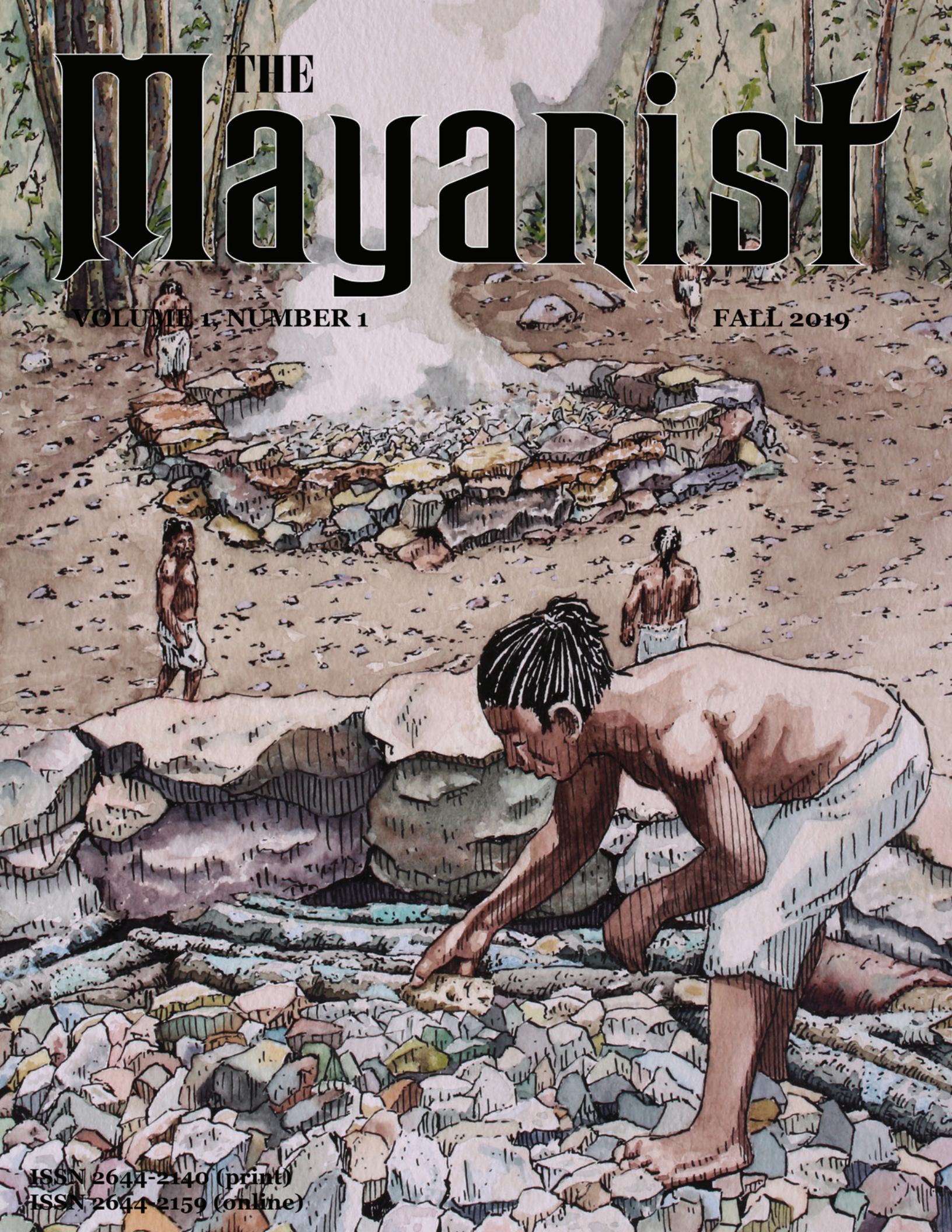


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The Editorial

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We are delighted to bring you the first issue of *The Mayanist*. Number 1 of Volume 1 contains four articles by authors who were also presenters at the 9th annual Maya at the Lago Conference, which was dedicated to the study of Northern Yucatán. *The Mayanist* seeks to somewhat shift the paradigm of academic journals. The landscape of academic archaeology is populated by excellent peer-reviewed journals. There are also many productive conferences and regional meetings dedicated to the archaeology of the Americas – some of which promptly produce editor-reviewed proceedings. Yet, one thing amiss, even within the Mayanist ecosystem, is a peer-reviewed journal aimed at both academics and the broader public. In particular one that is open source, relatively straightforward, and free to publish with.

