaman*

0 [k'in] 12 winikjiiy 3 haab 18 winikhaab 1 pihiiy pehtjiiy 6 chanik GI i hul matwiil 9 ik' 15 keh u ? kab matwiil ubaah uch'ab-ak'abil muwaan mat …

2 [k'in] 11 winikjiiy 7 haabiiy 1 winikhaab 2 pihiiy sihyaj i k'al sak hu'n tu ub'aah muwaan mat 9 ik' chum sak

On 8 Ajaw 18 Kasew Ixim? Muwaan Mat was born. Five months and 8 years after he was born, then it was his *k'almay*. On 4 Ajaw 8 Kumk'u the 13 Bak'tun (cycles of 400 years) were completed.

Two days, 9 months, and 1 year after the hearth, the portal of the sky, the first heated place had been changed, GI descended from the sky. On 13 Ik' the seating of Mol (13.0.1.9.2; February 5, 3112 B.C.) the House of the North, whose name was the Six Sky House and the Eight Chaak House was dedicated.

[It was] 663 years and 12 months (DN 1.18.3.12.0) after the Six Sky had been embraced [by] GI that he then arrived [at] Matwiil [on] 9 Ik' 15 Keh (1.18.5.3.2; October 21, 2360), [it was] the "earth-touching" of Matwiil [by] the person of the creation of Muwaan Mat…

2 days, 11 months, and 827 years after he had been born then it was the tying of the white bark paper onto the head of Muwaan Mat on 9 Ik' the seating of Sak (September 7, 2325) (translation of the author).

In addition to rereading this text in light of an improved understanding of Maya epigraphy, the problems posed by the 8.5.0 DN are clarified further when we look to the use of *k'almay* (lit. gift-tying) in other inscriptions at Palenque. In the Palace Tablet k'almay's meaning is more easily discerned. The relevant passage (D18-E12) reads:

19 k'in mi' winikijiiy 7 haab'iiy sihyaj i ut 2 kawak 12 yax yax k'al k'ik' k'al mayajij ux ch'ak kab'an(?) mat ch'ok yib'nal GI ch'ok une k'awiil GIII….

[3] The so-called "three-stone-place" continues to defy phonetic decipherment though the meaning of hearth has attained general acceptance for obvious reasons. The interpretation presented here for either a *sim* or perhaps *sam* reading, depending on which spelling conventions are correct, is merely a suggestion supported by phonetic complementation found on Step 3 of the Hieroglyphic Stairway at Seibal where the "three-stones" logogram is suffixed by a *mi* syllabogram (Grube and Nahm 1990) and by the likeness this glyph bears to a hearth. There are several words for hearth in the relevant Mayan languages: terms built around the root *k'ob'*, with synonyms in the words *siimtun* (Yucatec), and *oxyoket* in Tzotzil and Tzeltal. I present the alternative of *sim* or *saam* because this reading accounts for the presence of the *mi* suffix. There are some problems, however, that prevent me from endorsing this interpretation whole-heartedly. First, the full reading for the collocation would seem to be something like *ux sim tuun nal* for "three-heated-stone-place." We are never given details that would allow us to read the stone sign used in this glyph as *tuun*, that is, they are never to my knowledge suffixed with a *ni* syllabogram. Second, the etymology of the word *sim* is a bit difficult to determine. The *simtun* or *si'im* of Yucatec, or in other languages *sam*, all meaning *comal*, seem to be built around the root *si'* 'fire wood' and a participial ending -*m*. However, Mixe *sham* (Lipp 1991:224) and *sham* ~ *sam* in pMZ (Wichmann 1995) meaning "hot" suggests that at least in the case of *sam* we might be dealing with a different root entirely, which was perhaps borrowed into Mayan.

> 19 days, 0 months, and 7 years after he had been born then 2 Kawak 12 Yax happened. [It] was the first presentation of blood, the k'almay [by] Ux Ch'ak Kaban Mat Ch'ok under GI, GII, GIII… (translation of the author).

Thus, what Lounsbury (1976, 1980) and later Schele and Freidel (1990: 246) read as an implied birth is in reality the record of a childhood rite of passage that Muwaan Mat underwent when he was 8½-years old. This is nearly the same age at which Ux Ch'ak Kaban Mat Ch'ok (the youth name of K'inich K'an Joy Chitam) is said to have undergone the k'almay rite, and possibly his first bloodletting in the presence of the patron gods in the Palace Tablet. It is approximately at this same age that Kan Bahlam is said to have been *okte'*-ed (another class of pre-accession rites) in the other passages from the Temples of the Cross Group inscriptions. The prominence of these rite-of-passage rituals in the inscriptions of Palenque and the depiction of Kan Bahlam in the central panel at nearly the same age as when Muwaan Mat is said to have also undergone a childhood ritual argue for the reinterpretation of this passage: from one recording GI's birth to one documenting a childhood ritual that was the template for many of the royal youth rituals (pre-accession rituals) recorded at Palenque and other sites (Bassie-Sweet 1991:Chap. 7; Wald and Carrasco 2004; Carrasco 2005a:451–452, 2007). After the parenthetical insertion of the k'almay event in the Temple of the Cross inscriptions, the narrative documents the completion of the 13th Bak'tun on 4 Ajaw 8 Kumk'u, one of the most important events in Maya mythology. At Palenque the completion of this date is tied to the larger narrative that describes the changing of the hearth, the descent of GI from the sky where as we have seen he took the throne, the dedication of a building named the North House, and other mythological events as well as rituals that mirror these events performed by Kan Bahlam. We will soon review the changing-of-the-hearth passage in greater detail, but texts from two ceramic vessels, known as the Vase of the Seven Gods and Eleven Gods respectively, suggest that 4 Ajaw 8 Kumk'u was also the date on which the universe was organized and add to our overall understanding of the creation of the present era.

Organizing the Cosmos

In an analysis of Genesis, Gregory Bateson (2000:xxx–xxxi) observed the following:

> (1) The problem of the origin and nature of *matter* is summarily dismissed. (2) The passage deals at length with the problem of the origin of *order*. (3) A separation is thus generated between the two sorts of problem. It is possible that this separation of problems was an error, but – error or not – the separation is maintained in the fundamentals of modern science. The conservative laws for matter and energy are still separate from the laws of order, negative entropy, and information. (4) Order is seen as a matter of sorting and dividing. But the essential notion in all sorting is that some difference shall cause some other difference at a later time… For such an operation, we need something like a sieve, a threshold, or, *par excellence*, a sense organ. It is understandable, therefore, that a perceiving Entity should have been invoked to perform this function of creating an otherwise improbable order. (5) Closely linked with the sorting and dividing is the mystery of classification, to be followed later by the extraordinary human achievement of *naming*.

As we will see much of Maya creation mythology is similarly concerned with issues of order and the transformation of previously existing matter into new forms much more than with the origin of the material universe. The organizing of the deities listed on the vessels discussed below seems to be a prelude to the erection of the creation hearth said to have occurred on the same day. In this way Classic Maya mythology parallels rather closely the council of gods named in Central Mexican mythologies who also establish a hearth as part of the beginning of the present era (Sahagún 1950–1982 [1590]:7.4; Bierhorst 1992:147–149; Taube 2000b).[4]

The Vase of the Seven Gods (K2796)[5] and its mate the Vase of the Eleven Gods (K7750) (Figs. 3 and 4), both made in the vicinity of Naranjo, present two very enlightening scenes of the beginning of the present era on 4 Ajaw 8 Kumk'u, the textual captions of which clearly suggest that Maya conceptions of world creation present similar concerns to those outlined by Bateson for Genesis. The first in the sequence depicts a council of six entities seated in darkness in front of an enthroned God L, identified by a variety of features including his owl headdress, shawl, beads, cigar, aged features, roman nose, and square eyes (Taube 1992:79–88). The associated text gives the date and states that a series of important deities were put in order, or that they put something in order. The litany of deities named on the mate to this

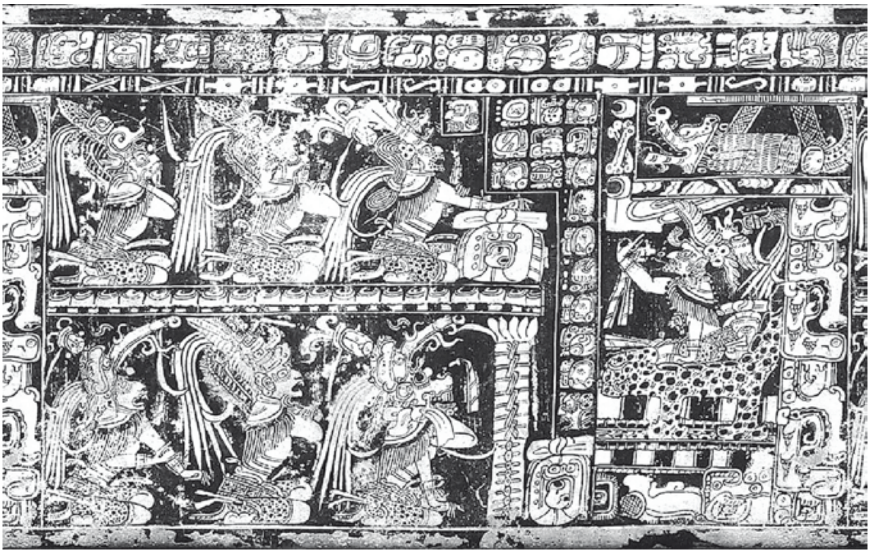


Fig. 3 Vase of the Seven Gods, Kerr Vessel 2796 (photograph by Justin Kerr, courtesy of the Foundation for the Advancement of Mesoamerican Studies, Inc.)

[4] In Colonial Central Mexican mythology a council of Gods assembled before a hearth that served as the location at which Nanahuatzin and Tecuciztecatl were transformed into the Sun and Moon respectively. Eventually all the gods must immolate themselves to set the heavens in motion (Sahagún 1950–1982 [1590]:7.4, Bierhorst 1992:147–149).

[5] This and all subsequent K numbers refer to Justin Kerr's (n.d.) *Maya Vase Database. An Archive of Rollout Photographs,* avaible online at :http://famsi.famsi.org:9500/dataSpark/maya.

Fig. 4 Vase of the Eleven Gods, Kerr Vessel 7750 (photograph by Justin Kerr, courtesy of the Foundation for the Advancement of Mesoamerican Studies, Inc.)

vessel, a square red and black-background vase, is identical except for the final two glyphs, which replace the name of the Jaguar God of the Underworld, with the phrase *uhtiiy k'inichil,* which may be translated as either, "it (the organizing) happened on the day" or "it happened at K'inichil." Thus, the two vases perhaps illustrate the creation of present era through the ordering (*tz'a[h]kaj[ii]y*) of the deities or primordial matter (Freidel et al. 1993:68–69). The slight differences between these two vases represent a nuance of meaning yet to be determined.

However, the meaning of the word *tz'ak* is clearer and is extremely important for our understanding of how the Maya conceptualized creation. Therefore, despite the tedium sometimes associated with linguistic and etymological discussions I would like to spend a moment on this important term. In Ch'orti' Mayan, the modern language closest to the language of the inscriptions (Houston et al. 2000), *tz'ak* means "a joining, a splicing, a bringing together." As a transitive verb, *tz'aki* can additionally refer to the act of doing "up in bundles" (Wisdom n.d.). In compounds with *tun* (stone), *tz'ihk* (adobe), and *te'* (wood), it means a "laying of stones, masonry," a "laying of adobe bricks," and a "splicing of timbers," respectively (Wisdom n.d.). As a derived causative, the related term *tz'a'akse* possesses such similar meanings as "to regulate, arrange or adjust, put into order, improve a thing, repair" (Wisdom n.d.) and by extension "to cure," a gloss also found in Yucatec (cf. Stuart 2003).

Freidel et al. (1993:68–69) saw the text of K2796 as referring to the ordering of the gods in the "black is its center" (*ik' utahn*) place. They interpreted the black background of this vessel as depicting a time before there was a separation of the sky and earth. However, aspects of this interpretation may be questioned because the *ik' utahn* collocation clearly modifies the next glyph *k'uh* (deity, god), and as such therefore cannot refer to a place, even if the location depicted does indeed appear to be in darkness. The first part of their idea about the importance of organization continues to have merit, however, and is strengthened by the discovery of the Vase of the Eleven Gods. The verb on both vases is spelled **TZ'AK-ja-ya** which could be taken to represent *tz'a[h]kaj[ii]y* or *tz'a[h]kj[ii]y*. In either case, the verb is in the passive voice, and is suffixed with the deitic enclitic–*iiy* (Wald 2004). Or, it could be realized as *tz'akyaj,* in which case the verb has been nominalized. This latter interpretation, though the less likely of the two in my opinion, is suggested by the use of /ja/ in the spelling of the thematic vowel of the passive voice instead of /ji/, the more common way of representing the passive when the deictic morpheme –*iiy* is also present. If the reading is *tz'a[h]kj[ii]y*, the passage reads, "[On] 4 Ajaw 8 Kumk'u the black-are-its-center gods, the heavenly gods, the earthly gods, the nine-wooden-pillar-gods (**9-OK-TE' K'UH**)… had been ordered." This reading changes the focus of the passage from the location of the creation, which still seems to be in darkness, to the entities themselves. As Stuart (2003) notes in his discussion of the "Distance Number Introducing Glyph" (DNIG), *tz'ak* in this context means to make a particular cycle of time complete or whole. Thus, *tz'ak* possesses two clearly related nuances in its meaning: "to build" or "combine," and "to make whole," perhaps in a more metaphysical sense.

The important point here is that by choosing a verb associated with building and arranging matter and time the ancient authors of these vessels suggest that creation was an act of construction or organizing with the intention of making that system whole and complete. In the inscriptions the verb *utz'akbuuj* often in a couplet with *ukabiij* (to oversee; govern) references the overseeing of events by rulers probably with the sense that the ruler imposes order on the events overseen.

Changing of the Hearth

Like Central Mexican creation stories, a hearth figures prominently in Classic period Maya mythology. Freidel et al. (1993) first discussed the role of the hearth in creation mythology at length. They tied the importance of the creation hearth to the constellation of Orion, as Eva Hunt citing Robert Laughlin had done as early as 1977.

Freidel et al. established the importance of the hearth in Classic Maya mythology, but Karl Taube (1998) to date has conducted the most extensive examination of the symbolic importance of the hearth. I do not intend to present a full review of what is known about the hearth as symbol here; rather, in this section I would simply identify the (Naah Ho' Chan) location where the Jaguar and Stingray Paddler Gods set the northern stone of the three-stone hearth as the site of the Maize God's "birth" within Classic period mythological texts (Freidel et al. 1993:92) and underscore the pivotal role of the hearth in Maya cosmology.

At Palenque, in addition to the Temple of the Cross inscription the date 4 Ajaw 8 Kumk'u is mentioned in the texts of the Temple of the Sun (Fig. 5). Reference to this event also occurs on Quirigua Stela C (Fig. 6 [Looper 1995, 2003:12]) and in perhaps its earliest known version on the Yax Wayib Mask (Fig. 7), a greenstone mask, which records that a particular manifestation of GI arrived at the Mouth of the Sky and First Three-stone Place (Carrasco 2005a:111–115). Most of these creation texts state that, "the hearth, the mouth of the sky, the first three-stone place was changed." The Tablet of the Temple of the Sun states (B16-O5):

alay sihyaj k'inich taj wayib k'intahn bolay sak?-naah sak baak naah chapa't atin k'ahk' ti' ? k'inich k'in? ajaw ? 6 [k'in] 3 winikjiiy 5 haab 18 winikhaab 1 pihiiy pehtjiiy wak chanik i hul matwiil ubaah uch'ab ixim muwaan mat k'uhul mat ajaw 16 e'w 5 winikjiiy 18 haabiiy 12 winikhaab 9 pihiiy jehljiiy k'o'b ti' chan yax sim? nal 4 ajaw 8 kumk'u i uht 2 kib 14 mol puluy uwaybil…

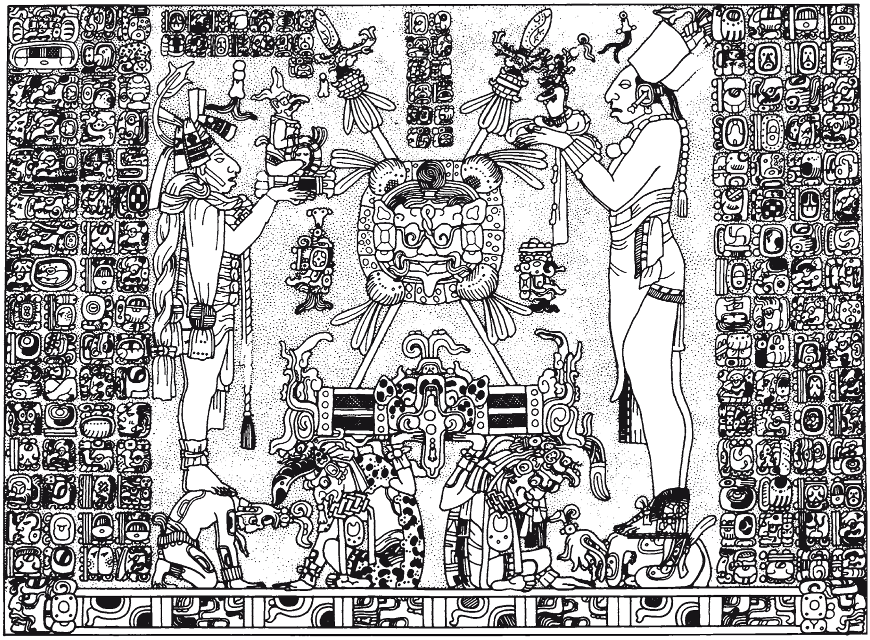
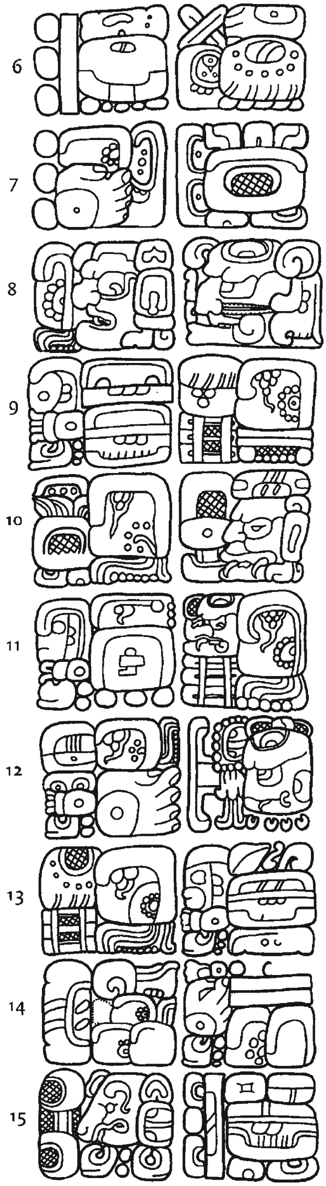


Fig. 5 Palenque, Temple of the Sun (drawing by Linda Schele, copyright David Schele, courtesy of Foundation for the Advancement of Mesoamerican Studies, Inc.)

Fig. 6 Quirigua, Stela C. (drawing by Mathew Looper [2003:12])



Here, was born the K'inich Taj Wayib (heated torch sorcerer), the K'intahn Bolay (Sun Center Jaguar), the White House, White Bone House Centipede, the Fire Bathing Mouth of the ?, the K'inich Sun Lord…[1.18.5.3.6] after the Six Sky had been embraced the person of the creation of Ixim Muwaan Mat, the Divine Mat Ajaw, then arrived at Matwiil. 16 days, 5 months, 18 years, 12 k'atuns, and 9 bak'tuns after the hearth, the mouth of the sky, the first three-stone place had been changed [on] 4 Ajaw 8 Kumk'u it then happened [on] 2 Kib 14 Mol that the shrine of K'inich K'in Ajaw was censed… (translation of the author).

Fig. 7 The Yax Wayib Mask (drawing by the author)

Unlike the texts of the Temples of the Cross Group, Quirigua Stela C describes the setting of this hearth in much greater detail, including the proper name of each stone, the gods responsible for placement of the stones, and the location where each of these stones was set (*utz'apaw*). It concludes by stating that the Six Sky Lord oversaw these events (also see Looper 2003:158–159). The following scan of the text emphasizes the rich use of parallel constructions and demonstrates the poetic and literary importance of such narratives.

1. *jehlaj k'o'b'*
2. *k'ahlaj ux tuun*
3. *utz'apaw tuun* "Jaguar Paddler" "Stingray Paddler" *utiiy naah jo' chan*
4. *hix tz'am tuunaj*
5. *utz'apaw tuun ik' naah chak ? ? utiiy kab' kah (?)*

6. *chan tz'am tuun*
7. *i uhtiiy k'al tuun naah itzam[naa]j*
8. *ha' tz'am tuun*
9. *uhtiiy ti' chan*
10. *yax sim? nal*
11. *utzutz[uuj]iiy uxlajuun pih*
12. *ukab'jiiy wak chan ajaw*

1. The hearth was changed,
2. three stones were tied.
3. The Jaguar and Stingray paddlers planted a stone at the House of the Five Skies.
4. This was the Jaguar Throne Stone.
5. The Black House God planted a stone at Earth Town.
6. This was the Serpent Throne Stone.
7. And then came the House Itzam[naa]j stone binding.
8. This was the Water Throne Stone.
9. These stone settings happened at the Mouth of the Sky,
10. At the First Heated Place.
11. Thus he finished it, the 13th Bak'tun,
12. He oversaw it, the Six Sky Ajaw (translation of the author).

Clearly cognate to the Quirigua text, the changing of the hearth passage from the Palenque inscriptions deletes the specific information about the setting of each of the stones so as to present only an abbreviated yet poetic description of the hearth changing that sets the scene for the actions that follow. In the Temple of the Sun text, the creation kernel follows the main focus of the inscription, which is the birth of GIII, and is even more abbreviated than the passage from the Temple of the Cross. In both cases, the creation passage here serves as an anchor for the actual focused subject of the birth, the rite-of-passage ritual, or other fronted information. The Maya scribe has indicated this in part by the use of the *-iiy* suffix on the *jel* (to change) verb, which was not present in the Stela C text.[6]

The passages referred to above and others clearly demonstrate the consistency within the textual descriptions of the establishment of the present era on 4 Ajaw 8 Kumk'u. From these examples it would seem that the triplet, "*jehljiiy k'o'b, ti' chan, yax sim? nal*" (the hearth, the mouth of the sky, the first three-stone place had already been changed) encapsulates the most important and necessary information, and additional nearly-identical passages are found on Coba Stela 1 (*jehlaj k'o'b*

[6] The interpretation of the *–iiy* suffix is a matter of some controversy at the moment. Wald (1999, 2004) sees it as a deictic enclitic that references previous points in the narrative. On the other side of the debate Robertson et al. (2004) see the *–iiy* as marking the past tense in narratives that are otherwise in the historical present. Here I have followed Wald's interpretation, as I also believe that tense and aspect are not represented morphologically in the EpM verbal complex. A temporal frame is constructed rather through adverbs of time, as is the case for a number of world languages, such as Classical Chinese and modern Mayan languages like Ch'orti'.

tzuhtzaj uxlaju'n pik), Piedras Negras Altar 1 (*ujel k'o'b* "Paddlers") and at Chichen Itza in the text of the Caracol Stele (*jel-[ji]-iy k'o'b*).

Creation Summary

From the texts examined above we have learned that there is a series of gods who existed prior to the present era, that on the day when the present era began the gods were put into order, and that the hearth was changed. As recorded in detail on Quirigua Stela C, this change occurred when a series of gods planted hearthstones at specific locations that seem to be the architectural prototype for the Temples of the Cross Group (Hansen 1992; Freidel et al. 1993) and identifiable in the sacred landscape as mountains (see below), mountains which themselves were possibly manifestations of deities (Bassie 2008:121). A deity known as the Six Sky Lord (6 Chan Ajaw) oversaw this event. The Early Classic text from the Yax Wayib Mask differs slightly from Late Classic period examples to record that deities arrive (*hul*) at the Mouth of the Sky and the First Three-stone Place. Thus, the creation of the present world happened through the joint effort of a group of deities that was overseen by the Six Sky Lord, which is possibly one of the titles of GI.

From the Temple of the Cross we learn that about a year and a half (1.9.2) after the changing of the hearth GI descended from the sky, where as we know from the Temple 19 texts Yax Naaj Itzamnaaj installed him as lord. Upon his descent he appears to dedicate a house (Six Sky House, Eight Chaahk House, The Northern House) that shares the same name (Six Sky) as the Temple of the Cross, which is also said to be the shrine of GI. A distance number of 663 years from a poorly-understood *pet* event (possibly meaning "to embrace," referring to the moment when GI holds the serpent bar as seen for instance on the Hauberg Stela), leads to a record of GI's arrival and the touching of the earth at Matwiil (Lounsbury 1980:112–113). Like Stuart, I see this less as a record of birth than as the manifestation of GI at Matwiil through ritual. The rhetorical reason for including this passage is that Kan Bahlam himself is recorded as conjuring gods during the rituals surrounding the dedication of the Temples of the Cross Group. However, unlike Stuart, I am not certain that the entity mentioned here would have been thought of only as a more limited aspect of the GI. It is simply that Kan Bahlam has used myth to highlight his own ritual actions by connecting his specific mythological lineage founder, Muwaan Mat, to mythic narratives of wider import.

The Birth of the Maize God

A series of painted ceramic vessels depicting the Maize God's birth provides an epigraphic and iconographic bridge between the above narrative and one directly related to the Maize God, and presents an obvious connection between mythology and agriculture, particularly the processes believed required for the germination of the maize seed. The above-cited texts narrate the events that occurred just prior to the birth of the Maize God from the Jaguar Throne Stone planted by the Paddler Gods and supervised by the Six Sky Lord, possibly another name for GI (Freidel et al. 1993:73–74). To my mind there are two possibilities at this point: (1) GI is himself a creator god who oversees the events of creation such as the setting of the hearth and the subsequent birth of the Maize God, or (2) the Maize God and GI are but two manifestations of a single deity who oversaw the termination of the 13th Bak'tun and the changing of the hearth. The texts and images presented in this section examine the location and events of the birth of the youthful Maize God.

The Cosmic Plate (Kerr 1609; Fig. 8) presents one of the most comprehensive depictions and descriptions of the birth of the Maize God.[7] The text and imagery of this vessel continues the narrative of creation as it was recorded in the passages cited above. After the date 13 Ok 8 Sotz' the text reads:

> *uht yax k'uhul* "split-earth" *och?,*
> *uhtiiy ik'* "portal" *nal*
> *ik' nab nal*
> 5 "flower" *nal*
> *chan ch'e'n*
> *chan mat k'uh, hix ?, chak xib chaahk*
>
> It happened the first divine splitting of the earth. They entered (?).
> It happened at the black portal place,
> the Black Ocean Place,
> the Five Flower? Place,
> Sky Cave,
> Chan Mat K'uh, Jaguar ?, Chak Xib Chaahk (translation of the author).

Following the initial split-earth event the passage specifies a series of mythological toponyms that give a more detailed account of the precise location of the Maize God's birth. These locations are critically important, because they serve as the symbolic template not only for the landscape of myth (Stuart and Houston 1994:72–75), but also for the morphology of the Maya shrine (Carrasco 2005a, b; Carrasco and Hull 2002). The first location *ik'*-"portal"-*nal* names the skeletal jaws framing the point of the Maize God's birth. The second *ik' nab nal* refers to the bar from which *chaahk* emerges. The third, 5-"flower"-*nal,* or the "Five Flower Place," names the skull from which the Maize God sprouts or perhaps refers to the general location of the birthing event. The final location is the ubiquitous *chan ch'e'n* or "sky cave" mentioned in a number of inscriptions in a variety of contexts. Moreover, as Taube (1998) has demonstrated, the three stones at the bottom of this image and other similar scenes are a direct reference to the three stone hearth of creation. Thus, this image and similar ones appear to depict the events that immediately follow the establishment of the hearth as described in the previous section.

[7] For a discussion of the astronomical significance of the imagery of this vessel see Schele 1992:137-8, Looper 1995:26, and Guernsey 1997:45.

Fig. 8 The Cosmic Plate, Kerr Vessel 1609 (drawing by Linda Schele, copyright David Schele, courtesy of Foundation for the Advancement of Mesoamerican Studies, Inc.)

Kerr vessels 688 (Fig. 9) and 1184 (Fig. 10) depict similar scenes in which a Maize God is shown with attributes normally associated with the so-called Baby Jaguar. Both vessels have a black background emphasizing the fact that the birth of the Maize God and perhaps other entities occurs in darkness. Significantly, the texts of both vessels state that the birth of these entities happened on a mountain and Kerr 688 specifies the location further to state that the birth happened at the "Naah Ho' Chan, the Mountain of the North" (*naah ho' chan witz xaman*). It will be remembered that Quirigua Stela C mentions this same location as the site where the Jaguar (Hix) throne stone was set and that the Naah Ho' Chan was the mythological structure upon which the Temple of the Cross was modeled. Kerr 1184, while not as specific, records that the birth of Seven Blades of Flint (*wuk ye tok'*) occurred on or perhaps from within a mountain. In this scene, however, the Baby Jaguar lies raised on an offering plate that sits atop a foliated skull framed by the jaws of the

Fig. 9 Kerr Vessel 688 (photograph by Justin Kerr, courtesy of the Foundation for the Advancement of Mesoamerican Studies, Inc.)

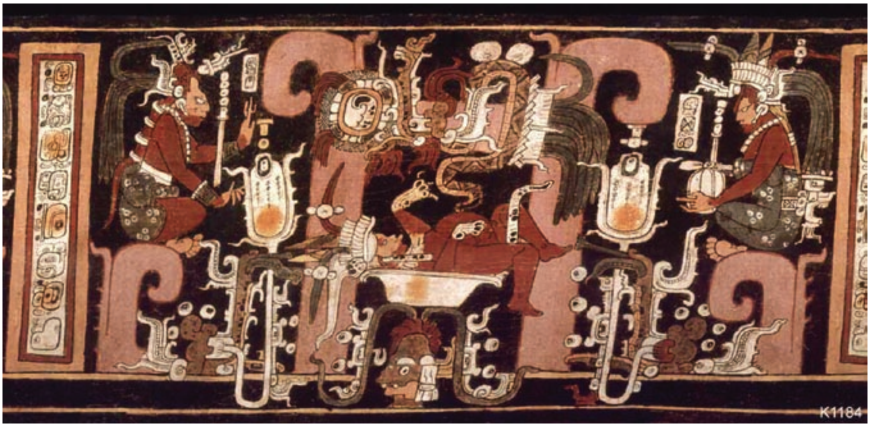


Fig. 10 Kerr Vessel 1184 (photograph by Justin Kerr, courtesy of Foundation for the Advancement of Mesoamerican Studies, Inc.)

portal. Through the eyes of the portal monster waterlilies sprout, emulating ropes similar to those found on K688. The tableau here, element for element, mirrors the well-known imagery of both Pakal's sarcophagus lid and the Cosmic Plate (K1609). Other less well-published examples could be cited, but the point, I think, is clear: this iconographic complex illustrates a mythic, phytogenic birth. Beyond this general observation, these images provide a clear picture of the conditions of the Maize God's birth: it happened from a seed or bone in the darkness of a mountain cave (Kerr 688 and 1184), apparently required heat or burnt offerings, as seen in the censer imagery of Kerr 1184 and Pakal's sarcophagus, as well as water, and was often presided over by a pair of figures. We know further that a turtle shell may act as a synecdoche for this entire complex of imagery and that Chaahk through his cracking of this turtle shell allowed the Maize God to sprout. Sachse (2008) has persuasively argued that the Maize God's movement between realms should be thought of as a journey analogous to the trials the maize seed undergoes upon planting (see Girard 1952).

The images cited above make explicit that birth occurs usually in darkness and, at least for the Maize God, in a mythological location that has specific connections to what we might call the underworld. It is most likely located within a mountain, and in the real world would find its equivalent in the caves that are of such ritual importance to the Maya today (Macleod and Puleston 1980; Bassie-Sweet 1991; Stone 1995; Vogt and Stuart 2005). However, in the Classic Period there is strong evidence that the word *ch'e'n*, "cave," and especially *chan ch'e'n*, referred to a pyramid's superstructure as often as it did to an actual cave (Vogt and Stuart 2005). The relevance of this point to the present topic is that if there is a link between the creation hearthstones and the location of the Maize God's birth, and, in turn, to the mountains and their associated caves, then those artificial sites that purport to be the location of the Maize God's birth also manifest and are representations of the sacred geography, or perhaps more precisely, the sacred architecture of creation.

In regard to the birth symbolism of the Temples of the Cross Group, Schele and Freidel (1990:239, 470) have noted that the inner sanctuary of the shrines of these temples is called a *pibnaah* (lit. oven house or sweatbath). In a subsequent article Stephen Houston (1996) explored the role of the sweat bath during pregnancy, particularly as a means of restoring the health and conceptual heat lost by the mother during childbirth. Thus, current evidence suggests that the inner sanctuary of the Cross Group temples duplicates the topography of phytogenic birth of gods as depicted in the vessel scenes discussed above. Additionally, Kerry Hull and I (Carrasco and Hull 2002; Hull and Carrasco 2004) have shown that the corbel-vault was anciently equated with the jaws of the portal creature, and have demonstrated that the vault and roof in architecture were symbolically equated with the back of the turtle from which the Maize God sprouts. This phytogenic process seems to require heat, water, and darkness, all elements which the contemporary Ch'orti' believe are necessary for the germination of maize (see below).

An analysis of Kerr 1892, the so-called Resurrection Plate, (Fig. 11) strongly suggests the ancient Maya also believed this, at least in the context of myth. The tableau depicts a beautifully rendered Maize God sprouting from the Earth Turtle. The cleft from which he emerges terminates in a torch skull with an *ak'bal* or darkness sign for an eye. Once enigmatic this image is entirely intelligible if viewed in light of the narrative of the Maize God's birth briefly summarized here. The skull torch motif combines all of the important elements of the Maize God's birth: (1) the bone stone seed, (2) the darkness in which the seed waits before germination, and (3) the torch, analogous to the hearth from which the Maize God sprouts, which symbolizes the heat necessary for the successful germination of the seed. The turtle

Fig. 11 The Resurrection Plate, Kerr Vessel 1892 (drawing by Linda Schele, copyright David Schele, courtesy of Foundation for the Advancement of Mesoamerican Studies, Inc.)

here represents the earth as it floats on the waters of the Primordial Sea. The Maize God in this image is possibly assisted and watered by his two sons, perhaps read Ju'n Ajaw and Yax Bahlam in Classic Ch'olan. Here Yax Bahlam pours a jar of water on the cleft from which the Maize God sprouts. In this imagery we find the mythological prototype for much of ancient Maya ritual action, architectural symbolism, mortuary practice, and eschatology.

Dressing of the Maize God

Maize God dressing scenes provide a connection between the agricultural processes that occur within the milpa, such as planting and germination, and the foodway practices that happen in the house and are performed by women. Immediately following the birth of the Maize God he is often dressed by young, nude women. One of the better-known images of this is found on Kerr Vessel 3033 (Fig. 12). This vase presents three depictions of the youthful Maize God. The first in order of narration is found in the figure seated between the two Paddler Gods who hold a sack of maize seed. The second scene depicts the youthful Maize God emerging from the mouth of a serpent, while the third, in a position associated with a point in time just after sprouting — that is, in this case, the emergence from the serpent — is dressed by two female attendants. A similar scene lacking female attendants is depicted on K731 (Fig. 13) with only slight variations.

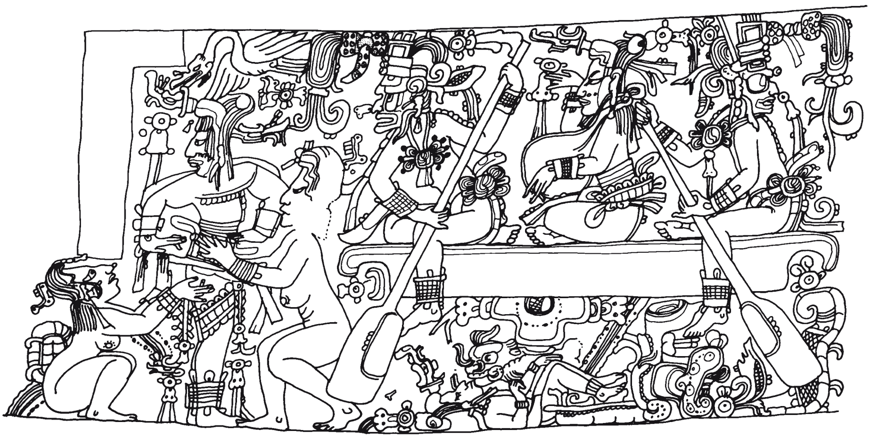


Fig. 12 Kerr Vessel 3033 (drawing by Linda Schele, copyright David Schele, courtesy of Foundation for the Advancement of Mesoamerican Studies, Inc.)

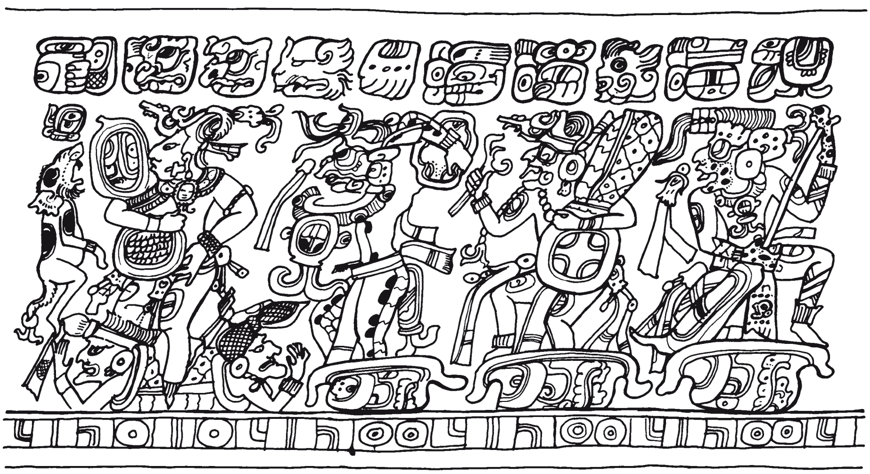


Fig. 13 Kerr Vessel 731 (drawing by Linda Schele, copyright David Schele, courtesy of Foundation for the Advancement of Mesoamerican Studies, Inc.)

Fig. 14 Kerr Vessel 626 (photograph by Justin Kerr, courtesy of the Foundation for the Advancement of Mesoamerican Studies, Inc.)

For a number of years, I have been fascinated by the dressing of the Maize God for two reasons: first, unlike the textual captions or narratives about the changing of the hearth or the Maize God's birth, dressing scenes are limited to the visual record, to the best of my knowledge. Second, many of these scenes, especially K626, K6298, and K7268, appear to depict events that were probably enacted in ritual performance and served as the mythological prototype for certain rituals that are also illustrated in painted ceramic scenes. Vessel K626 (Fig. 14), for instance, shows the Maize God, or a Maize God performer, seated on a platform decorated with the skull seed complex similar to ones found in other images of the Maize God's birth. More interesting still is the fact that such ritual platforms are found archeologically at a number of sites including Chich'en Itza and Altun Ha'. This suggests that the scenes on these vessels probably represent ritual dramas that would have taken place in court plazas. Dorie Reents-Budet, marshaling evidence from other vessel scenes and recent archaeology, has demonstrated that these locations also seem to have been sites of ceremonial feasting (Reents-Budet 2000). Thus, the rituals depicted on these vases seem to record events that could have occurred at specific archeologically-identifiable locations within ancient cities.

But what does it mean to "dress" the Maize God? The closest textual references to dressing are found in *na[h]waj* (was adorned) statements (Bricker 1986:158) that are limited to three contexts: (1) marriage statements (PN St. 3); (2) the adorning of gods (Dos Pilas and Palenque); and (3) the adorning of captives.[8] While the use of the same verb does not necessarily always imply conceptual links, the limited lexicon employed in the inscriptions attests to the highly self-conscious use of terms. Thus, what do the Maya mean by dress or adorn? To answer this question

[8] Recently, Marc Zender and David Stuart have questioned the reading of *naw* as "to adorn". Zender suggests that that Ch'olti' *nau* was really intended to represent *nab*, "to paint, adorn" and not the word *naw*. Stuart sees this glyphic term as possibly coming from the root *na* "to know" (cited in Guenter 2007:21). While it is possible that a new gloss for *naw* could emerge the Classic period root is *naw* and not *na'*. Therefore, while I find the criticism compelling, I am skeptical of the gloss "to know".

we might turn to the opposite one: What is indicated when ornaments are lacking or have been removed? In Mesoamerica, to strip a person of his finery usually signifies a loss of status because ornaments of costume are markers of social position. At Palenque *ma' unawaaj* (not adorned) refers to a time when because of an attack by Calakmul, Palenque's patron deities could not be properly prepared for the K'atun rituals. Adornment would seem to make things and people appropriate for the occasion. The dressing of the Maize God gives him the identifying objects that mark his place in the cultural world — even if it is the other world. This event happens at the site of his birth, which is of course at the hearth.

I would make the tentative suggestion that the dressing episode corresponds to the processing of maize at the hearth. That is, the life-giving force of maize was manifest only after women transformed it over the hearth into foodstuff such as *waaj*, *maatz'* or *sak ha'*. This idea, as well as the analogy between the human life cycle, and that of maize, is further clarified when we turn to the imagery of the Popol Vuh and ethnographic record.

Historical and Ethnographic Parallels

Rafael Girard has documented that the Ch'orti' Maya believe that both the germination of the maize seed and the gestation of the human fetus undergo similar processes.

> Agriculture and eschatology are intimately associated. The position of the maize grain in the bosom of the Mother Earth is identified with that of the child in the maternal womb and of a dead body in the tomb. This is a concept the Chortís objectify in their temples by the figure of the Child God, a representation of the young Maize god, in a niche or tabernacle. In the dark regions of the underworld the seed, the dead body, and the fetus suffer the same hardships and fight against adverse forces to come up into a new world. (Girard 1995:191)

Girard also noticed that pyramids, planting mounds, and funeral mounds are all known by the word *mujr* in Ch'orti' (*mul* in Classic Mayan). He suggests that the equivalency of these categories lies in the concept,

> that the interred corpse like the maize seed undergoes the same process of disintegration to transform itself into a new being, and that the stages of life, death and rebirth of the maize are comparable to those of divine or human beings. Such concepts are mythologically exemplified by the civilizing heroes who die and are reborn in the underworld. (Girard 1995:192).