We should say that *The Mayanist* is rooted in the AFAR philosophy which has fueled the Maya at the Playa/Lago Conferences since 2007. “Playa”, which occurs in September, is at its 13th edition this year, while “Lago”, held in April, will be at its 10th edition in 2020. These events have sought to facilitate a discourse between senior and junior scholars, lifelong learners, and the broader public (with an emphasis on precollegiate students). Our conferences have evolved from a largely Belize-oriented gathering to one seeking to integrate scholars working in the broader Maya world and originating from Belize, Guatemala, Mexico, Canada, the U.S.A., the U.K., and continental Europe. Although the initial intention was not to produce thematical meetings, themes have emerged organically and worked well.

American Foreign Academic Research (AFAR), based at Davidson Day School, has for principal activity its pioneering field school program – bringing dozens of pre-collegiate students to be initiated to field archaeology in Belize, Portugal, Spain, and Greece. Yet, Maya at the Playa/Lago have been the academic and social node for the ever-growing AFAR family. It is important to note

that these fun, atypical, scholarly events are only possible thanks to the faithful participation of groups of erudite, lifelong learner; some of whom produce dedicated newsletters. One of the outcomes of this long collaboration has been a certain feedback; one which is at times critical. The principal criticism that has emerged is that great conference talks and workshops are rarely recorded or published; and when they are, delays can be long.

The Mayanist emerges out of a desire to create a new sort of peer-reviewed journal; one which delivers excellent contributions to the archaeology, epigraphy, ethnohistory, and anthropology of the ancient and modern Mayas. These contributions' quality is attributable to their coherency, conciseness, and to their visual appeal. This journal is not only dedicated to the creation of detailed knowledge, but to that of a literature that is appealing to both specialists and to anyone interested in advancing their knowledge of the Mayas. In addition, we are dedicated to a prompt publication schedule, with a gestation period of six months, from submission to print. We receive submission 2 weeks after each conference and deliver the printed product by the following conference. Each paper is peer-reviewed by three scholars. In addition, we are dedicated to crafting a visually appealing product. This is why we have partnered with Canadian artist Aaron Alfano, who has collaborated personally with each lead author to create the fine watercolors featured in this issue. Finally, we would like to emphasize that *The Mayanist* is open source – and so, free of charge to the authors.

We, the chief and executive editors, recognize that this is a work in progress. Its submission format and review process will likely evolve. Yet, we hope to fill a nice new niche with this journal and to contribute to the advancement of Maya Studies for a long time. We are grateful to this issue's authors who believed in this project. We would also like to thank the people who have supported this endeavor: Joel Skidmore, whose help has been invaluable, our gracefully prompt reviewers, and our talented team of artists, Aaron Alfano, Laura Mueller Woods, and Mike Thomas. We must, of course, also thank our efficient and critical guest editor, Bill Ringle, to whom we now give the floor so that he may adequately contextualize and introduce the first issue of *The Mayanist*.

A Word from our Guest Editor

I first met Mat Saunders about a decade ago, soon after his arrival in Davidson to begin a new career at Davidson Day School. Not content with the success he had enjoyed with the Maya at the Playa conference, he had the audacity to suggest a similar conference could succeed in this small college town. I kept my opinion to myself, which was that its chances were somewhat less than those of the proverbial snowball, and it is a good thing I did. Over the intervening years the conference has grown and prospered, playing host to some of the most prominent, and some of the most promising, Mayanists in the field, all of whom welcome its intimate format and the chance to speak beyond the usual 15 minutes of academic conferences. Mat has continued to be its guiding spirit, in the process assembling a dedicated group of volunteers to help him, and now he and Maxime Lamoureux-St-Hilaire are taking it to the next level with this inaugural number of *The Mayanist*. *The Mayanist* will publish in a timely, visually attractive, and approachable manner a selection of the wonderful talks given annually at the Maya at the Lago conference. We hope the digital format will provide some idea of the intellectual excitement of the meeting to those not able to attend in person.

The Maya at the Lago conference has also been a welcoming forum for scholars in the early stages of their career. In fact, I don't think any other conference (besides the Maya at the Playa) affords younger scholars similar attention and encouragement. This first issue of *The Mayanist* underscores that commitment by featuring authors who have either recently completed their Ph.D.'s or are in the final stages of their graduate careers. The four articles all relate to the archaeology of northern Yucatan, the theme of the 2019 conference. Northern Yucatan comprises a substantial portion of the Maya lowlands and counts many of the most popular tourist destinations among its archaeological sites, sites such as Tulum, Chichen Itza, and Uxmal, but for various reasons it often receives short shrift in general treatments of the ancient Maya. One reason is that it lacks the extensive hieroglyphic record of the southern lowlands. Thanks to the fullness of southern texts, epigraphers are now able to trace the complexities of dynastic politics over several centuries at dozens of sites. In contrast, the limited number of texts in the north mainly mark calendrical period endings and the dedication of structures. The north differed ethnically as well, for an ancestral form of Yucatec Maya predominated in the north, while southern texts are in a language most closely related to historical Cholti and current-day Chorti. Broad regional differences were also expressed in material culture, such as the near absence of brightly decorated polychrome pottery in the north, of the sort that has been so important in shaping our understanding of Maya religion and court life.