Continuing on this theme in his commentary on the Popol Vuh, Girard (1952:179) similarly observed that,

> *La colocación de las matas de maíz en el centro de la casa en el preciso instante en que los gemelos bajan al inframundo para personificar, con la muerte de semilla, las pautes de la escatología maya-quiché, revela la costumbre de la época de enterrar los muertos en medio de la casa.*
>
> The burying of the corncobs in the center of the house at the precise instant at which the twins descend into the underworld to personify, like the death of the seed, the patterns of

Mayan-Quiche' eschatology, reveals the period practice of burying the dead in the middle of the house (translation of the author).

This quotation refers to a scene in the Popol Vuh where the Hero Twins Junajpu and Xbalamke plant ears of unripe maize (*aj*) in the center of their grandmother's house (*ja*, in K'iche'), the verdure of which indicated their vital status in the Xibalba. Important to the topic at hand is the sequence of events that eventually led to their death and subsequent rebirth.

Despite passing with ease the trials set by the lords of the underworld the Hero Twins know that their defeat is imminent and learn that the Xibalbans intent to trick them into jumping into a pit oven (*chojib'al*). They instruct the shamans, Descended and Ascended, to grind their bones "upon the face of a stone like finely ground maize flour" after their immolation in the pit oven (Christenson 2003:177). After their death, as instructed, the shamans grinded their bones and sprinkled the dust into the river, wherein after five days they appeared as fish people and on the next day emerged as poor orphans.

This sequence of events is of extraordinary interest because the structure of the story parallels the domestic practice that informs not only the mythological cycles described above for the Classic period, but also agricultural practice, mortuary rites, and food preparation. The hero twins as we have seen are analogous to maize and are indeed indexically connected to the corn plants rooted in their grandmother's house. Significantly on this point, Girard (1952:219–220), in his discussion of the Popol Vuh, notes that in hot and humid areas it takes four days for maize to germinate and five days for the seedling to sprout from the earth, the same amount of time it took for the twins to reappear. Girard further suggests that at this time an analogy is made between the sprouting maize and the sun's rays, thus possibly explaining the conflation of the Maize and Fire God (i.e., the Jaguar God of the Underworld) in Classic period images of birth as well as the presence of heat-generating implements such as censers.

When this rebirth or emergence occurs in the underworld the maize ears in the center of the Grandmother's house again begin to revive. Girard and Christenson both see the weeping of Xmukane, the grandmother of the Hero Twins, as providing the water that revivifies the maize ears. Indeed, Xmukane weeps three times in the Popol Vuh, each time in the confines of the house. Girard connects her to the Ch'orti' lunar-water goddess known as Santa Ana or little mother, who is also the grandmother of the Christ/Maize God in Ch'orti' mythology. Her weeping, it is said, brings rain to the people and supplies water to the Maize God (Girard 1995:162–163). In the Postclassic Period she is known glyphically as Chak Chel (Goddess O), and in the *Ritual of the Bacabs* as Chacal Ix Chel (Roys 1965). As genetrix she appears to have many roles and is a goddess of water, childbirth, medicine, divination, and weaving (Taube 1992:99–105). In Pablo Mo's Pokomchi narrative describing the origin of corn (*na ix k'ul ixim*) the female protagonist exhibits all the features of the lunar-water goddess. She collapses the various women in the Popol Vuh into a single figure who weaves on the porch of her house and pours water onto the path of an old man to make him fall so that she might laugh (Mayers 1958:3–11).

> How can one tell about the origin of the corn. An old man came and he found a girl on the porch of the house and she was weaving. The old man arrived carrying a deer and he passed in front the house. The girl approached pouring water onto the trail. The man approaches along with the deer. He falls in the water that the girl pours out onto the trail. The girl wished that he fall so that she might laugh. When the old man fell with the deer he was changed into a trunk of a tree and so the girl was not able to laugh at him. (Mayers 1958:3)

Strange though this opening passage is, it demonstrates the fact that we are dealing with the personification of various related phenomena that at times may be spread over several individuals or condensed into one person as the needs of the story demand. The roles of grandmother, the water goddess, and the mother of maize have been unified into a single person. In central Mexico this female deity may be related iconographically to a complex of earth-related goddesses commonly known by the names *Tlaltecuhtli* and *Coatlicue* (see Townsend 1979:28–31).

Returning to the Popol Vuh, to summarize the sequence, we find that upon death the twins are burned, ground, and thrown into water. Maize too grows; then it is decapitated and allowed to dry. After desiccation the maize kernels are either cooked, ground, and made into *waaj* or ground, mixed with water, and consumed as *sak ha'*. Through either of these processes human flesh is formed. If used for crop seed, the dried, dead kernels are planted into the darkness of an earthen mound and watered, and through heat, literally the sun's energy, they germinate and sprout.

The fact that maize is planted in a location in the house that is normally reserved for the three-stone hearth is completely rational within the logic of Maya mythology described above, where it is from the hearth, and a complex of conceptually-related motifs, including skulls, bones, and seeds, that the Maize God is born in Classic period imagery.[9] That is, like that corpse the maize is planted at the center of the house. This gives us not only the well-known equation between bones, especially skulls, and the maize seed (Carlsen and Prectel 1991:28), but also one between the house and the planting mound. We also find in the Popol Vuh, at the moment when the Hero Twins jump into the underworld oven prior to the grinding of their bones, another instance where the hearth becomes a tomb and entities are transformed. In this case, the transformation moves from life to death, which is but the point from which life begins anew and is a classic example of the myth of the eternal return (Eliade 1954). The hearth and center of the house is a place of transformation, and I suspect that we could tie the fire rituals associated with tombs (Stuart 1998) to this pattern with additional investigation (see Taube 2000b:303 for comparison with possibly cognate practices in Central Mexico). Among the Colonial Yucatec Maya Taube (1998:439) has noted that the earth was personified

[9] Similar to the imagery of the Popol Vuh cited above, Eve Hunt mentions that among the Cuicatec the three skulls of the Goddesses of sustenance symbolize the hearthstones (1977:158). Cuicatecan mythology here perhaps coordinates with Karen Bassie's idea that the bones of the Bone Woman of the Popol Vuh are the source for the first maize used for the formation of true humans (Bassie 2002). Outside the Maya area Chevalier and Bain (2003:27) have also observed that: "The Gulf Nahuas and Popolucas perceive fundamental similarities between humans and the plants that grow and go through repeated cycles of life and death in order to feed those who reproduce them".

as a caiman, Itzam Kab. The *Ritual of the Bacabs* records that the head of this deity was the symbol (*uayasba*) of the hearth, *k'óoben* (in modern orthography), and its tongue the symbol of fire (Roys 1965:50). Thus, this imagery suggests an identification between the hearth and the caiman earth monster similar in many respects to the saurian creature from which the youthful Maize God emerges in the scene found on K3033 (see Fig. 12).

The imagery of the hearth surveyed above bears a strong resemblance to Central Mexican myth and ritual, where the hearth is invoked at the beginning of the present era. The *Legend of the Suns* (1558), preserved in the *Codex Chimalpopoca*, records that a "spirit oven" burned for four years before the deity who is to become the sun, Nanahuatl (Nanahuatzin), immolates himself in the fire of the hearth (Bierhorst 1992: 148). Not limited to myth, the changing of the hearth figures in the domestic renewal rituals performed at the end of a Mesoamerican fifty-two year "century." Fr. Bernardino de Sahagún (1950–1982 [1590]:2.25) recorded that among the Mexica the three-stone hearth was changed during the "Binding of the Years" ceremony.

> First they put out fires everywhere in the country round. And the statues, hewn in either wood or stone, kept in each man's home and regarded as gods, were all cast into the water. Also [were] these [cast away] – the pestles and the [three] hearth stones…; and everywhere there was much sweeping – there was sweeping very clean.

In these examples, as in the Maya ones cited above, the hearth or oven was a site of transformation and regeneration.

This process of transformation was (and still is) believed to require both metaphoric and literal heat. Girard recorded extensive rituals as part of the Great Winter Opening Ceremony designed to generate the heat needed by the newly-planted maize. Even today some communities still celebrate the Great Winter Opening Ceremony from April 25th to May 3rd. On May 3rd people travel to a cross on a particular mountain where it is believed that fire was born. This ceremony however does not celebrate the birth of fire; rather, it is undertaken to help the newly-planted maize. Offerings (*ajk'uyaj*) are thrown into the fire *twa' e katata', twa' e jinaj*, "for our lord, for the field." Thus, it seems this ritual is a petition to the Fire God for the heat necessary for the successful germination of the maize crop. These ideas are not limited to the Ch'orti' nor even to the Maya, but are commonly held beliefs throughout Mesoamerica as documented by Jacques M. Chevalier and Andrés Sánchez Bain (2003:23).

> The heliotropic […] adds an important caveat to considerations of health viewed as a moving equilibrium. The rule stipulates that death is both inevitable and a requirement of life. Man and woman must grow up and gather the strength and heat needed to reproduce the seed (corn, food, children) that will sustain them throughout their lives and in their old age. In doing so they gradually wear themselves out, drying up, and dying for the sake of future generations of corn plants and human beings alike. The heat of aging and death is food to the cycle of life.

In addition to heat, water is also an essential element in the germination of the maize seed as well as an important component in Ch'orti' Maya funerary rites. Watering events are common in Ch'orti' ritual where they follow a sequence similar to the order of the Classic period and Colonial mythic cycles described above. Girard (1995:138) observed the following during Great Winter Opening Ceremony:

> From the sacred pool next to the temple, the slaves carry a number of jugs of "virgin" water to the chapel. They hand them to the elder, who then wets down the interior of the temple, pouring some on the floor in the corners, over the plant covering of the altar, the image, the candles holders, and over the canoe in a mimetic rite to attract the rains. This act is repeated every day, from the 25th of April until it rains.

This wetting event is the precursor to rites that will occur in the fields after the actual maize is planted. The watering in the temple acts as a symbolic event that waters the effigy of the child maize god housed in the altar of the agrarian temple. The parallel of these agricultural rites to those surrounding burial practices are clearly seen when we turn to the following description recently recorded by Kerry Hull (2006:51–52).

> *Tya' ak'a'pa e rum watar e ixiktak xe' uk'echo'b' ub'ujrir e ja' o umurir e ja' watar. E winik, e noj winik xe' o'b'na o'jron taka e katata', uch'ami e ja'. Tame' b'ujr aka'y uyari kurusb'ir. War o'jron war uyari war che ja'xir ke' tara. Che, "Inche yer e kurusb'ir ja' twa' matuk'a e mab'amb'anir watar, upijch'ye't y watar uyasi ame'yn." Y b'an koche'ra uche. Aka'y uyari ja'xir e ja' ira. Watar ixtoya' e ixiktak uyaryo'b' tuno'r e ja' xe' uk'echo'b' este ke' aketpa anam e rum.*
>
> When they are finished with the dirt, the women who carry jugs of water and containers of water come. The man, the elder who knows how to pray to god, takes the water. With the jug he begins to sprinkle it in the form of a cross. He is speaking, he is sprinkling, the one who is here. He says: "I make the form of a cross with water so that nothing bad will come, so that (the evil spirits) won't tempt you and won't come to cause trouble for your spirit (as it is leaving the tomb)." And thus he does it. He begins to pour this water. Then the women pour all the water that they brought until the dirt turns into mud.

Through the examination of Classic period myths, the Popol Vuh, and other ethnographic sources we have constructed a picture wherein a single logical system unifies agricultural, ritual, and domestic practices.

The above literary and ethnographic examples do not reflect a direct connection between the specific features of contemporary practice nor a unitary meaning throughout time; however, because ancient, colonial, and modern beliefs and practices bear a strong structural resemblance we may draw from them a pervasive pattern – a fundamental Mesoamerican worldview. At its most basic level this worldview reveals a sequence wherein darkness, heat, and water are all necessary for the birth of gods and humans, as well as the germination of maize upon which many of these concepts are based. These are also the steps found in the processing of maize. If Mesoamericans are such close observers of the natural world and agrarian practice it stands to reason that the actions performed upon agricultural goods should also be highly marked. That is, grinding, forming, and cooking all become important moments in myth. The hearth is central to this because it is the location where fruits of the field are transformed to foodstuffs, and through this the hearth mediates between different spheres of social life and symbolic regimes.

Conclusion

The mythic fragments analyzed in this chapter present a world of imagery that is remote from our daily experience. Like all mythologies that speak to people strongly, the Maya's was crafted from the ebb and flow of domestic life and agricultural practice. That is, maize agriculture provided the root metaphor or key narrative through which culturally universal dichotomies were given culturally specific meaning. Or, to put it another way, the lifecycle of maize stood in a symbiotic and dynamic relationship with other spheres of higher order ideation. Just as the Maize God went through a lifecycle that emphasized his death and rebirth the maize of the field followed suit. Part of the difficulty in understanding ancient mythology and the images used therein, as Turner (1967:19–47) pointed out for understanding the multiple symbolic facets of the *mudyi* tree in the puberty rituals of Ndembu girls, lies in seeing that different symbolic meanings can overlay a single mythic episode or material object. If for instance we take the example of the Maize God's emergence from the northern hearthstone at the Naah Ho' Chan we can read it in two basic ways. On the one hand, this scene corresponds in reality to the sprouting of the maize plant as indicated through the Maize God's phytogenic origin. However, and equally importantly, it also refers to the transformation of maize from field grain to foodstuff. One only needs to look to the fact that one of the more conservative planting patterns in the Yucatan is called *k'óob'en pak'*, "hearth planting," to see that this symbolic connection is maintained (Bricker et al. 1998:154; Tuxill personal communication, 2004). Yet there are other indicators of this connection that are worth reviewing here, not only to partially address the questions outlined at the beginning of this chapter, but also to gain clearer insight into the processes that were believed to occur within ancient shrines. As we have seen temples were often equated with the hearthstones to the extent that the *sanctum sanctorum* of the Temple of the Cross Group temples was literally referred to as oven or sweat house. This temple complex not only resembles the three-stone hearth formally but, like the changing of the domestic hearth in Central Mexican rituals, its dedication is also timed to the important temporal cycle of the K'atun.

One of the major scenes in the birth of the Maize God is his adornment by nude or nearly nude women. These women, as we have seen, hand the Maize God elements of costume. If we take into consideration the well-known fact that insignia and elements of costume signal status in Mesoamerican societies, a fact proved by the removal of these items from luckless captives, then we may interpret the women in these scenes as providing the items that mark him as a cultural being. This corresponds in a powerful way to the processing of maize by women in the domestic sphere. The women are the ones who transform a substance, which is from outside the cultural sphere of the house, into the food that is consumed by all. Moreover, this transformation is effected at the hearth, and utilizes many of the same elements as needed by the sprouting maize plant in the field. In the field, the seed is planted in the earth and plunged into darkness, at which point water is needed as well as heat. Rafael Girard (1995) documented that the Ch'orti' likened this process to that of the child in the womb and reproduced this process in their religious rites. Moreover, this process also parallels that of making *waaj* (foodstuffs made of maize such as tortillas, tamales, etc) and *maatz'* or *sak ha'*, atole drinks made from the flour of toasted maize kernels (see Hull this volume; Carlsen and Prectel 1991:32). The maize from the field is brought into the house, back into darkness, where it is boiled and then ground and eventually cooked over the hearth. One set of labor is done by men in the field, the other by women in the house. A beautiful symmetry exists in this analogy and the points of mediation that connect its component parts, not only in the abstract structures of myth as we now analyze it, but also in the dynamic relationship with the basic activities of life that it expresses.

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The Flesh of God: Cosmology, Food, and the Origins of Political Power in Ancient Southeastern Mesoamerica

David Freidel and F. Kent Reilly III

I come today as a pilgrim from the east, from Maya lowland country, sister and daughter civilization, to the heartland of the first civilization in our American part of the world: Olman, Olmec country. I will return to Maya country at the end of this journey. In Olman human ingenuity met a confluence of circumstances that gave birth to civilization. That birth was not engendered by people from Africa, or Asia, or Europe, but by Americans native to their place and time. You, the knowledgeable and dedicated creators of our understanding of Olman, have decisively confirmed the virgin nature of this birth. To be sure, we must all respect our ignorance of this human-made miracle and proceed to agree reluctantly to grand generalizations about it. But our science also demands bold conjecture and new knowledge comes both from the ground, as at El Manati, San Lorenzo, La Venta, Chiapa de Corzo and La Blanca, and from inspired contemplation of what happened at those places to create the intentional patterns now meticulously documented. The bold conjecture is this: Claude Lévi-Strauss, great anthropologist, said that food is good to think as well as to eat.[1] *When people domesticated food, they domesticated themselves. That is to say, the means of physically reproducing people became just as dependent on the organized and conceptual model of the universe articulated by the wise and eloquent people in society as did the production of food. Domestication succeeds as a source of staple food when such cosmological models persist in the face of repeated failure. For growing food requires people to defy the arbitrary catastrophes of nature and create social means of countering them. In Olman, people created a model of the world in which they could effectively intervene in the cycles of nature. The metaphors appear naïve: to control rain, to give birth to maize, to contest with immortal disease and famine through the ballgame. But the social reality leaders bound to that religion worked. Over centuries of trial and error the leaders emerged as divine kings mobilizing labor not just to self-aggrandizement but to social survival; to the task of redistributing the risks of subsistence in ways that averted famine. How Olmec kings, after centuries of effort, became maize, the flesh of god and the flesh of their people, is the challenge facing us as scientists. That they became maize, and passed that truth on to successor civilizations of southeastern Mesoamerica, among them the lowland Maya, is a working hypothesis of growing productivity.* David Freidel, the LLILAS conference "Olmec: The Origins of Ancient Mexican Civilization" November 21, 2008

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[1] From *The origin of table manners* (Lévi-Strauss 1978).

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For the Olmec, the human body was both a reflection and expression of the cosmos. Karl Taube (2004a:13)

Flesh of God

The Pre-Columbian peoples of Mesoamerica domesticated some of the major plant foods in the world, maize first among them (Staller et al. 2006). Not only did they consume foods of their own making, but they worshipped them as well, again particularly maize. The maize god cults of the southeastern lowlands of Mesoamerica, the Olmec and Maya, were also royal cults celebrating the divinity of rulers as incarnations and agents of maize fertility and fecundity (Taube 1986, 1996a, 2004b; Reilly 1987, 1994; Fields 1989, 1991; Freidel et al. 1993). As armatures and pivots of the cosmos, rulers were portrayed as vitally natural beings: trees, maize stalks, jaguars, crocodiles, and raptors among them (Guernsey Kappelman 2002; Guernsey 2007; Schele 1995; Schele and Freidel 1990). They were also divine in that they were both male and female, not monstrous hermaphrodites but mother/fathers, embodiments of the generative order (Looper 2002). For Mesoamericans, then, the cosmic center was manifest among them, willful, mindful, and human. The exalted status of human cosmic agents, world makers, came with the awful responsibility of knowing and negotiating with the other divine forces, conveying or blunting their intentions, and nourishing them through prayer and sacrifice and performances renewing Creation. But as godhood was manifest in human beings, many gods lived in the human world, contesting, communing, sacrificing, and nourishing each other even as they did the soul forces that stayed in natural forms. This cosmos was immediately present, observable, and constantly engaged in the affairs of everyone. And everyone had a role and a stake in the unfolding of history. For everyone was made of the same material: maize, the flesh of god.

The quotidian work of ordinary people: planting, cultivating, harvesting, storing, cooking, eating, weaving, modeling, and carving, were all expressions of the same creation. Everyone knew this and knew that no matter how innocent or ignorant they might be of the arcane elaborations of cosmology wielded by the powerful, the foundations of the universe were under their own feet and its pillars of their own making. In the world we outline here, followers not only enabled leaders through their labor and the fruits of that labor, but also literally created them through the facilities and instruments they constructed, crafted, and paid for (Freidel 1992). In return, leaders insured the security and prosperity of their followers. Certainly they did this through success in commerce, war, and public works designed to enhance agricultural production. But these very practical efforts are not enough in themselves to explain the role of cosmic agents in this world. This study is a foray into expanding and synthesizing our explanations of divine kingship in southeastern Mesoamerica in ways that can be tested against material evidence.

Why Divine Kings?

As William Rathje (1983:26) declared, tropical lowland elites were apparently fungal. Fungi are sometimes beautiful and astonishing in the tropical forest, and even sometimes delicious, but they are basically parasitic. That might be said of southeastern Mesoamerican divine rulers and the elite who celebrated their cults, that is, unless one can discern some useful purpose to their existence. And their existence from the Olmec kings of Olman through the lowland Maya kings, was enduring, brilliant, and exemplary on a planet well populated with exalted rulers ancient and modern. In his most recent foray into this enigmatic domain, Rathje (2002) builds on John Clark and Michael Blake's influential (2000) research on aggrandizing Early Preclassic elites in the Pacific coastal lowlands to envision Preclassic incipient lowland Maya rulers, nouveau elites, mobilizing resources in spectacular ways that, while feeding people and providing them with work, embed the main product of those resources in Massive Visual Symbols such as pyramids (Fletcher 1977). Rathje here accepts competition as the main driving force in emergent Maya elite and states: "Many of the cultural acts that serve to limit access to wealth have archaeological implications. One set of such acts centers on *social production*, defined by Brookfield (1972) as *the objectification of labor in basically noneconomic terms with social and ideological significance* – a temple, a burial, a scepter, ritual paraphernalia – what Binford (1962) called *socio-technic* and *ideo-technic* artifacts" (Rathje 2002:32–33, original italics) He argues, then, that primal Maya monarchy was a matter of eliminating competition through the diversion of resources away from other ambitious elite and capturing those resources in Massive Visual Symbols heralded as common goods.

Now it is indeed the case that the grandest of lowland Maya Late Preclassic ceremonial centers have the largest and most resource profligate pyramids (Hansen 1998), especially impressive in this regard is El Mirador in northern Petén, Guatemala. Moreover, Rathje's 2002 model for the Preclassic emergence of the outward trappings of Maya monarchy and elites is commensurate with the general consensus among Mayanists, from Cultural Ecologists like David Webster (2001), to champions of the primacy of ideology like Arthur Demarest (2004), that status competition fueled the extraordinary arts and industries of Classic period Maya high culture (Baines and Yoffee 1998). However, such a model makes the activities of the elite largely inconsequential to the daily affairs of ordinary people, beyond incessant demands for tribute in the form of labor and goods. While these are not to be underestimated, why would ordinary people put up with outright oppression for centuries? Were they truly gulled by the pomp and glitter of public spectacle into voluntarily relinquishing such power (Inomata 2006)? Did they so willingly and so enduringly accept a cosmology in which their role was to sustain divine rulers and priestly elite with no tangible and material benefit to themselves? We are, and have been for some time, frankly skeptical of such dominating ritual economy (Wells and Davis-Salazar 2007). Functionalist as it may be, we think that a more realistic appraisal of southeastern Mesoamerican lowland civilization requires a model based on a political economy in which elites and divine rulers are engaged in the administration of goods and services necessary to the daily lives of ordinary people.

Rathje (1972) early on proposed such a political economic model in order to make sense of the rise of lowland Olmec and Maya civilizations. He argued that the lowland people had rich resources, but also lacked some critical commodities necessary to subsistence, especially stone suitable for cutting tools and weapons, stone for grinding their principal food, maize, and salt. Rathje further proposed that lowlanders developed elaborate religion and ritual artifacts to legitimate leaders whose real authority was based upon the administration of trade and the flow of vital goods into their country, in return for prestigious finely crafted religious symbols of their sacred power suitable for display as status symbols for elites in the source areas. His model was presaged by Kent Flannery (1968), who argued for long-distance trade between emergent elites in Oaxaca and in the Olmec lowland heartland – now called Olman by experts in that region – in which symbolically rich craft articles were exchanged by interacting elites. Rathje's model explained incipient lowland civilization's appearance in "core areas" most distant from the important commodities as the result of greatest pressure to organize and administer their import. The eventual succession of these core area polities by "buffer zone" polities was asserted to still be in lowland settings, but closer to the source zones for the imports as the result of their growing ability to supply their own prestigious crafted status symbols.

Archeologists largely discarded Rathje's early model (1972) when it quickly became apparent that lowlanders did not really need obsidian, even though they imported it over long distances throughout Pre-Columbian history. They did not need to import basalt for grinding stones from far away, even if they preferred it to softer stones. Rathje's critics tended to pass over his third key commodity, salt, with the assertion that it was sometimes locally available in lowland settings in Veracruz in salt springs and on the coast (Pool 2007). Rathje's student, Anthony Andrews, investigated salt sources in the lowland Maya area and calculated the likely requirements for this vital dietary supplement, and provided evidence favoring the long-distance import of substantial quantities of salt into the interior areas throughout the course of the civilization (Andrews 1980). Salt has quietly continued to grow as an economic and political factor in Maya subsistence and trade over the last 20 years (Andrews and Mock 2002). Bruce Dahlin and his colleagues at the enormous Early Classic city of Chunchicmil in northwestern Yucatan (Dahlin and Ardren 2002) argue that the prosperity, even the existence, of this community depended on organized large-scale salt mining, packaging, and transport from nearby beds on the western coast to far-flung markets (Fig. 1). Heather McKillop (2000, 2005) has discovered a sizeable, if noncentralized, salt industry on the southern coast of Belize dating principally to the Late Classic. As Anthony Andrews (1980; Andrews and Mock 2002) cogently worked out, people who subsist principally on vegetarian diet, as was likely the case for ordinary Olmec and Maya, require mineral salt to survive in a tropical environment. And while salt does not inevitably inspire complex organization, it has given rise to some remarkable states and cities, such as

Fig. 1 Major culture areas of Pre-Columbian mesoamerica

Timbuktu in Mali, Africa. But vital salt trade goes along with vegetarian diet, and the imperative for trade economy as envisioned by Rathje has been right in front of us all along: maize (Freidel and Shaw 2000).

Maize, native to Mesoamerica and pervasively a staple by the Middle Preclassic period (1000–400 BC) as best can be inferred from available data, is a filling and protein worthy food when properly prepared (the so-called *nixtamal* lime-soaking method). It is also sensitive to drought and frost, attractive to mold and vermin, and difficult to effectively store beyond a few years in the humid tropics. So how did Mesoamericans live in dense populations and subsist on this basically risky food? For most of our colleagues, this is evidently a nonissue as the facts declare that they did indeed successfully live on maize in large populations. But when we have some historical control over how they lived, we learn that it was not so easy. The Aztec nation nearly failed in the notorious "curse of one rabbit" midfifteenth century severe famine caused by maize crop failure, in turn the product of prolonged drought (Therrel et al. 2004). The response was that ordinary people in the Aztec realm sold themselves into slavery in the Veracruz lowlands to avoid starvation. This was one of many repeated famine episodes afflicting the Aztecs related to drought, frost, and other catastrophes. If the Aztecs, a powerful and resourceful imperial nation, had to adapt to repeated drought and famine, it seems very likely that other Mesoamericans before them also had this challenge. Indeed, the northern lowland Maya of Yucatan recorded episodes of famine in their prophetic books that may have occurred before the Spanish arrived. Historian Nancy Farris (1984) lists

17 major episodes of famine in the Colonial period, under what should have been a more effective economic regime and in the context of a greatly diminished overall population from Pre-Conquest levels.

Again, in our view the way that the Maya, the people of Olman, and other lowland Mesoamericans generally adapted to the fickleness of maize was apparent to the first Europeans who observed them: they stored the bulk of this vital food not in the fields, in the ground or in cribs, but in imperishable tokens, currencies, obtained through market exchange. Yucatecan farmers took their surplus harvest to the market, and bought jade, red shell beads, copper rings, bells, miniature cooper axes, miniature ground stone axes. Food or seed could be purchased at the same market. So observed Diego de Landa (Tozzer 1941), first Bishop of Yucatan, who left us the most detailed account of the sixteenth century lowland Maya. Indeed there were several other popular currencies, including roasted chocolate beans (Millon 1955), a delicious luxury resistant to inflation; standard lengths of woven cotton cloth. These currencies were highly fungible and virtually universal within Mesoamerica proper at the time of the Conquest because societies were storing maize in the regional economic system.

Clearly it was not a perfect system, as the Aztec case attests, but it must have been an extensive and enduring one to sustain civilization in the lowland regions. The regional Mesoamerican market system was quite intact and operative through the period of initial contact. It was described in detail by several observers in the highlands of Mexico, the highlands of Guatemala (Miles 1957), the lowlands of Tabasco, homeland to the Olmec, as well as the Maya lowlands. This indigenous marketing system survived into the twentieth century in highland Chiapas and Guatemala among other areas, termed Solar marketing as smaller towns and villages had widely spaced market days revolving around central market towns with more frequent ones (McBryde 1945). In the chronicles of Acalan-Tixchel (Scholes and Roys 1948), the Tabasco lowland region home to famous merchant groups at the time of the Conquest, the marketing system was so integrated that areas and communities specialized in certain export commodities, primarily maize or cacao, and depended on the markets to provide them with other necessities. Merchants knowledgeable in the demands and supplies of the general area would trade one commodity for another to transport to a market where the demand and the value were especially high. So storing food in the system means that when one region suffered drought and imminent famine, the value of maize and other staples would rise and merchants would bring more to market there. Societies no doubt paid high prices for such downturns, but they did not starve, or migrate, because they had value stored in currencies against such a future need.

Skeptics counter that the lack of beasts of burden makes such a system impossible: human carriers had to eat the very food they carried over distances. Frankly, the math has never impressed us because the reality is simply there in the historical descriptions (Cowgill 1993, Sluyter 1993). People carried quantities of food, other agricultural goods, and salt over distances to major markets like the one in the Aztec capital at Tlateloco. Western notions of what people can endure in work and need in food do not apply here. Moreover, the system in place did not require food to go very far, for the geography of Mesoamerica is highly diversified and very different environments are closely juxtaposed. Bulk commodities could travel in many areas of the lowlands by sea, estuary and river, and it is in the lowlands that long-term storage of maize is least feasible. The skeptics further counter that there is no evidence that cacao or jade, among other things, served as currencies before the time of the Conquest (Demarest 2004). They trust in an evolutionary scheme crafted by our intellectual forebears that asserts the Preclassic societies as chiefly preludes to the Classic ones, the Classic ones as theocratic states relying on faith and spectacle to assure the loyalty of the masses, and Postclassic states, militaristic and mercantilist innovators of the economy observed by the Spanish (Willey and Phillips 1958; Marcus and Feinman 1996). There is, in reality, little evidence that the Classic states, or even the Preclassic states, were less warlike than the Postclassic ones. And there is no evidence that the jade beads, red shell beads, cacao beans, used as currency in the Contact Period functioned differently in the Preclassic and Classic periods. Indeed, epigrapher David Stuart (2006) has quite independently recently posited that the Classic Maya valued cacao beans, and possibly jades, as money like their Postclassic descendents. His closely argued proofs are textual and iconographic rather than archaeological and ethnohistorical, and provide an encouraging convergence toward the thesis pursued here (Freidel and Scarborough 1982; Freidel 1986, 1992; Freidel and Shaw 2000; Freidel et al. 2002).

Karl Taube (1996a, 2000) observed that the thesis of Middle Preclassic currency was put first forward by Flannery and Schoenwetter (1970) concerning agricultural risk in Preclassic Oaxaca. In his most recent discussion of this theme, with particular regard to jade celts and food storage, Taube (2004a:18–19) notes that converging lines of evidence support an emergence of maize as a primary staple in the Middle Preclassic Period, concomitant with a fluorescence of crafting associated with the manufacture of greenstone artifacts. Taube (2004a) also reviews the history of the idea of storing staple commodity value in forms of wealth items (D'Altroy and Earle 1985) and Olmec celts as units of exchange (Thomsen 1975; Joralemon 1988). In the last analysis, however, he notes that significant size variability and quality of manufacture suggest celts were more likely analogous to ethnographically observed primitive valuables, wealth items that could not be used in market transactions (Dalton 1977). He further notes that the relatively common practice of incising symbolism on the celts implies that they were more likely regarded as treasure, with its constraints on alienability, than as money. He concludes that jade celts could have been used for emergency conversion to staple food in the face of famine, a rare problem in the Gulf Coast region in his view, and "Whatever the crises, a system of readily stored and convertible wealth would be of great adaptive use to the Preclassic Olmec" (Taube 2004a:19).

Taube's concerns with standardization and the hazy frontiers between inalienable treasure, wealth, and currency are legitimate, but not grounds for discarding his hypothesis that jade celts functioned as currency in the Middle Preclassic period and subsequently (Fig. 2). There is scant evidence to suggest that the Contact Period Mesoamericans were overly concerned about standardization of currency tokens. To be sure, sixteenth century currency tokens were within a fairly tight

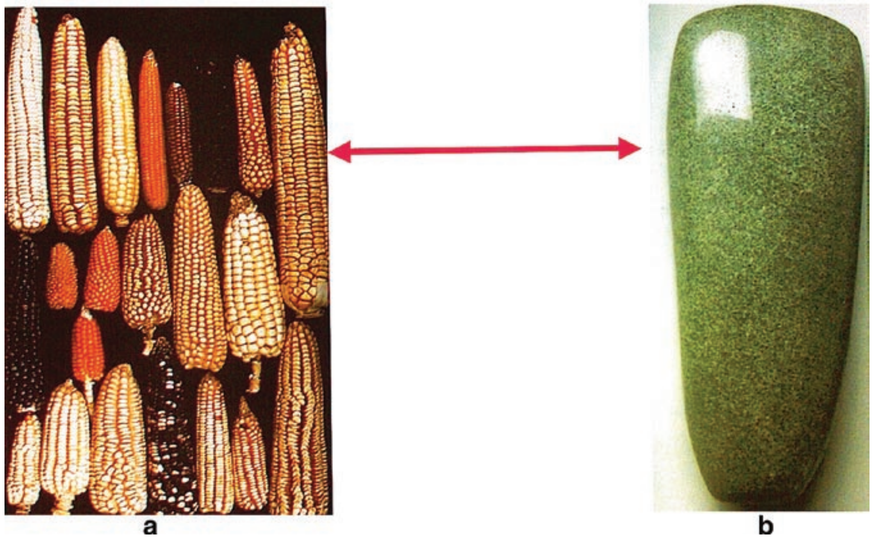

Fig. 2 Karl Taube postulates that Olmec green stone celts functioned symbolically as ears of maize

range of size and weight: cacao beans are naturally of a regular size; Postclassic beads of shell and stone vary from large to small, as do copper bells and miniature copper axes (and greenstone polished celts, another likely token). But there is little evidence that the Pre-Columbian Mesoamericans used standardized weights and measures beyond the "*vara*" of cotton cloth. No doubt they would visually estimate amounts in containers or bundles and make sure they were getting what they bargained for, and judges were in markets to adjudicate disputes at the time of Contact. On the other hand, there is an abundance of evidence that Postclassic Mesoamericans concerned themselves with the counting of commodities, both in eye-witness accounts and in the formal tribute lists of the Aztec and other societies' codices. Stuart (2006) makes a clear case for the Classic Maya formalized counting of bagged cacao beans using inscriptions and depictions on painted vases, and the use of cacao as currency in that era. We will return to this matter of counting and currency shortly. Suffice it to say that Pre-Columbian currency use back to the Middle Preclassic is, in our view, an idea whose time has come.

We think that the convergence of staple maize and greenstone proliferation indicates the presence of a regional marketing system formalized in the transition from the Early to the Middle Preclassic, or Preclassic Period. The precise nature of that innovative process at the regional level, as evinced in the evidence for sustained interaction, is hard to pin down and remains controversial. Barbara Stark (2000) reviews the prospect that incipient elites in Mesoamerica demanded exotic goods, and exotic ideas expressed through their crafting, as a way of negotiating power in their communities – a concept explored by Mary Helms (1986, 1993). Clearly we are suggesting a more material foundation for such trade and consequential power. Stark further notes the evidence for Archaic period forest clearing and cultivation presaging the Early Preclassic Olmec fluorescence, but the botanical data concerning the development of maize as a staple, and of other staples such as beans, during Early and Middle Preclassic times in lowland contexts are also less robust than we would like (Stark 2000; Pohl et al. 2007; VanDerwarker 2006; Fritz personal communication, 2008). No doubt the Early Preclassic rulers of San Lorenzo already mobilized massive amounts of labor (Coe and Diehl 1980a,b; Gullén 1993), and their means of insuring authority were likely more on the lines favored by Helms and Stark than those we suggest operated later. Nevertheless, by Middle Preclassic times as iconographers we can see salient features of the institution of divine kingship in Olman, its instruments and facilities, as indicative of the way kings were metaphors for a system of storing and distributing staple maize by way of currency tokens.

Taube (1996a, 2005) has long argued for the significance of the Olmec Maize God. Virginia Fields (1986) identified the sprouting maize seed as the natural referent for the primary jewel of Olmec and Maya kingship. Kent Reilly (1986) demonstrated the anchoring of Olmec religion in ecological reality and the role of kings as managers of that reality. Freidel et al. (1993) explored the continuities in the Olmec and Maya cults of the divine ruler as embodiment of maize. Guernsey (2006) shows how Izapan rulers advanced divine kingship in the transition between the Middle and Late Preclassic in a crucial node of the regional trade networks. We suggest that the religious focus of southeastern Mesoamericans on maize was anything but fortuitous or arbitrary. Divine kings were not parasites, nor were their courtiers. They emerged as pivotal agents in the maintenance of the economy of maize in the lowlands of southeastern Mesoamerica. Were they truly necessary? In the last analysis, there were other ways to maintain such an economy, other religious rationales devoted to gods rather than to human avatars, that came to the fore in the Postclassic period. But the institution of divine king seemingly endured for some 2,000 years or more in southeastern Mesoamerica.

The Birth of Currency

If the jadeite celt was a form of currency and an ingot of preciosity, it is iconographically also the axial symbol of the role of Middle Preclassic divine kings in engendering the economic system sustaining their peoples. Freidel (1996:Fig. 5) showed that a black steatite crouching figure in Middle Preclassic style depicts a bearded and wizened man giving birth from his female genitals to a circumcised penis (Fig. 3). This remarkable conflation, later to be realized in the multisexed Maya maize god and ultimately Ometeotl of the Aztecs, makes sense of a range of other Middle Preclassic images. The squatting body with legs up, the tensing the muscles of the chest against the ribcage, the gaping mouth, is part of the birthing pose represented famously in the Ttlazolteotl Aztec goddess figure housed in the Dumbarton Oaks Library. Without such an explicit depiction of the actual birthing,

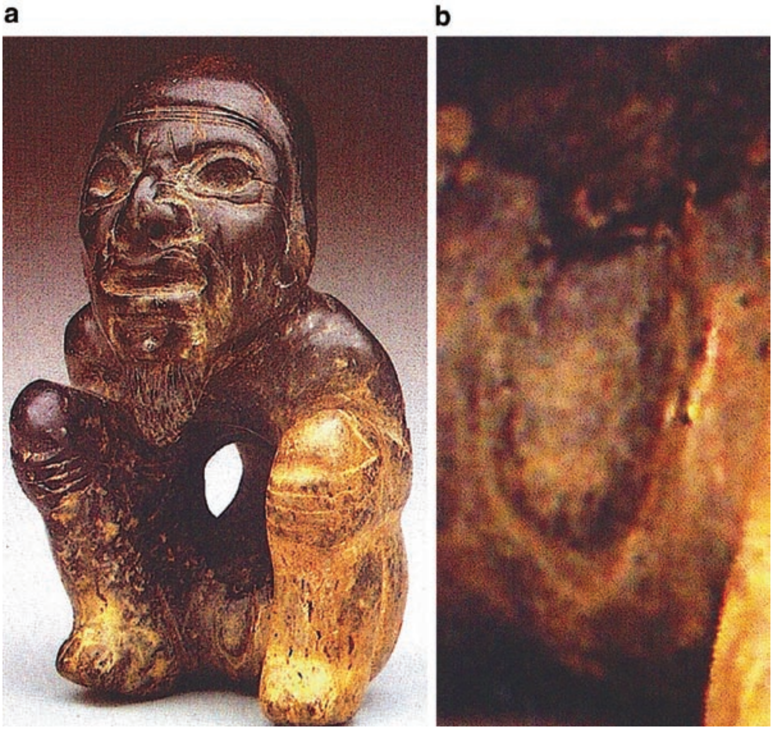

Fig. 3 (**a**) Incised groove completely delineates the phallus, (**b**) close up indicates this is not a hermaphroditic image. (Photograph courtesy of the Dallas Museum of Art)

the Dumbarton Oaks collection also contains a Middle Preclassic greenstone figure very similar in pose to the black figure described (Taube 2004a:Plate 17). That figure is also bearded and displays straining muscles against the ribcage, but completely lacks genitalia. However, the figure wears the trefoil sprout of the maize god, worn by Olmec kings, on top of his head, and a headdress of mirrors and feathers. Taube (2004a:103) notes the remarkable similarity between these two figures, but argues that they are both early expressions of the old fire god, Huehueteotl. We stand by Freidel's original iconographic interpretation of the black figure as giving birth and extrapolate it to the maize god-divine king represented in the Dumbarton Oaks figure.

The circumcised penis birthed by the black figurine is expressed as a phallic fetish on Middle Preclassic carved greenstone artifacts previously identified as pseudobottles with stoppers (The Olmec World, Plate 202). The bottle gourd can resemble a phallus and scrotum and the Maya represent the general idea in the K'iche' Popol Vuh, where the severed head of the maize god, One Hunahpu, is transformed into a gourd which spits upon the hand of a maiden of Xibalba to engender his twin sons (Christensen 2003:127–129). The two fetishes in question have incised compositions on them. The larger has on the "stopper" a face of a maize god king. The smaller artifact has a personified sky (crossed-bands) scaffold on the "bottle" and a vegetal frond on the "stopper." Inverted, the same circumcised penis becomes an exclamation-point-shaped rain drop fertilizing vegetation depicted on relief carvings at the Middle Preclassic site of Chalcatzingo in Morelos (Grove 2000:276), well illustrated in the famous relief of "El Rey" (Fig. 4).

There are other phallic fetishes that take the form of scepters with vegetal connotations (Schele 1996:106–107) being wielded by Olmec lords and insofar as these are phallic references, they convey the male ruler as source of food-yielding plants. But there is also a direct visual, structural, substitution of the phallus by a celt on some Olmec stone figurines. This celt image is distinct from that of a loin cloth as there is no depiction of the waistband and the celt floats, bit up, directly in the position of genitalia (e.g., The Olmec World: plate 18). In the case of another figurine in the Dumbarton Oaks Library discussed by Taube (2004a:Plate 8) he says, "…*this device represents a loincloth in the form of a vertical celt*." (Taube 2004a:70). He goes on to note that there are several other examples of this free-floating celt over the genitalia and he suggests that this substitution of a celt for the loincloth may refer to the heavy labor of men clearing forest for fields. He also suggests that the celt served as a symbol of male power and the *axis mundi*. We find these ideas productive, but we think that the equation of male genitalia and the phallus in particular, with the celt conveys the principle that Olmec rulers were the generative source of treasure, wealth, and currency (Fig. 5).