The north also differs in terms of its terrain. Geographically it forms the tip of a long peninsula, making it a "world apart" according to some scholars. Much of the north is relatively flat, with the exception of an uplifted wedge, the Puuc hills, that defines the southern limit of the northern lowlands. Rainfall decreases as one moves west and north across the peninsula, so that tall forest yields first to lower deciduous forest and finally to thorny scrub north and west of modern Merida, an area which nevertheless was densely populated in prehispanic times. Conversely, the low elevation of the northern plains meant that the water table was relatively easy to tap, either by means of natural features such as *cenotes* (sinkholes) or via wells. Only in the Puuc was it necessary to build facilities to capture and store rainwater, most notably the famous *chultuns*, cisterns which were excavated into house platforms and were filled by the drainage from their plastered floors.

Yet despite these challenges, and despite several severe demographic upheavals, the ancestors of the present-day Maya of Yucatan persevered and prospered, building a landscape whose beauty and complexity continues to hold us enchanted.

Introducing the Contributions to The Mayanist

Turning now to the contributions to this issue, readers may be surprised to learn that despite countless studies of Maya architecture, we know very little about actual extraction and construction practices. Ken Seligson is at the vanguard of this line of research. Working in the Puuc region, Seligson has been able to make a very strong case that so-called annular structures were in fact prehispanic open-air kilns for the production of lime, a necessary ingredient for mortar-and-rubble construction. In this article, Seligson considers the broader implications these kilns have for understanding ancient management (or mismanagement) of the ecosystem. This is especially pertinent given recent popular treatments arguing that the Maya essentially did themselves in environmentally. Seligson instead advocates reframing the relationship as one of

cultural resilience rather than collapse. After noting Maya achievements in the management of agricultural and water resources, Seligson then situates lime production within broader forest management practices lasting over 700 years in some places. As he notes, this adaptability has very clear implications for our current concerns with climate change.

The research of Parker et al., also based in the Puuc, concerns another aspect of Maya construction practices, in this case the dwellings of those he argues were stone masons. These form part of a hilltop group known as Escalera al Cielo (Stairway to Heaven). This group is composed of several vaulted buildings, and so housed families of relatively high status in addition to the masons' houses. A further point of interest is that this group seems to have been abandoned fairly rapidly at the close of the Classic period. Though the masons' houses were of perishable construction, they were located quite close to these masonry structures, suggesting to Parker et al. that their labor was controlled by these neighboring elites. However, it is first necessary to establish that this was in fact the occupation of the occupants, so the heart of this article is a comparison of previously excavated stoneworking toolkits to those found at Escalera al Cielo. Parker et al. then provide a nuanced discussion of the possible implications of this assemblage for understanding the organization of labor in the Puuc hills.

Research into the northern Maya Preclassic (or Formative) period has been especially prominent in recent years, revealing a time depth and areal extent unknown just a few decades ago. The article by Barry Kidder et al. addresses the close of this period and the transition to the Early Classic period among a network of communities on the northern plains linked by a long causeway, or *sacbe* in Maya. The authors argue that a shift from a more communitarian ethos to one recognizing the privileges of an elite subset can be observed in the changing architectural spaces and exchange patterns of the main site of Ucanha, located to the east of modern Motul. Kidder et al. emphasize that community membership and obligations had to be continually negotiated and take the novel approach of assessing the quality of life of community members. Thus, instead of just attempting to measure household wealth, the authors also look at "capabilities," essentially the ability of households to connect with other households and participate in the larger life of the community. By looking at a variety of measures, from household inventories to construction techniques, to the building of community monuments, the authors demonstrate a promising avenue of research for future projects.

The final article of *The Mayanist*, by Stanley Guenter, addresses a perennial debate in the archaeology of the north: were foreigners, in particular Toltec migrants from Tula, Hidalgo, responsible for the highly unusual art and architecture of Chichen Itza? Iconographic and architectural similarities between the two sites have long been recognized, yet there are significant difficulties in squaring the testimony of native chronicles with the archaeological evidence, especially with regard to chronology. Archaeologists have also pointed out influences at Chichen Itza from elsewhere in Mesoamerica. Nevertheless, Guenter argues the iconographic, sculptural, and architectural similarities between Chichen Itza, Tula, and elsewhere in Central Mexico are too close to have been the result of happenstance or general diffusion. Guenter advances philological, ethnohistorical, and iconographic evidence to argue for the essential truth of native chronicles, including mentions of intrusion and conquest by "Mexicans" in early Spanish texts, and similarities in the late writing systems of Chichen Itza, Tula, and other sites of Central Mexico. This is a huge and vastly complicated topic for such a short contribution, so it will be interesting to see Guenter's future amplifications on this theme.

Prehispanic Maya Burnt Lime Pit-Kilns and Environmental Resource Conservation

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Although the origins of Classic Maya civilization can be traced back millennia, the popular imagination continues to focus on the transitional phase toward the end of the Classic Period colloquially known as the Maya “collapse.” The main objective of this paper is to shift focus to the resilience of Classic Maya society and contribute to the growing spotlight on Prehispanic Maya environmental resource conservation practices. From agricultural terraces (Chase et al. 2011), elaborate reservoir systems (Scarborough et al. 2012), and careful agroforestry practices (Lentz et al. 2018) to burnt-lime pit-kilns (Seligson et al. 2017a), Classic Maya civilization supported massive populations in a challenging tropical forest environment for over 700 years. The development of fuel-efficient pit-kiln technology toward the end of the Classic Period suggests that the inhabitants of the Puuc region of the Northern Maya Lowlands recognized that they were dealing with population-induced environmental stresses, possibly exacerbated by natural climate change. The development and widespread use of this pit-kiln technology is an example of socio-ecological adaptability in the form of communal environmental resource management. This paper evaluates Late and Terminal Classic Period Puuc resource conservation through the lens of resilience theory and argues for the importance of adaptability and a willingness to change in response to climatic or environmental variability – a lesson that is worth heeding by contemporary society.

Keywords: Burnt Lime, Resilience, Conservation, Pyrotechnology, Collapse



The Classic Maya civilization flourished for roughly 700 years (ca. AD 250-950) and was neither uniform nor static over that time span. Although its origins can be traced back millennia, popular imagination continues to focus on a transitional phase often referred to as the Maya “collapse” toward the end of the Classic Period (Figure 1). The main objective of this paper is to shift focus to the *resilience* and longevity of Classic Maya society and contribute to the growing body of work on Prehispanic Maya environmental resource conservation practices. I address this goal by evaluating the development and use of fuel-efficient burnt lime pit-kilns in the Northern Maya Lowlands through the lens of resilience theory (Figure 2).

Archaeologists have long recognized the Maya area as a mosaic of subregional cultural and socio-ecological variation. Examples of Prehispanic Maya environmental resource management practices abound in the scholarly corpus, and the number of such cases has only grown since the start of the LiDAR era. In the public imagination, however, the Prehispanic Maya are still seen as a homogeneous society that likely broke down or “collapsed” due to mismanagement of their environmental resources. Consideration of the potential effects that climate change may have had on Classic Maya society have entered the public mind of late due to concern for the uncomfortable parallels with the present, but the idea that this pre-modern civilization succumbed to the deleterious effects of its own practices (and ignorance) continues to have public appeal. Thus, while a more nuanced view exists within the Mayanist community, a misunderstanding of Maya conservation practices persists in non-academic circles to the disservice not only of the Prehispanic Maya, but also to their descendants living in eastern Mesoamerica today.

Fortunately, it appears that the public’s understanding of the Classic Maya is trending in the direction of greater nuance thanks to increasing public outreach efforts by Mayanists. One of the more useful ways that archaeologists can continue to shift the focus of public fascination away from the idea of “collapse” is by sharing specific smaller-scale examples of pre-modern socio-ecological resilience (Smith and Mohanty 2018:1326). After explaining the importance of shifting focus to resilience from “collapse,” I discuss several lines of archaeological research that have illuminated Classic Maya sustainable ecological practices and resilience. This broader survey sets the stage for a more detailed examination of how burnt lime pit-kilns represent another clear example of Maya resource conservation. I present evidence from a case study of lime production at the mid-sized urban center of Kiuic in the Puuc Region of the Northern Lowlands. The earliest settlement at the site dates back to at least 800 B.C. (Gallareta Negron et al. 2014), but like many other sites in the Puuc, Kiuic’s population and architectural program expanded dramatically during the Late and Terminal Classic Periods. Elite compounds such as *Escalera al Cielo* that included a high frequency of vaulted architecture were constructed on hilltops surrounding the site center. This growth may have strained natural resources. Previous archaeological work has

General Chronology of the Maya Lowlands	
Postclassic Period	ca. 950-1520 AD
Late/Terminal Classic Period	ca. 650-950 AD
Early Classic Period	ca. 250-650 AD
Terminal Preclassic Period	ca. 100 BC - 250 AD
Late Preclassic Period	ca. 400-100 BC
Middle Preclassic Period	ca. 1000-400 BC

Figure 1. A general chronology for the Maya Lowlands.