We assert this generative power was further represented in celtiform offspring of kings. Among the several important images and ideas for which the polished stone

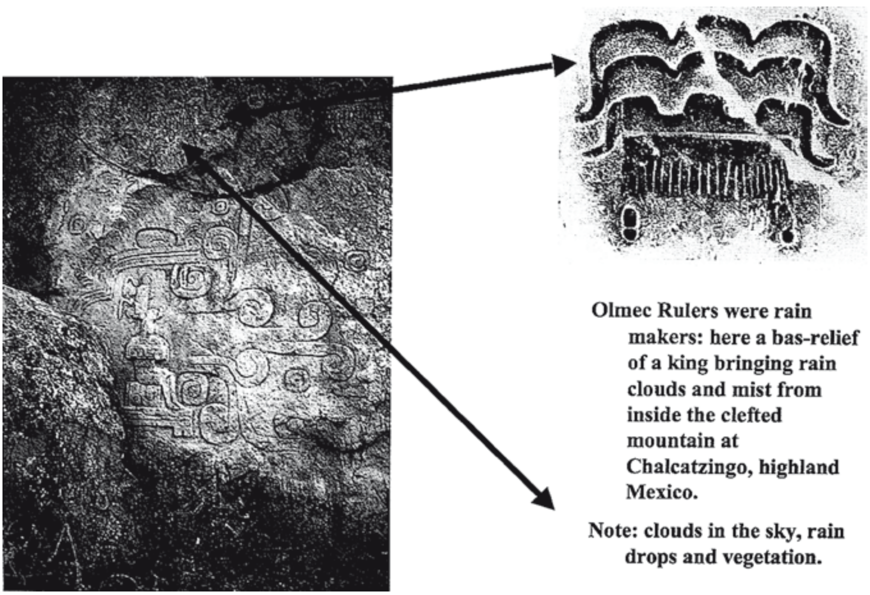

Fig. 4 Olmec rulers as rainmakers

Fig. 5 Olmec rulers with celtiform phalluses, representing maize and treasure

celt served as a template is the snarling "were-jaguar baby." Taube (2000:88–89) specifically identifies some celtiform deities as the infant maize god. Famous examples of the celtiform deity include one discovered at La Venta south of Tomb A (Diehl 2004:Fig. 35) the Kunz Axe (Coe and Diehl 1996:Fig. 17) and the extraordinary monumental image dubbed "El Bebe" discovered by Maria del Carmen Rodriguez and Ponciano Ortiz at Le Merced (Rodriguez and Ortiz 2000:154). The most dramatic and explicit representation of the celt as birthing, or literally sprouting, child is one shaped as a maize kernel with the baby maize god emerging from it (The Olmec World 1996b:plate 76). In addition to images of men holding celts in their clasped hands before them, there are also images of men holding were-jaguar babies, either flaccid, as in the case of the Las Limas figurine (De la Fuente 2000:Fig. 3) or active as in the celtiform baby being presented by the famous standing figure in the Brooklyn Museum (The Olmec World: Plate 35). The size of that baby is approximately the same proportionally as a class of effigy stone plaques depicting celtiform were-jaguar babies (e.g., The Olmec World 1996b: Plate 36), and it is likely that these plaques were displayed in this fashion. The plaques all depict active and alert deities, even if their limbs are not splayed like those of the baby on the Brooklyn figure. Like the later Maya kings (Stuart 1988), Olmec kings gave birth to gods, and those gods, we suggest, represented maize, treasure, wealth, and currency. Insofar as jade symbolized animate soul force (Taube 2005) and the celt represented the *axis mundi* (Taube 2004a) divine kings were the progenitors of that living conduit.

The flaccid pose of the baby held in the arms of the Las Limas figure, in our view, does not represent a dead or sleeping being but rather the conflation of the celtiform deity with the bundle-wrappings that would usually cover it when it was inert and not being activated by the ruler (Fig. 6). The hands of the Las Limas figure are precisely posed as those of a ruler cradling a bundle (Reilly 1996a:Figs. 23, 25, 26) The unbundling of the jade celt, figurines, or other power objects representing deities, in our view, would have been the metaphorical birthing event, with the cloth or pelt wrappings representing the ruler in his animal aspect (Reilly 1996a) and the objects his divine children. A particularly dynamic expression of this idea is the depiction of a jaguar, the bundle pelt/ruler, bearing the revealed and activated celtiform were-jaguar baby on its back – clinging to the pelt tail like a scepter (Reilly 1996a:Fig. 34, the pelt reading of the jaguar discovered by John W. Nunley following a lecture by Freidel in December 2008).

Fig. 6 Las Limas figure holding infant Maize God. Jalapa Museum of Anthropology, Veracruz, Mexico

The act of unbundling objects representing divine beings is a pervasive and enduring royal ritual performance in Pre-Columbian Mesoamerica (Guernsey and Reilly 2006). We argue that this performance was central to the Olmec public ceremony, particularly to the kind of major episodic ritual events that attract pilgrims and fairs to contemporary indigenous centers in Mesoamerica, such as Holy Week in Santiago Atitlan (Christensen 2001). Unbundling this theme is now our task.

Bundles, Burdens, Scaffolds, and Altar Thrones

Like the cosmological models sustaining the faith and forbearance of ordinary people living in their realms, the instruments and facilities of divine kings (Freidel and Schele 1988) derived from practical everyday things. Pre-Columbian Mesoamerica had no draught animals, so everyone carried bundles and burdens. The farmer's knotted sack of twine, the mother's woven shawl with a nursing baby in it, the merchant's backpack and tumpline, the shaman's bundle, the king's handbag, everyone carried something. Today the Spanish gloss, and anthropological term, for office in indigenous Mesoamerican political and religious hierarchy is cargo and this connotes all the relevant things: the bundle, the social and economic responsibilities, the burdens of office. Officials carry their offices and embody their contents. Not surprisingly, the cargo concept, in all its references, is certainly Pre-Columbian (Stross 1988, Stuart 2006). The bundle as an idea, image and word, registered both the container and the contents. People could see these as both real and moral equivalents. The farmer's burden containing food from the fields was like in kind to the merchant's pack containing both food and precious equivalencies in perishable and imperishable commodities, and both of these were symbolized in the sacred bundles of the shaman and the king with their contents distilling as magical tokens the imperatives of all the other bundles carried by their people. Consequentially the divine king as the prime instrumental object of the realm for which he was responsible (Freidel 1992) was also himself bundled (Reilly 2006). But just as the bundle was a metaphor revealing the common purposes embracing everyone and their work, it also contained and concealed precious things and powers that could be dissipated dangerously if not covered and bound. The iconography of bundles (Guernsey and Reilly 2006) is central and thematic to discerning how divine kingship institutionally centered the regional economies that sustained large scale societies subsisting on staple maize.

The simple scaffold of lashed wood was the framework, literal and metaphorical, of the world as a rectilinear and human-made facility. Everyone had to make places in which to store their bundled belongings and in which to sleep. Farmers stored maize in scaffold cribs. Homes were storage facilities for people and made along the same craft principles, held up by posts and beams lashed together, usually rectilinear in frame if not in outer form. Field altars were (and are, Freidel et al. 1993:Chap. 1) scaffolds with surfaces on which to lay out offerings and votive objects (Fig. 7a,b). Everyone made scaffolds and used them routinely. As divine

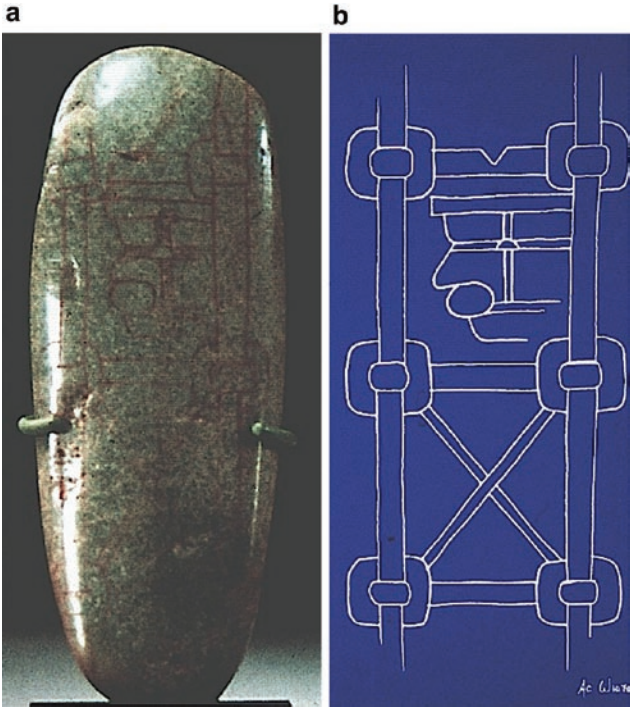

Fig. 7 (**a**,**b**) F. Kent Reilly III has observed that, "The incised imagery depicts a human figure with a *k'an* cross in his eye seated on a scaffold that is dramatically similar to the scaffold depicted in the San Bartolo Murals." Lords of Creation 2005:34

kings were metaphorically maize and the bundled preciosities that were maize equivalents, so their thrones were scaffolds (Fig. 8a,b) (Taube 1988). As an image, the basic scaffold is usually represented by vertical uprights, horizontal beams, and diagonal cross-braces. In the Middle Preclassic corpus, the crossed-bands comprise the sky motif (The Olmec World 1996b:121). While the cross-braces are helpful in stabilizing scaffolds, they are not absolutely necessary and there are examples of scaffolds from Olmec to Aztec art, lacking cross-braces.

Throughout the long cultural history of Mesoamerica the sacred, in all its forms, was ritually enhanced through the act of bundling or binding (Stenzel 1967, 1968, Guernsey and Reilly 2006). These acts of bundling and binding not only enhanced sacredness by screening ritual objects from profane observation, but also signified the control of such objects by elite ritual practitioners. Objects sanctified through ritual acts of bundling and binding could range from the very small to monumental sculpture and even buildings (Reilly 2006). However ritual bundling and binding could ultimately reach both geographic and cosmic proportions. The bindings of the day and night sky were marked through the observation of Equinox and Solstice alignments (Freidel et al. 1993:78–103).

a

b

Fig. 8 Olmec Thrones as Scaffolds: (**a**) San Lorenzo, Monument 20; (**b**) La Venta, Monument 20

When Mesoamerican maize farmers laid out their fields using a quincunx based geometrical patterning, laid out on both the vertical and horizontal, they were literally describing an earth bound bundle that held the promise of that sacred food that, through both work and ritual care, would eventually sprout and mature within the cycle of the solar based ritual calendar. Undoubtedly, this is the meaning of the bindings that surround the Xoc Figure bundle (Fig. 9a,b). In this instance, ears of maize are positioned on either side of the crossing point of the vertical and horizontal

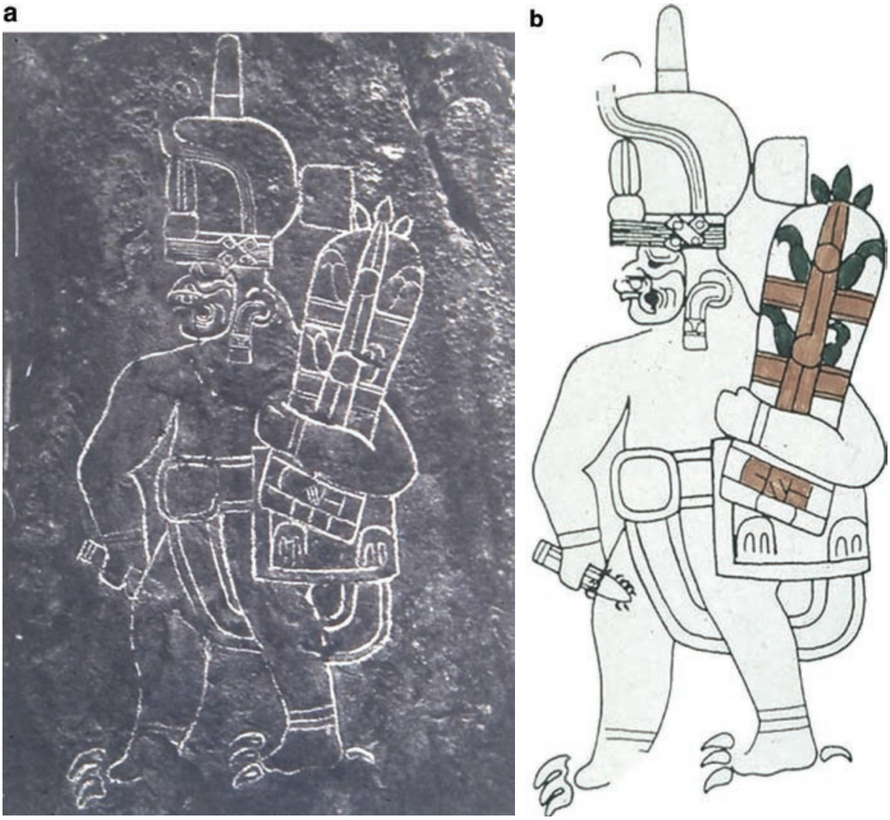

Fig. 9 Olmec iconography: (**a**) Xoc Figure, Chiapas, Mexico (now destroyed) ; (**b**) Redrawn Xoc figure showing him holding the bundle

bindings of the bundle (Taube 1996a, Reilly 2006). Furthermore, the trefoil of sprouting maize emerges from the top of the bundle. It should be noted however that the maize ears incorporated into the Xoc Bundle wrappings may in reality be green stone celts. As we have noted, Taube (1996a) postulates that green stone celts functioned symbolically as ears of maize and that Olmec rulers wore maize ears tied around their limbs thus furthering their ritual identity as the Maize God. We, of course, see such display as also advancing the value of celts as treasure and currency (see Freidel et al. 2004 for a comparable argument concerning the introduction of Thorny Oyster (*Spondylus* spp). as currency in the Late Preclassic period).

The contents of sacred bundles varied with the specific ritual function of the bundle. Examples of open Middle Preclassic period bundles can be seen on three more exemplary objects from the same period. The first two of these objects are the Chalcatzingo Vase and the Dallas Tablet (Figs. 10–12). That these are "unwrapped" views is signified through the visualized image of the central untied knot denoted as behind the revealed mask on the Chalcatzingo Vase and the four untied knots located at the four corners of the Dallas Tablet (Reilly 1994, 2006).

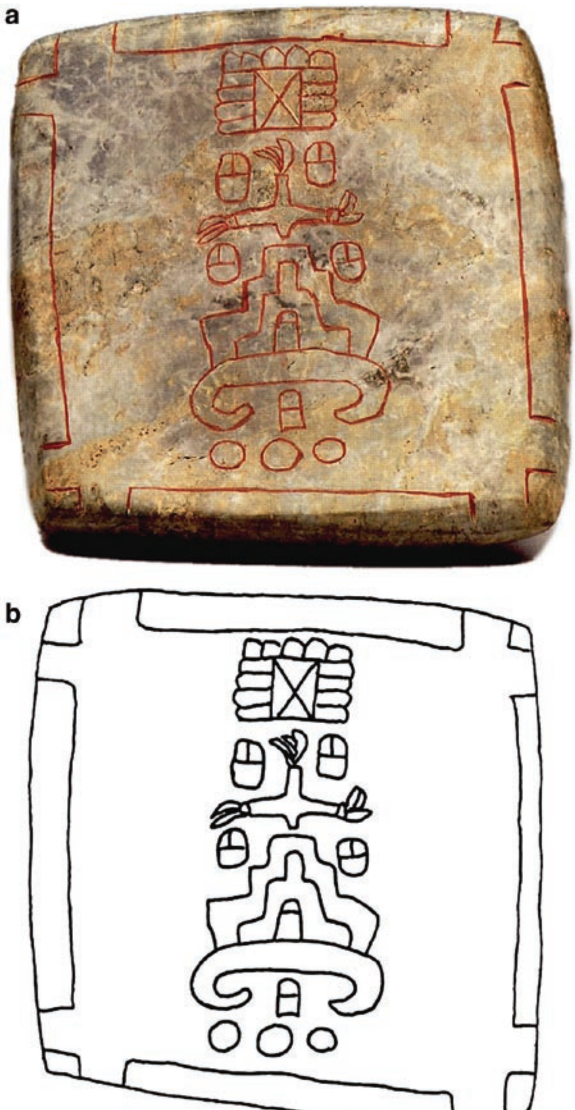

Fig. 10 (**a**) Dallas Tablet (Guerrero, Mexico 900–400 BC); (**b**) Redrawn, showing the cosmos engraved on the Dallas Tablet. Dallas Museum of Art

The Chalcatzingo Vase is itself evidently a pear-shaped effigy of a seated bundled corpse as typically depicted in later Mesoamerican art (e.g. Freidel and Guenter 2007.) On it is an opened bundle that when closed would resemble in its bindings and outer symbolism the Xoc Bundle with its signaled contents of jade and maize (Fig. 13a–b). Both are long in the vertical axis and both are topped by the trefoil

Fig. 11 (**a**) Chalcatzingo Vase; (**b**) Redrawn, showing the complete bundle image as a roll out. From a roll-out photograph by Justin Kerr

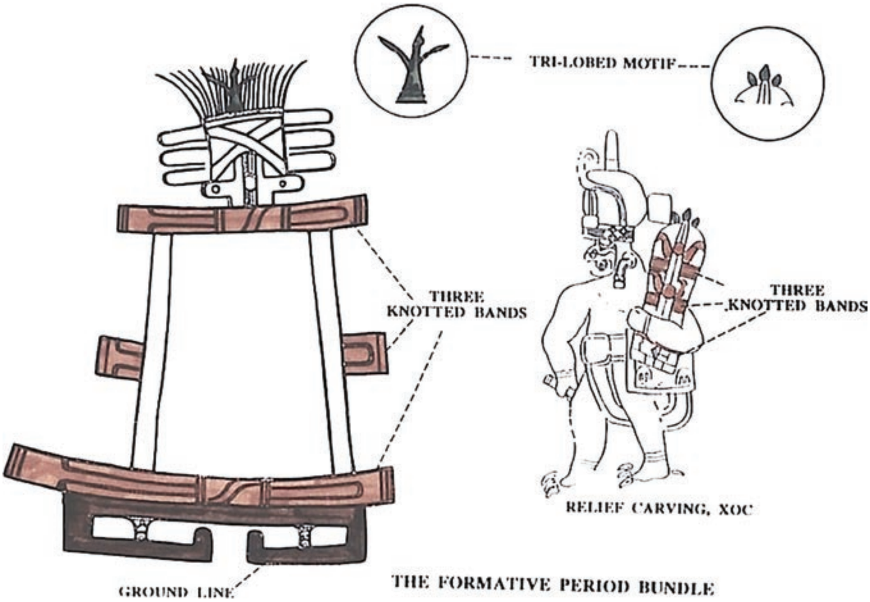

Fig. 12 The formative bundle. Drawing by F. Kent Reilly III after a roll-out photograph by Justin Kerr of the Chalcatzingo Vase and photographs of the Xoc relief in C. Navarette 1974

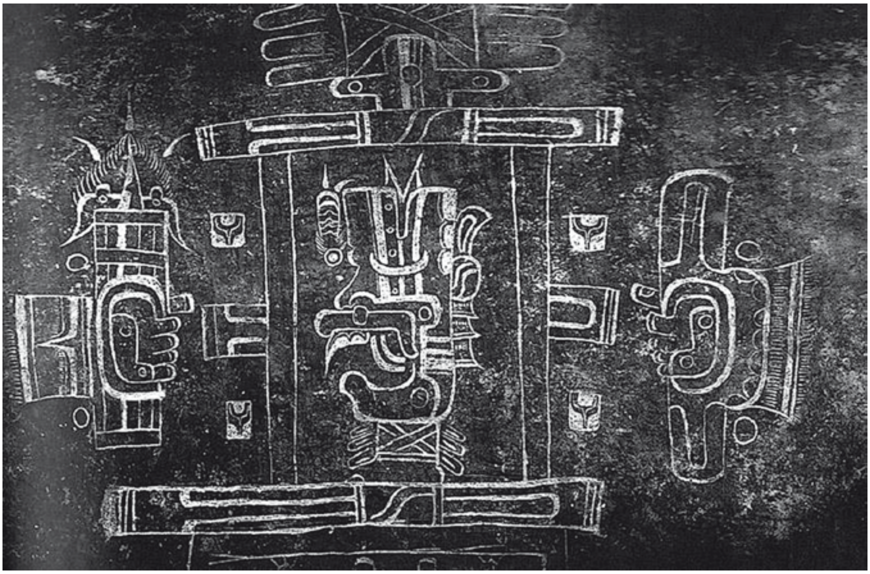

Fig. 13 There are other emblematic arrangements emphasizing the horizontal alignment, as on the Chalcatzingo Vase. In this case, a "torch" and a "knuckleduster" flank a mask. The concentrically arrayed shark's teeth and vertically stacked elements, including bundling knots, indicate the arrangement is still emblematic. The sky/scaffold bundle is at the *top*

motif. One difference is that in the case of the Chalcatzingo Vase bundle the trefoil sprout emerges from what Freidel (2008) has identified as the "Maize Scaffold Bundle", symbolic of resurrection as discussed below in the context of the Dallas Tablet. The content of the Chalcatzingo Vase bundle appears to be a sprouting Maize God mask bearing symbols of several other deities, including two identified by Michael Coe and his student David Joralemon (Coe 1973) representing death and spring renewal as incised on the famous Las Limas Figure (see Fig. 6). Flanking the mask are hands grasping two objects, a scepter-like bundle at Taube (2004) identifies as a maize fetish and a "knuckle-duster", an enigmatic object apparently made of spiky shell identified by David Grove (2000, 1987) as a blood letter. In light of our earlier arguments concerning phallic fetishes, it seems likely to us that the scepter has such phallic connotations and that the "knuckle-duster" is a shell representing female genitals as it did for later Preclassic Maya (see Taube's "corn maiden" with her shell genital covering on the north wall of the Pinturas building at San Bartolo, Guatemala, Saturno, Stuart and Taube citation.) If these identifications hold, then the Chalcatzingo Vase bundle references not only the death and corpse-bundling of the Maize God, but also his resurrection and sprouting through the conjoining of the phallic rain/celt/seed (and Taube would add pollen) and the vulva/womb/earth. As a prosaic matter, the vase is suitable for holding liquids and likely held ritual liquids appropriate to the resurrection symbolism on it. The contemporary Tzotzil speaking Maya of Chamula, among others, cook a special thick maize gruel that has the color and consistency of semen (Freidel et al. 1993) and it is integral to rituals celebrating sacrificial death and resurrection.

The powerful and ambiguous Chalcatzingo mask illustrates two other important points: first, it shows the function of performance regalia as a vehicle for imbuing ritualists, especially rulers, with a preternatural identity. In this case, the mask is in or on an effigy corpse bundle as life-sized Olmec jade masks no doubt adorned real ones if later Mesoamerican practice is a guide. Secondly, it illustrates the importance of motif conflation to specifying the nuanced and complex nature of supernatural persona as performed by mask wearers. Perhaps this Middle Preclassic practice of motif conflation was the basis for the conflation of specific signs into logographs, a principle figuring prominently in the Late Preclassic writing systems encoding spoken language.

An examination of the contents of the Dallas Tablet bundle incised on its surface reveals a critical point to any understanding of the ritual use of bundles in the Preclassic period. The bundle contents are not laid out haphazardly but in a specific vertical and concentric pattern. In this instance that pattern is a diagram representing the cosmos at the moment of creation. This pattern of incised images is not intended simply to be read as pictographs or ideograms, but in our view represents an actual display of objects symbolic of divine beings manifest as living places. As Freidel et al. (1993:55–58) state with regard to contemporary Yucatec Maya practice in the village of Yaxuna, the arrangement of sacred objects, foodstuffs, and plants on and around the field altar by the h'men have specific cosmological references to the maize field, the order of the earthly plane, the order and aperture of the heavens, and the disposition of gods and spirits relative to this microcosm. And the h'men's assistants "bind up" this space by encircling it three times clockwise and then three times counterclockwise, making of it a bundle. William Hanks (1990) provides more examples of the cosmological symbolism of the spatial arrangement of real objects in traditional Yucatec Maya ritual practice. The cosmological symbolism of arranged objects taken out of bundling and placed on altars is broadly observed in contemporary Mesoamerica (see Christensen 2001 for examples from highland Guatemala).

In the case of the objects displayed on the Dallas Tablet, the arrangement is primarily vertical, revealing, from bottom to top, the three hearth stones of the creation place where the Maize God emerged reborn in later Maya religion, above which is a pars-pro-toto representation of the maw of the living earth. Atop the "ground-line" locative signaling that this place is an animate being is positioned an undulating mountain that is here also a female vulva/womb containing an erect circumcised penis/rain-drop/celt/seed, the coupling of earth and rain that births food plants. The rain-drop connotation of this image also signals water in the mountain, as in the case of the muyal cloud symbolism inside the cave in the famous El Rey relief at the site of Chalcatzingo (Reilly 1996b). From the mountain/womb sprouts a cruciform tasseled (hence fertilized) maize plant functioning as the axis-mundi and, in later Maya imagery, representing the Maize God resurrected following sacrifice (Freidel et al. 1993). Four celt/seeds are positioned around the axis-mundi maize plant forming the quincunx model of centered and ordered space where the portal between this world and the Otherworld is open. Above the maize plant is a motif that closely reassembles the maize scaffold motif seen on the bundle imagery of the Chalcatzingo vase (Fig. 14). However, the fact that the central crossed bands motifs carries a surround made up of thirteen individual elements may identify this symbol as standing for a specific location within the sky realm: on the binding ecliptic path with its thirteen constellations. The zenith crossing of the ecliptic path with the north-south positioning of the Milky Way marked the place of resurrection of the Maize God on the evening of August 13 (or 11), 3114 BC for the later Maya (Freidel et al. 1993). In prosaic terms, the Dallas Tablet bundle contains jade and maize like the Xoc relief bundle. In cosmic terms, it contains the power of divine kings to understand and enable the forces sustaining the ordered world and the people in it. As previously mentioned, it is the specific layout of ritual objects atop the wrapping of the open bundle that reveals the cosmological implications of the ritual in which this bundle would have taken part. Reilly has long advocated the notion that the layout of the great ceremonial center of La Venta is a creation cosmogram analogous to the pattern incised on the Dallas Tablet. He has further argued that the principal royal performances at La Venta pertained to manifesting the *axis-mundi*-world tree, the display of bundles, and scaffold accessions (Reilly 2002). We would here add to these performances the revealing of the contents of bundles, the tokens of divine power, treasure, wealth, and currency. We think that the prophetic or divinatory arrangement of real bundle contents could be memorialized in arrangements of celts and other precious objects and cached in the ground to make the performances and declarations of rulers enduring, much as later people would raise carved stone monuments as such memorials. We propose that the ordered

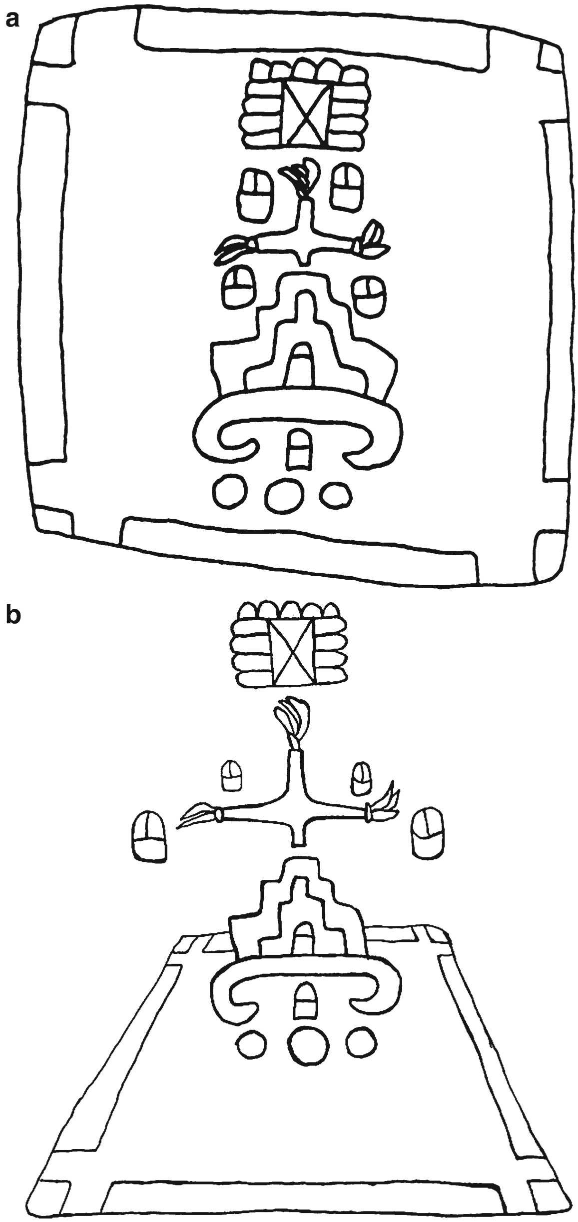

Fig. 14 (**a**) The Dallas Tablet, drawing by F. Kent Reilly III; (**b**) The images on the Dallas Tablet rendered in three dimensions, Drawing by F. Kent Reilly III

placement of ritual objects within the context of an open bundle, as in the incised imagery on the Dallas Tablet or as in the caches of La Venta, may have profound implications for our understanding of the origins of Mesoamerican writing systems.

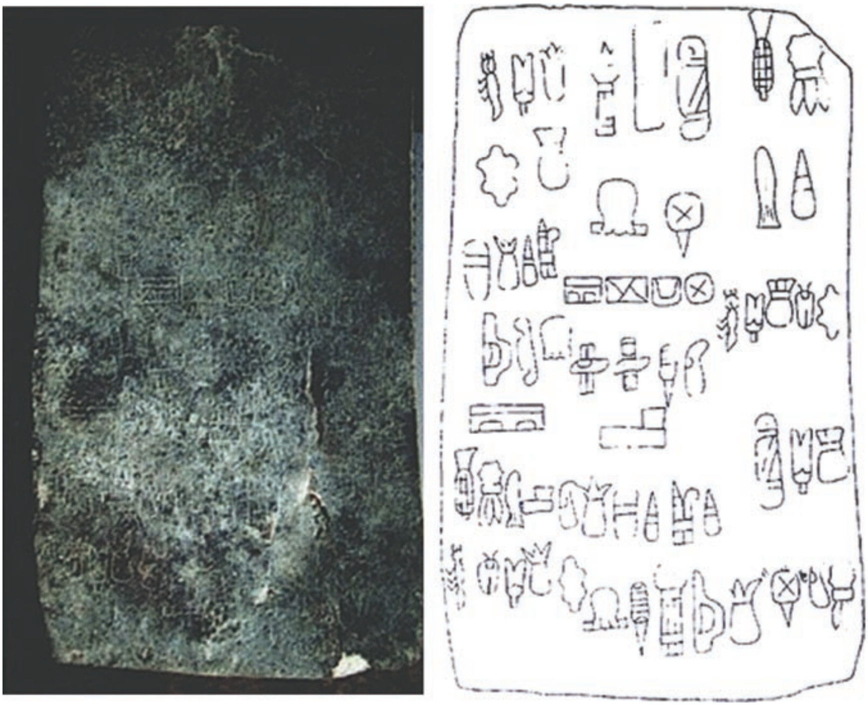

Fig. 15 (**a**) Cascajal block, San Lorenzo, Veracruz, Mexico; (**b**) Redrawn to show glyphs which appear on the block

Nowhere are the implications of the link between Middle Preclassic symbolism and later Mesoamerican writing clearer than on the recently discovered Cascajal Block (Fig. 15) (Rodriguez Martinez et al. 2006; Rodriguez and Ortiz 2006).

The Cascajal Block, Bundle Contents Memorialized

We propose that the Cascajal Block is an incised representation of three opened bundles with their contents laid out in a precise ritual order. A brief summary of the Cascajal Block's discovery (Skidmore 2006) reveals that the Cascajal Block was found in a gravel quarry near the Olmec Heartland site of San Lorenzo sometime between 1998 and 1999. The context of its discovery along with associated ceramics dates the block to the San Lorenzo Phase B ca. 900 BC. The block is carved from serpentine and has six sides. Five of those six sides are somewhat convex. The block is roughly 15 in. long and corresponds in size and shape to the serpentine blocks that make up the greenstone deposits found in the central court and Mound A-2 at the Archaeological site of La Venta (Drucker et al. 1959). In our view this is most appropriate as a memorial of public prophecy and divination accompanying festivals and fairs as the massive serpentine deposits represent the wealth of the polity backing the value of currency tokens made of greenstone. The flat side of the block is incised with 62 signs or symbols. Scientific investigation by INAH and other research bodies supports the Cascajal Block's authenticity (Fig. 16).

Epigrapher Stephen Houston proposes that the block carries a fully developed writing system encoding spoken language, an extinct system without issue and without the prospect of decipherment (Rodriguez Martinez et al. 2006). We do not think that the signs on the Cascajal block reflect such a developed writing system. Important to our argument is that the signs are not arranged in the vertical reading order that is the standard format of Mesoamerican writing systems (Coe 1976; Justeson 1986; Justeson and Mathews 1990; Mora-Marín 2001). Several arguments have been made as to the correct reading order of the 62 signs). The Block has even been turned on its side in order to establish (without success) a vertical reading order. Critical to our argument is the obvious horizontal layout of the individual symbols as opposed to the vertical template that is the standard arrangement for writing systems in Mesoamerican.

The reporters of the initial discovery of the Cascajal Block have identified, in their text analysis, a total of 28 signs (Rodriguez Martinez et al. 2006:1612). They

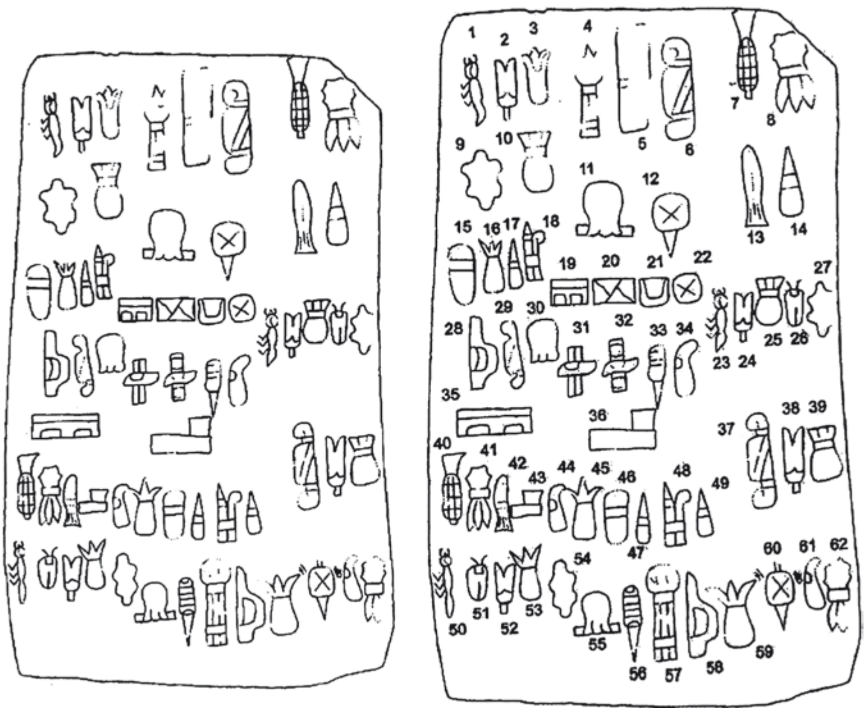

Fig. 16 (**a**) Cascajal block (**b**) Cascajal block with glyphs numbered

suggest that the signs show a consistent reading order, and within that reading order there are a series of short sign sequences within a larger grouping of signs. The authors of that article have also provided a chart that groups the individual signs in order of the frequency of appearance (Cascajal signary) within the overall Cascajal imagery (Rodriguez Martinez et al. 2006:1613, Fig. 5). The initial discovery of the Cascajal Block has generated an article in Arqueología *Mexicana* that has linked several of the Cascajal signs to existing Olmec style symbols and individual examples in the Olmec sculptural corpus (Ortiz et al. 2007).

The actual symbols on the Cascajal Block include several that are representative of objects, and most of them can be found in Peter David Joralemon's dictionary of Olmec motifs (1971). The "torch" and "knuckleduster" (Cascajal 57 and 58 for example) are well-known objects (The Olmec World 1996b:Fig. 196) that occur as a pair on the Block and occur separately and paired on several Olmec artifacts, including San Lorenzo Monument 10 (Coe and Diehl 1980a,b), where the seated individual displays two knuckledusters. The torch and knuckleduster pair is depicted on the Chalcatzingo vase described, and on a greenstone figurine in the Dumbarton Oaks collection where they are again held as objects (Taube 2004a). Another clear object is the "stiletto." This occurs as an object in greenstone in Middle Preclassic contexts, and it is incised as a symbol on San Lorenzo Monument 50 over the main composition. A split-topped celt symbol (Cascajal 38 for example) occurs as decoration on actual greenstone celts, as a component of emblematic arrangements (citation) and also as a displayed object (citation). The maize symbol (e.g., Cascajal 7) occurs as an insignia on headdresses incised on celts. There is a bundle image (e.g., Cascajal 6) that resembles bundles carried or displayed by Middle Preclassic Olmec individuals (Angulo V. 1987:Fig. 10.21). A trefoil-topped object (e.g., Cascajal 45) occurs as an incised greenstone celt in the Dumbarton Oaks collection (citation). Symbol 32 on the Cascajal Block depicts two eyes above and below a horizontal band, and this is replicated on a carved and incised greenstone celt (The Olmec World 1996b:Fig. 126). The curious insect symbol (Cascajal 1) has a trident top that resembles a greenstone insect effigy identified by Taube as a centipede (The Olmec World 1996b, Fig. 175). Other symbols on the block are more likely not object based, but as motifs decorate eyes and other parts of beings and objects in the corpus. That said, enough of the symbols on the block are object based to make it fruitful to consider that what is depicted on the block is a complex and dense arrangement, or tableau, of objects. This hypothesis is testable against existing contextual and artifactual evidence.

The Cascajal Block's finely incised symbols are clearly organized in a linear fashion, and this provides a key rationale (Houston 2004) for Rodriguez Martinez et al. (2006) to hypothesize that it is the earliest known example of true writing in Mesoamerica. However as mentioned earlier these symbols show a decidedly horizontal linear arrangement, in contrast to the documented corpus of early inscriptions from Mesoamerica in which glyphs are arranged in vertical reading orders (see Coe 1976). The authors of the *Science* article note this horizontality in their consideration of comparable material when they suggest that the Middle Preclassic Humboldt Celt and the Tlaltenco Celt (Fig. 17b,c) may have the same

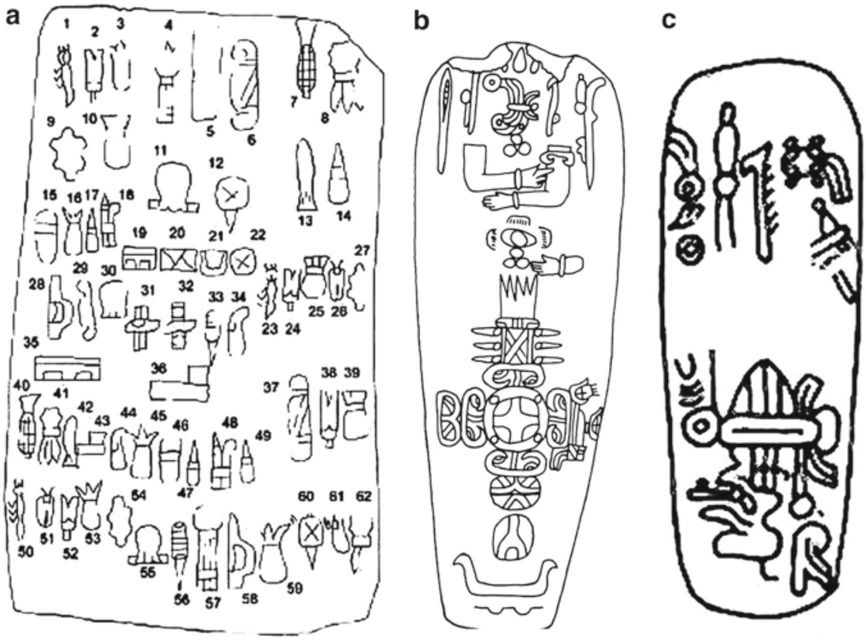

Fig. 17 (**a**) Drawing of the Cascajal block; (**b**) Drawing of the Humboldt Celt; (**c**) Kent?

early writing system on them (Fig. 18). Houston (2004) notes that symbols that do not encode language do not have to conform to a fixed order and can be arranged emblematically, as for instance on the Middle Preclassic greenstone tablet in the Dallas Museum of Art discussed. Following this argument, the Humboldt Celt would display both true writing in the horizontally arranged symbols at the “top” and emblematically arranged symbols below that could be “read” by knowing their meaning and the significance of the spatial arrangement (Fig. 19). On the Humboldt Celt, the symbols below the postulated written graphemes are in fact arranged vertically, as in the case of the Dallas tablet, and concentrically, as is found on other incised Middle Preclassic Celts. The vertical arrangement of symbols and images is generally more common than horizontal arrangement in the known corpus of incised Middle Preclassic celts. In part this may result from the presence of images derived from regalia and insignia worn or displayed by humans depicted on these artifacts that are normally read as resting on the head, worn on the chest or groin, and carried in the arms. The common reduction on these celts of humans to just the face inside of a vertically aligned stack of symbols reinforces the correlation between vertical arrangement and the original ornamentation of people with the symbols. Eventually, in the earliest glyphic inscriptions, heads continued to be used as glyphs in vertical alignments.

The horizontal linear arrangement of symbols on the incised celts is displayed when individuals hold two objects, one in each hand, and it is present in the display of

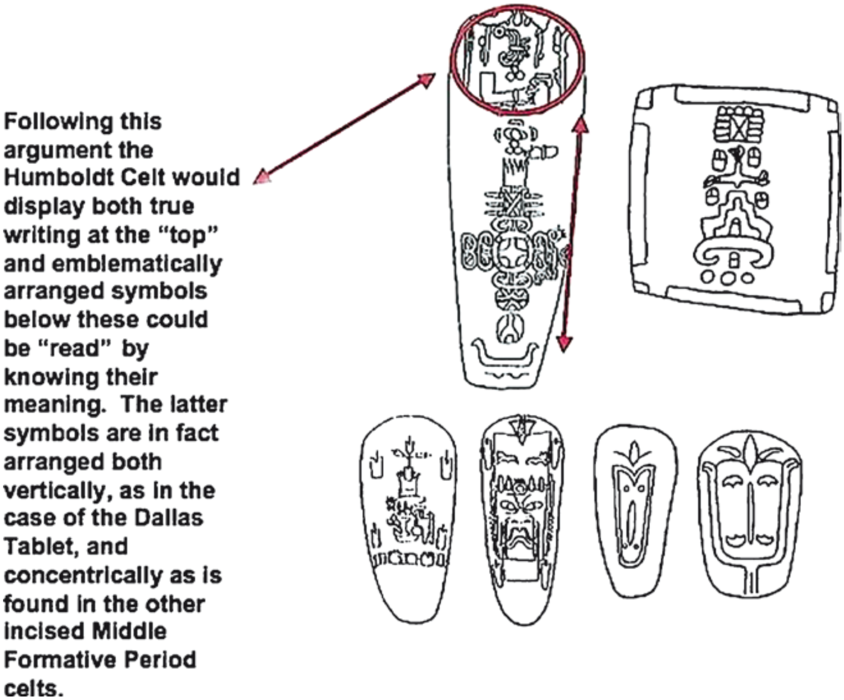

Fig. 18 Comparison of pictographic compositions: Humboldt Celt, Dallas Tablet and four other incised celts

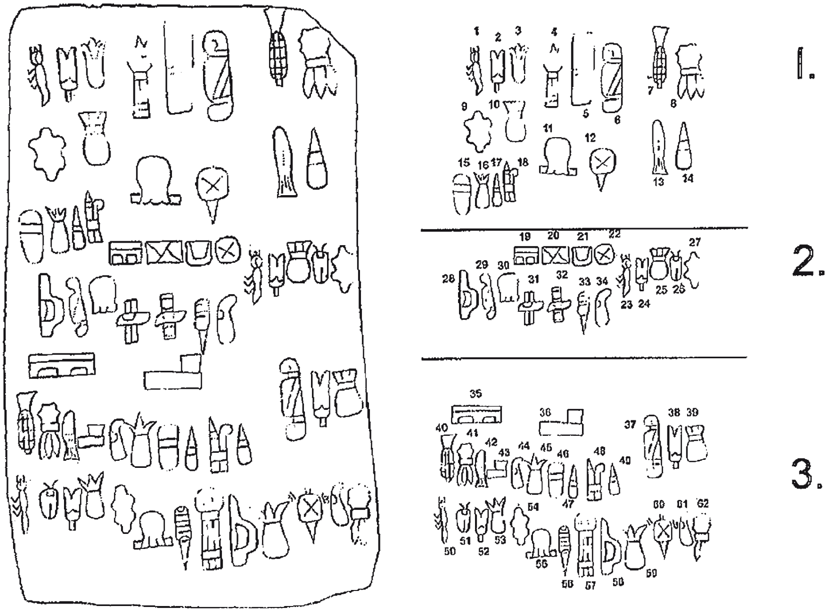

Fig. 19 Incising on the Cascajal Block divided into three registers

multiple diadem insignia on crowns worn by figurines and images on monumental sculpture, as on bas-reliefs at Teopanticuantitlan in Guerrero (Martinez Donjuán 1985). As Taube (2000, 2004a:105–121) has noted in detail, these diadem insignia are often represented as incised celts and mirrors. This pattern is found in actual Middle Preclassic celt and mirror offerings at La Venta (Drucker et al. 1959; Taube 2000). There are other examples of emblematic arrangements that emphasize the horizontal alignment, as on the Chalcatzingo Vase. In this case, a torch and a knuckleduster flank a mask. The arrangement is still emblematic in Houston's (2004) terms, as there are concentrically arrayed shark's teeth and vertically stacked elements, including the bundling knots described. In sum, while horizontal linearity is represented in the emblematic arrangement of symbols in the known corpus of Middle Preclassic incised celts and other Olmec portable carvings, vertical linearity is even more represented, and it is vertical linearity that registers in the earliest agreed-upon true writing at the threshold of the Middle and Late Preclassic periods (Coe 1976).

We have suggested that this horizontal order is more closely akin to the incised depictions of the symbols of cosmology and supernatural representations that are found on many Middle Preclassic Period stone Celts. We further propose that the 62 signs can be logically grouped in three horizontal registers (Fig. 20) (see also Fig. 5a). Each of those registers shares six signs (Fig. 21) (see also Fig. 5b). In Register One we find sign 1, 2, 6, 9, 10, and 11. In appearances sign one appears to be an insect, perhaps an ant; sign 2 is a stemmed maize seed or plant, sign six is a bound bundle, sign 9 is a pelt or hide, sign 10 is a closed divinatory bag. and sign 11 is an open divinatory bag. All these visual images are repeated in the other two registers. So in Register Two signs 29, 30, 23, 24, 25, and 27 have their counterparts in register one. Finally in Register Three signs 50, 52, 54, 55, 37, 38, and 39 have their counterparts in both Registers One and Two. It should be noted that signs 52 and 39 in Register Three duplicate each other. It should be noted that Registers One and Three carry explicit maize ear imagery, a point of reference that these Registers share with the bindings and maize ears of the Xoc bundle.

Our proposed grouping of these six signs is also present in the Cascajal signary. In column 2 of the signary there is a list of 6 signs that as we have previously stated reappear three times within the overall of 62 signs. The third entry in this proposed patterning sequence is a sign that can be identified as a pelt and corresponds to Motif 66 *Pelt Worn over Back, 15, 90* contained in "A Dictionary of Olmec Motifs and Symbols" (Joralemon 1971). Within the numbered sequence provided in the Cascajal report this sign corresponds to number 9 in the upper left hand corner of the block, number 27 on the middle right hand edge, and number 54 near the lower left hand corner of the block. Thus numbers 9, 27, and 54 form roughly a triangle whose three points appear to anchor a series of four reoccurring and closely related signs with the three groups (Fig. 22). The positioning of these three groups of signs supports the horizontal reading hypothesis for the Cascajal Block. Furthermore this sequence of "pelt" and its accompanying four signs can also be read (numbers 9 to 27 to 54) in a boustrophedon sequence (Fig. 23), that is highly reminiscent of the post-Classic Mixtec Codices and certain pages of the Borgia Codex (Fig. 24). It also should be noted that our proposed boustrophedon reading is repeated on San

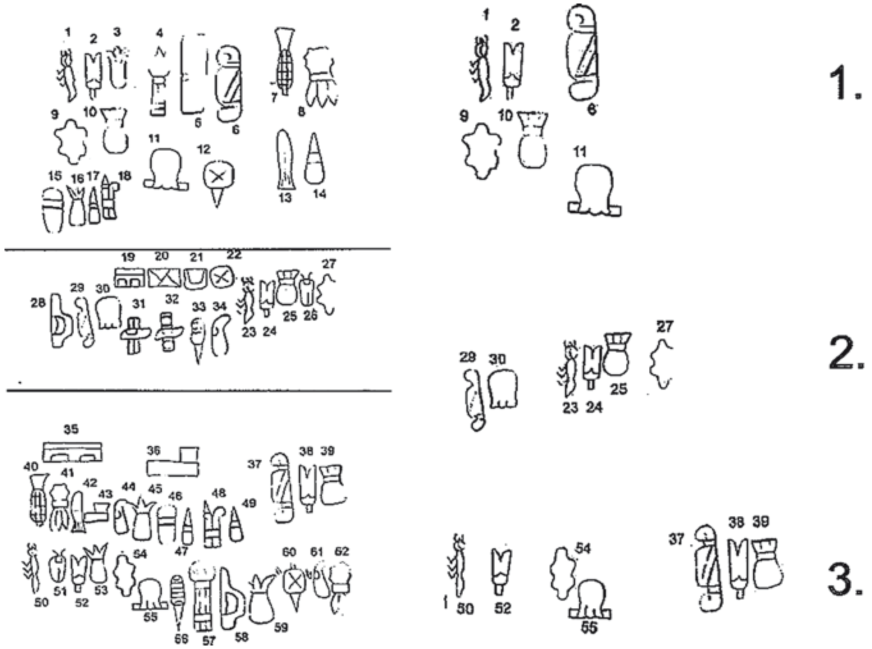

Fig. 20 The six shared symbols and signs in all three registers

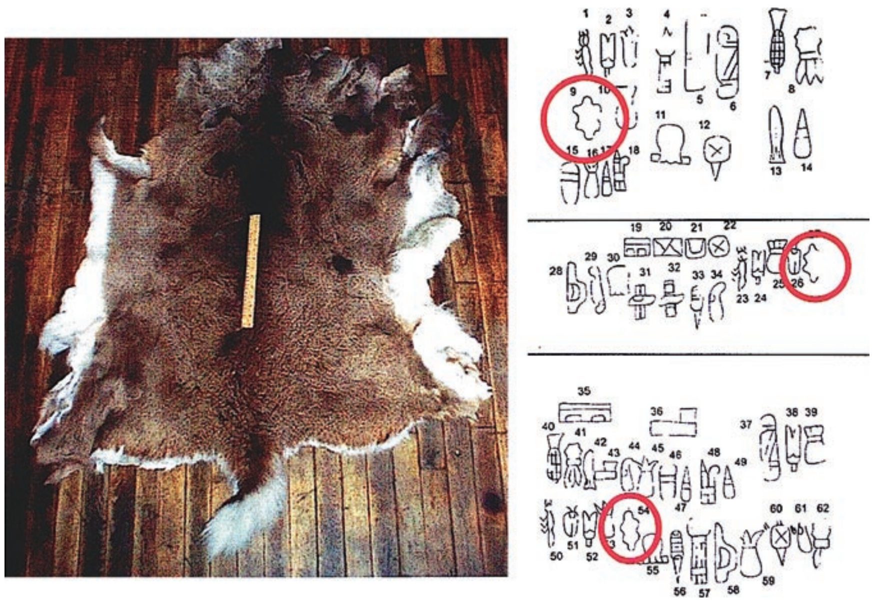

Fig. 21 Three bundle hides on the Cascajal Block

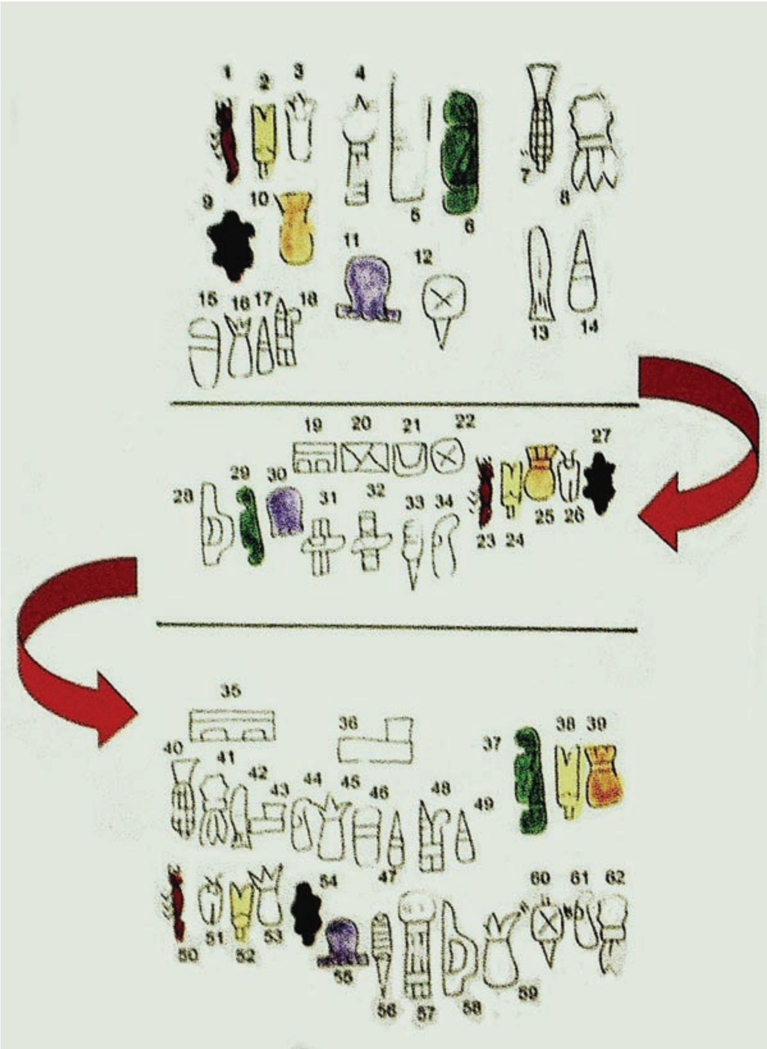

Fig. 22 Using the Pelt as the pivotal element, the incised signs on the Cascajal Block seem to be grouped in a horizontal fashion and should be "read" in a boustrophedon pattern

Lorenzo Monument 8 (Fig. 25) (see also Fig. 7a). This altar/table is specifically designed for the ritual and ordered placement of celts, just as the incised placement of symbols and signs on the Cascajal Block reflect a ritual and ordered placement. Mon 8 has a raised border and six carved depressions that were evidently designed to hold actual celts. The pattern of these celt depressions in groups of two arranged in three registers also appears to repeat the boustrophedon pattern that we have identified on the Cascajal Block (see Fig. 7b).

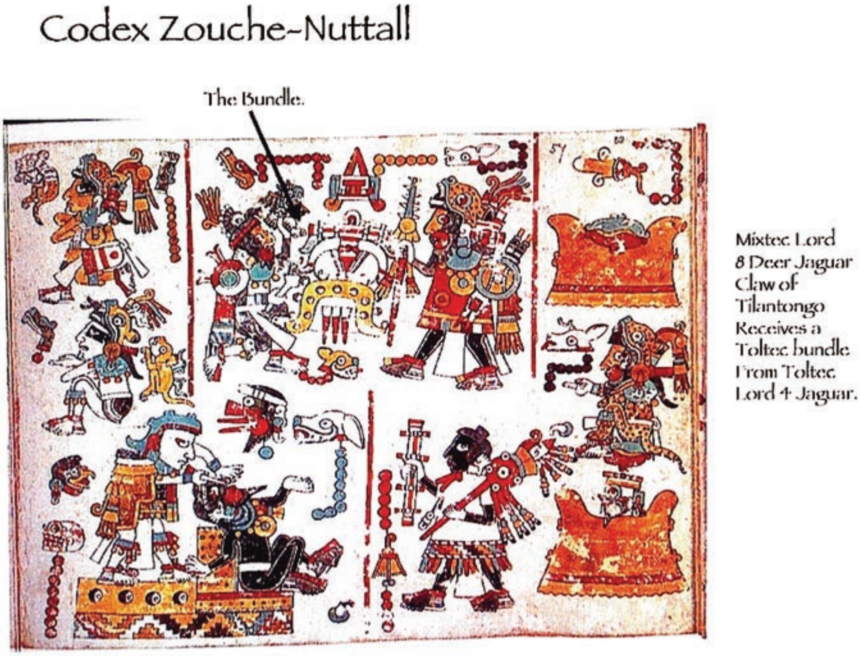

Fig. 23 Codex Zouche-Nuttall

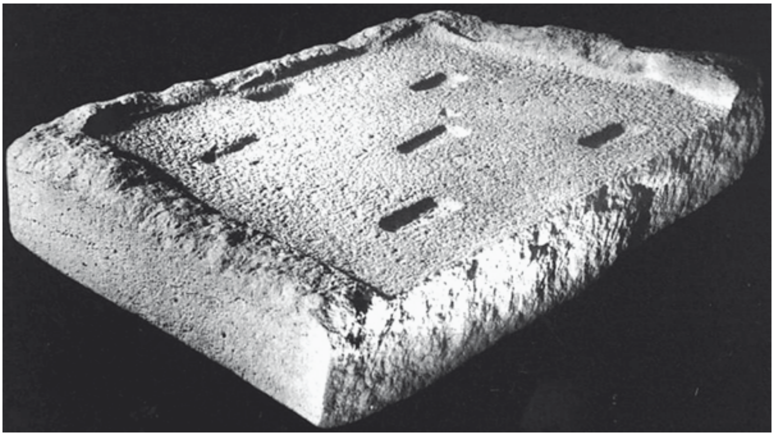

Fig. 24 San Lorenzo, Monument 8

Returning to the Cascajal Block, a close examination of our proposed three registers reveals that surrounding sign 9 is a group consisting of signs 1, 2, 3, and 10. Preceding sign 27 is another group of four signs, Numbers 23, 24, 25, and 26. Finally sign 54 is accompanied by another group of four signs, numbers 50, 51, 52,

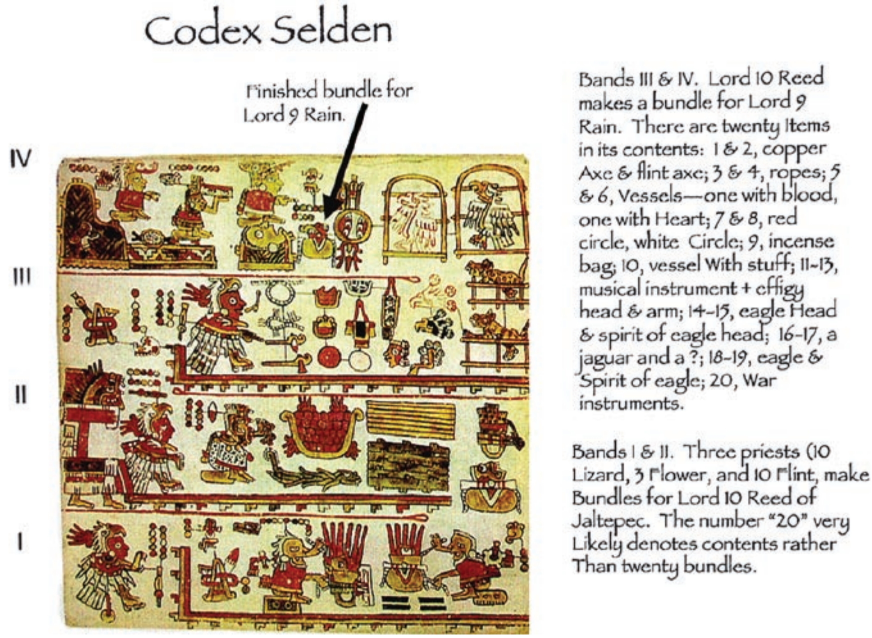

Fig. 25 Codex Selden

and 53. Our proposed grouping of patterned signs is uniform in that all three groupings contain the sign that appears to be an insect (1, 23, and 50). All three groupings carry the cleft maize symbol on a stem (Joralemon 1971, Reilly), numbers 2, 24, and 52. The groupings headed by numbers 9 and 27 contain a sign that appears to be a pouch or bag from which a rectangular trefoil element emerges. The grouping in front of sign 54 contains a sign similar but not identical to signs 10 and 25. This sign, number 53, also appears to be a bag or pouch from which a trefoil emerges. However in the case of sign 53 the trefoil is rendered as the more traditional vegetative motif that Taube has identified as a maize fetish (1992). Sign 53 is repeated three other times, signs 45, 16, and 59. Certainly maize symbolism is not lacking in the overall sign corpus of the Cascajal block. As previously stated, explicit depictions of maize ears appear twice, signs 7 and 40. However, implicit maize ears are rendered as signs 13 and 42. Finally sign 51 is repeated as sigh 26 in the grouping centered on signs 27 and 53. This sign is replaced in the grouping of sign 9 is replaced by sign tree - another sprouting trefoil image that only appears once within the overall composition of the Cascajal imagery. In summary there are three occurrences of a grouping of five signs that appear to be related in some way. The placement of signs 9, 27, and 54 may provide the answer that links each of these groups or patterns of individual signs to the larger body of signs, which are in direct proximity to each of the "pelt" (sign 6) sign groupings.

We suggest that the three animal skins or pelts (signs 9, 27, and 54) correspond to the outer coverings of three ritual bundles. The horizontal arrangement of handheld

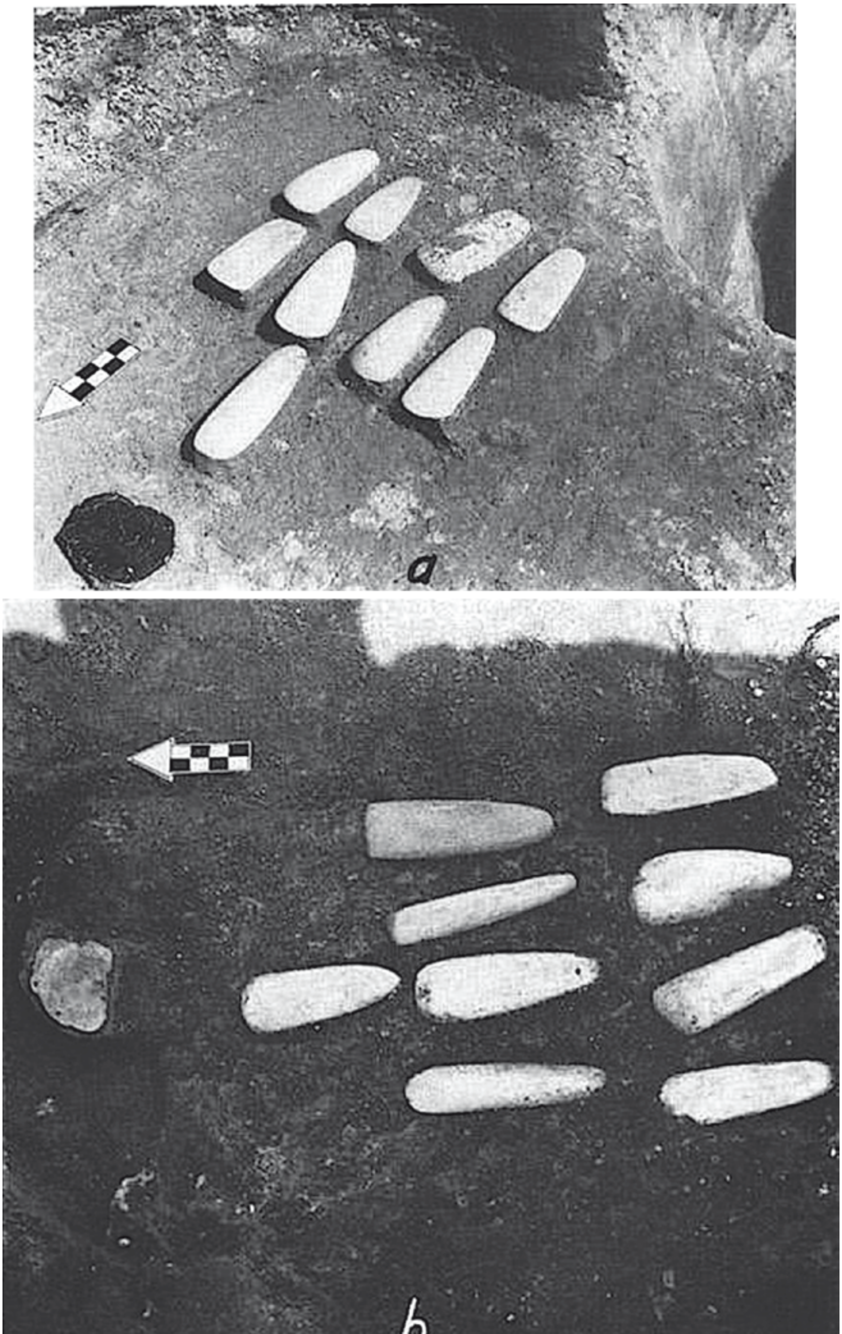

Fig. 26 Offerings of celts, mirrors, magnetite, and ilmenite at La Venta (*arrow* points north) (from Drucker et al. 1959:Plate 42a,b)

objects and maize symbols or ritual objects would then correspond to the orderly arrangement of these bundles' ritual contents. Indeed, we think there is at La Venta an actual sculptured representation of a ruler opening and laying out such objects. The sculpture is Monument 22 (Drucker et al. 1959:Fig. 57, Plate 51a) which depicts a seated personage with his right arm across his chest and his left arm on a table altar. Next to his left arm, and crossing the table, are two ridges that define a shallow horizontal trough or row appropriate for laying out a horizontal set of objects.

Certainly, Robert Williams has identified just such a depiction of an open bundle and its sequentially displayed contents in the much later Mixtec picture book, the Codex Selden (Williams in press) (Fig. 26). On pages 3-III through 3-IV of Codex Selden, an early colonial painted Mixtec manuscript the open bundles contents are shown to be twenty in number and are depicted in a seemingly specific order composed of groupings of two: with 12 objects in the first group and eight in the second. After the contents is a depiction of the bundle toped with the head of a *nuu* or Mixtec supernatural that animates both ritual objects and geographical locations in the Mixtec belief system (citation). Returning to the Cascajal Block, it should be noted that signs 19 and 35 have been suggested as sky symbols because of their gum-bracket markings (Joralemon motif dictionary 1971, motif 24). A perhaps more plausible explanation is that they are representations of the altar/thrones that play such an important part in the Olmec sculptural corpus. These gum-bracket markings can be seen carved on the overhang on Altar 4 at La Venta and Monument Portero Nuevo Monument 2. In these cases the gum-bracket motif serves as an earth band. This identification is clearly seen in a carved relief at San Isidro Piedra Parada, El Salvador where a line of Gum brackets supports a walking or dancing ritual performer. The association of symbols 19 and 35 with the gum-bracket motif and the placement of this same symbol on the overhangs of altar/thrones suggest that signs 19 and 35 may be the mesas or altars on which ritual bundles were displayed. In this instance perhaps the Cascajal block itself!

It has been reported that signs 24 and 25, "suggest the facial markings on some Olmec Celts…" (Rodriguez Martinez et al. 2006:1612). The iconic sourcing for some of the Cascajal signs is further supported by the pairing of signs 21 and 22, the u-bracket and crossed bands motifs. These signs certainly appear as eyes on several Olmec sculptures, but in each case the subjects of these sculptural images possess a supernatural identity or they depict ritual performers who have taken on a supernatural identity. It could also be that each of these paired groups of facial markings are *pars-pro-toto* representations of either a full-figured image incised on a celt or an actual three-dimensional statue or statuette of which there are many examples.

We further suggest that the incised imagery on the Cascajal Block is in fact visualization as well as a record of bundles and ritual objects that would be displayed for a specific Olmec ritual activity. Remarkably, to this day, many traditional ritual practitioners continue to display sacred objects in sequences that are highly reminiscent of the patterns displayed on the Cascajal block. Frank Lipp in his study of the Mixe of Oaxaca (1990) records that Mixe shamans maintain the numerical sequences and designs, i.e., the layout of ritual objects in notebooks (2007:112–116). Lipp (1990:112) further states that, "*Although Mixe shamans are* *well versed in the prayers and orations for ritual performances, the numerical sequences, design plan, and paraphernalia necessary for each specific ritual are maintained in notebooks. … In these notebooks each ritual is set forth, giving its purpose or function, the appropriate calendar days, the numerical sequences, and the requisite paraphernalia needed for the ritual to be properly performed.*"

We believe that the pelt sign groupings are, in effect, ritual bundles that are opened or unwrapped in order to display their contents. The other signs are best understood as ritual objects that would be used in the ritual sequence. This interpretation is supported when one takes into consideration how many of the signs are repeated for each grouping, as well as the fact that the majority of those signs function as hand-held objects in the Olmec sculptural corpus (Celts signs 15 and 46) or they are explicit objects (maize ear signs 7 and 40) associated with vegetative fecundity (Ortiz et al. 2007). Finally, many of the Cascajal signs are depictions of objects with specific ritual functions such as perforators (signs 12, 33, 56, and 60) and maize fetishes (signs 4 and 57).

The authors of the original introductory article describing the Cascajal Block discovery declare that far from being a "shamanic" system of symbols that is an isolate with no known successor, the signs on the Cascajal block are in fact the precursor to the later Mesoamerican hieroglyphic scripts (Rodriguez Martinez et al. 2006:1613). Certainly, there is much about the Cascajal block that suggests this ancestral role. However, it is also equally clear that the Cascajal Block pattern indeed does fall directly into the system of the recording, counting, and mnemonic functions of shamanic ritual performance that endured through the Pre-Columbian era and is alive and well in many areas of the Americas today.

Following our arguments, the Cascajal Block may very well be a permanent record of a ritual performance in which three bundles were depicted as open and their contents laid out in a specific and orderly fashion just as a Roman Catholic, Orthodox, or Anglican priest lays out the chalice, paten, and monstrance in an orderly or predictable pattern on a church altar today. It should also be noted that many of the celt caches at La Venta are laid out in such similar and orderly patterns. Frank Lipp has pointed out the contemporary Western Mixe of highland Oaxaca conduct rituals in which as many as forty bundles are laid out in an orderly fashion! Thus the function of the Cascajal block is to preserve this specific bundle ceremony in the permanent medium of an incised stone so that the hoped-for results of this ancient ceremony will be permanent and ongoing. Undoubtedly the Cascajal Block reflects an ideology and political economy based on access to ancestors and the ritual timing of planting and harvesting that was indispensable to the Olmec heartland and all later Mesoamerican social and political order.

Rulers, Trees, and Bundles

The Olmec, from the San Lorenzo fluorescence through the apogee of La Venta, displayed a strong interest in the deliberate spatial arrangement of sacred objects large and small. We have already made our case that the celts, from the time of the

Early Preclassic caches at El Manati southeast of San Lorenzo (Ortiz and Rodriguez 2000) to their regional proliferation in later Preclassic times, were treasure, wealth, and currency tokens. At La Venta, Drucker and Heizer recorded spectacular offerings of celts, mirrors, figurines, and other artifacts all very carefully arranged. These offerings were dwarfed by the massive offerings of serpentine blocks very similar in shape and dimensions to the Cascajal Block. These offerings are, in our view, the "Fort Knox" material expression of the economic power of rulers backing the value of greenstone currency tokens in the regional Middle Preclassic economy. The alignments of the celts in offerings at La Venta emphasize the horizontal over the vertical, if the long axis of the celts determines observer's perspective. Indeed, the celts are laid out in sets of varying number horizontally, much like the symbols on the Cascajal Block. While most of the celts are plain, several are incised, increasing the resemblance to the symbols on the Cascajal Block. There are also differences between the La Venta caches and the Cascajal Block: aggregate sets of horizontally placed celts are sometimes arranged into cross shaped patterns. This is the world tree-*axis mundi*; we return to this pattern momentarily. What is clear is that the Cascajal Block symbols are not unique when viewed as a tableau of objects, but rather they are an expression of a well-documented Olmec ritual propensity that includes significant horizontal alignments.

The cruciform celt and mirror caches deposited at La Venta (Fig. 27) mark a signature Middle Preclassic Olmec pattern (Taube 2000) that resonates with the

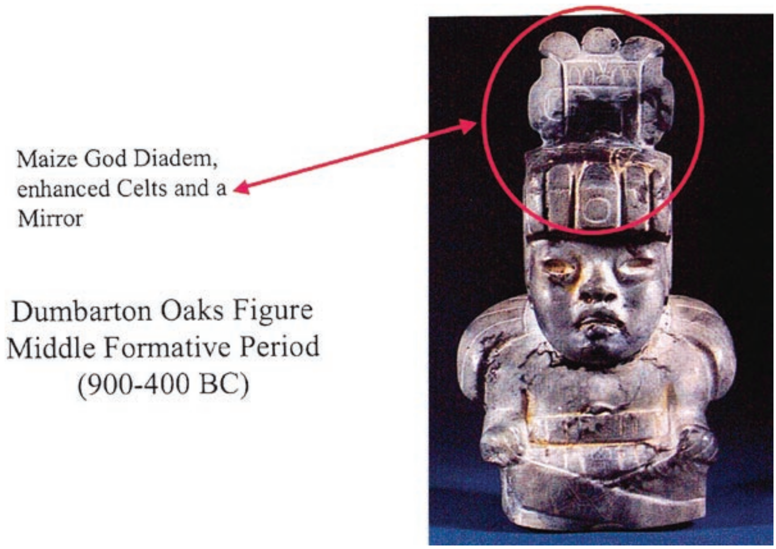

Fig. 27 Dumbarton Oaks Figure, Middle Formative Period (900–400 BC). Olmec kings were cosmic agents. Their regalia was a metaphor for the Maize God as well as the cosmic realm in which he functioned

equally amazing celt offerings at La Merced (Rodriguez and Ortiz 2000) and which are presaged by the remarkable Early Preclassic caches at El Manatí (Ponciano Ortiz and Rodriguez 2000). So when Estrada-Belli and his colleagues recently discovered a Preclassic cruciform cache at the site of Cival in northeastern Petén, Guatemala (Bauer 2006), they confidently interpreted its presence as evidence of Olmec legacy and symbolism. Bauer (2006) observes that the Cival cache is a k'an cross, or Greek cross, pattern. The k'an cross and the related quatrefoil aperture represented a portal between the Otherworld and the world of the living already in Middle Preclassic Olmec art, and they continue to do so thereafter in southeastern Mesoamerican civilizations. On top of the elaborate concentric arrangement of materials, Bauer discovered a large posthole suitable for raising a symbolic tree. Taube (2004) following Michael Coe (1972) and building on the work of Schele (1996) and others interprets the cruciform caches at La Venta as representative of the World Tree, the *axis mundi*, and notes that Middle Preclassic Olmec rulers displayed celts and mirrors in their crowns to signal that they were embodiments of the World Tree. We would argue that these rulers were carefully underscoring the value link between their royal "treasure," no doubt inalienable property, and the currency tokens their markets used. Rulers in the subsequent complex societies of southeastern Mesoamerica sustained and elaborated this identification with the World Tree and *axis mundi* (Freidel et al. 1993). In this way, the La Venta caches in question represented the body and being of the rulers who commissioned them, laid out as treasure, wealth, currency, in patterns representing royal prophecy.

The Middle Preclassic cruciform tableaux of objects in cached offerings provide an important clue to the basic significance of vertical and horizontal alignments. Drucker et al. (1959) argued that even the most explicitly tomb-like deposition of artifacts at La Venta, that in Tomb B's sandstone sarcophagus, comprised cenotaphic representations and not adornments on an actual body. Cached offerings in the northeastern platform of Group A at La Venta were also cenotaphic assemblages of royal jewels. We suggest that the Olmec read the vertical axis generally as representative of a person and that person's actions, while they read the horizontal axis as what the person was carrying, particularly in the arms or in the hands, and also as bound onto the person, particularly on the brow. Together, the vertical and the horizontal formed the *axis mundi*, the complete performing person of the ruler.

In our review of the objects related to symbols on the Cascajal Block, we make reference to them held, cradled, or displayed as diadems bound onto the head. Taube (2004) has made explicit the relationships between the Olmec crown containing celts and mirrors and the cached offerings of actual celts and mirrors (Fig. 27). It is, in our view, significant that the crown worn by later Maya rulers, in its simplest form, was a band of cotton that represented the bundling of the ruler in majesty through the display of the objects that defined majesty, normally sewn onto the bundle wrappings placed on the ruler (Schele et al. 1990). The Maya diadem jewels were objects normally bundled and revealed when tied onto the brow of the ruler. Indeed, the Panels of the Cross and Foliated Cross at Palenque explicitly depict the gods of majesty, Huunal and K'awiil, worn on the brow and wielded in the hand, revealed on their bundle wrappings before the accession of king Kan Bahlam II (Schele and Miller 1983; Schele 1983). The many ceremonial bars displayed by Maya rulers horizontally are, in most cases, bundles containing relics of ancestors and talisman of gods (Freidel and Guenter 2006; Schele and Grube 1992; Schele and Mathews 1998). We think the same reasoning holds for the Olmec, and that what is displayed in the horizontal plane on ruler's bodies, or carried by them, constitutes sacred objects that were normally bundled. The celts in La Venta caches are generally deposited in horizontal sets, reading the long axes of the celts as the orientation of the observer. The horizontal alignment of these and other objects in caches at La Venta signal, in our hypothesis concerning Olmec emblematic reading protocols, their primary meaning as sacred bundle contents.

In addition to reading the vertical order as the person and the horizontal order as containing the objects activated and wielded by the person, the Olmec and later Mesoamericans read the concentric arrangement of materials and people as a fixing of space and opening of the path between the natural and supernatural realms (Reilly 1996a). Olmec performance of this "centering" (Freidel et al. 1993) activity is explicitly displayed on several incised celts thought to be from Rio Pesquero (Reilly 1996a:Figs. 23, 25). The centering is conveyed by the distribution of four celt-shaped objects in four corners around the ruler. These celt symbols sprout seeds from clefts like the rulers themselves, and on one celt they have eyes on them. They are clearly animated. The rulers depicted on these incised celts carry bundles horizontally across their chests. The famous Las Limas figure mentioned earlier (Coe 1976) depicts a seated person with four celt-shaped deity profiles incised on its knees and shoulders signaling that the person is between the heavens and the underworld (Reilly 1996). The person holds a bundle baby that he can open and activate. These examples illustrate that for the Olmec centering was a performance that could involve the display of sacred animate objects and bundles.

Our arguments on emblematic reading protocols for the Olmec and later southeastern Mesoamerican imagery may be summarized as follows: the cruciform arrangement, vertically representing the ruler and horizontally his instruments, and the quincunx arrangement of symbols, representing the establishment of sacred space and the opening of the way between the supernatural and natural worlds are all manifest in the incised and sculpted iconography of the Olmec and in actual objects and facilities. Reading the Cascajal Block with these ideas in mind, we see not a horizontal linear arrangement of glyphs encoding spoken language, but an elaborate display of unbundled sacred objects and symbols that can adorn objects arrayed as Olmec would normally arrange such objects in caches and in ritual performances. Such horizontal arrangement of bundled objects continues to the present day among indigenous Mesoamerican diviners who cast, sort, count, and set out their divining crystals and beads on flat rocks, boards, or tables often the size of the Cascajal Block. What makes the Cascajal Block a crucial key to understanding Olmec thought and practice is that the display of sacred objects has been elaborated in its purely symbolic forms to reveal its vital function of expressing a distinctive pattern to be read, not as encoded speech, but as divined prognostication.

The tableau of symbols on the Cascajal Block does reflect fundamentally on the evolution of writing, for it is no doubt out of casting, counting, arranging, and reading sacred objects that the mathematics of place notation were innovated and perfected in Mesoamerica. True writing as a way of making explicit the meaning of objects and actions was inextricably linked to the sacred performances of rulers and gods. Counting, in the course of the Preclassic, emerged as the basis for prognostication, calendar keeping, and we would argue, record keeping in administered political economies. Both writing and counting, however, emerged in decisively vertical alignment, the expression of the person of the ruler and not of the objects he wielded. The horizontal alignment of sacred objects seen on the Cascajal Block is never lost to the iconographic programs of Mesoamerican civilizations that follow the Olmec. The horizontal array of sacred trees, birds, and sacrifices on the western wall of the Late Preclassic Maya San Bartolo Shrine called Pinturas in Petén, as William et al. (in press) have discerned, constitute a display of sacred objects and beings that echo in the New Year pages of the Dresden codex more than a 1,000 years later. Indeed, the layout of numerous calculation pages in Maya codices displays the horizontality seen in the Cascajal Block, although the writing and mathematical calculations still prioritize the vertical alignment.

Planting the Seeds, Raising the Trees, Celebrating Food

This brief foray into a paradigm of Mesoamerican civilization in which rulers and elites, from the outset, have a real place in the daily lives of ordinary people through the regional administration of currency-based markets providing them with secure food sources must inevitably raise more questions than it answers. We are neither original nor alone in championing this cause. But we feel it is time for those who see the record as we do to stand up and suggest that the old dominant paradigm of Preclassic tribute chiefdom, Classic theocratic tribute state and Postclassic market-based state fails in the face of accumulated data over the last 50 years. The Preclassic polities very likely include states – certainly El Mirador in Petén is a city governing one, and La Venta with its ever-increasing evidence of enormous hinterland population probably headed one as well. The imperishable currency tokens of the Contact Period, particularly those of greenstone, are well established in Middle Preclassic times, or as in the case of red shell tokens, enter the record decisively in the Late Preclassic (Freidel et al. 2002). By the Classic period, the fully literate lowland Maya are counting and inventorying cacao in a manner virtually identical to that witnessed in the Contact Period. This leads Stuart (2006) to declare for currency use in that civilization. It seems highly unlikely that the Classic Maya were alone in Mesoamerica in this practice in light of the intimate interaction with Teotihuacan and that city's strong presence in the cacao growing Soconusco region of Guatemala.

Paradigms stand or fall by their ability to advance understanding of data in hand and predict future patterns in data. Elsewhere, we have argued that the salt trade between Olman and the northern Maya lowlands kicks in to high gear in the Middle Preclassic period and that there are Olmec style kings performing in the city of Yaxuna, Yucatan, in ways paralleling their contemporaries in Olman in that period. That trade would make sense if rulers are administering regional trade in this increasing vital supplement to diets relying on staple maize.

Here we would suggest that the extraordinary cached offerings found in Olman at El Manatí, La Merced, La Venta, to name the scientifically documented offerings are not just read as evidence of popular devotion and the power of rulers to harness that faith among followers. We would read those caches as prophetic declarations by divine rulers memorializing the revealed relationship between power, food, and destiny. We suggest that the remarkable Cascajal Block is an understandable product of this ritual practice. The power of nature was mitigated by the power of people to offset risk of famine through the work of their rulers to coordinate and maintain regional trade and marketing institutions. The relationship between these memorial caches, bundled in the earth, and stone monuments (bundled and revealed) remains intriguingly complicated from the outset (Guernsey 2006), but surely these relationships, between "seeds" and "trees," were converging and strengthening by Middle Preclassic times and flourished subsequently. By the time of true writing public calendar dates provided a precise abbreviated notation for the scheduling of events at places where people gathered, to celebrate, to feast, to trade, to reaffirm and negotiate political alliances (Rice 2007).

The continued practice of burying large quantities of precious imperishable materials that connoted wealth, treasure, and currency throughout the Classic Period, particularly clear to us among the lowland Maya, maintained the proposed link between precious tokens and food. For certainly among the Classic Maya jade represented the material in which the vital force of life could abide and be sustained (Taube 2005). Maya kings were buried poised for resurrection, seeds (Freidel and Guenter 2006) sprouting as trees for the future prosperity of their people as elegantly depicted on the sarcophagus of K'inich Janaab Pakal I at Palenque (Schele and Mathews 1998). Stuart (2006:137) has discerned in reading the texts of Palenque's Temple of the Inscriptions that "in this setting the World Trees are the source for the 'heavenly cargo, the earthly cargo' Jade is, in addition to its worldly importance, the *ikatz* of the cosmos." He identifies these as K'atun trees, trees celebrating the turning of the great calendar cycles. It is clear that at least one of the great World Trees depicted at Palenque, on the Panel of the Foliated Cross, is maize adorned with jades. Stuart carefully provides exegesis for *ikatz*, but the essential connotations are bundle, burden, cargo in the sense of transferred material, and cargo as used widely in Spanish today among indigenous peoples including the Maya to gloss the idea of responsibility and political office. We think the Palenque Maya were sustaining and celebrating the burdens of power institutionalized not very far to the west of their kingdom in the ancient heartland of Olman – food for thought.

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