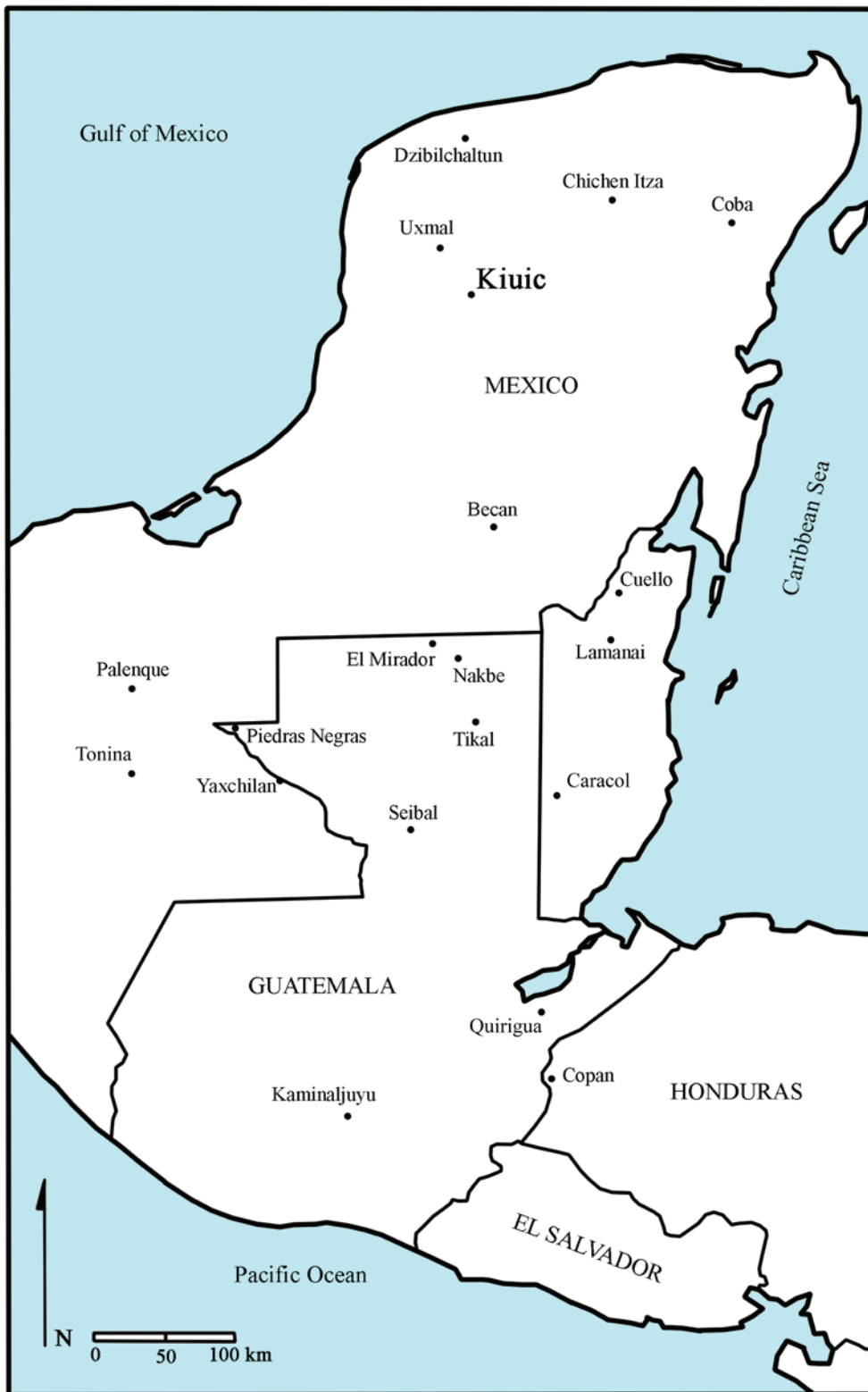


Figure 2. A map of the Maya Lowlands, highlighting the location of Kiuc (adapted from Seligson et al. 2017a).

suggested that the production of burnt lime contributed to environmental degradation. In this paper, I argue that the development of fuel-efficient burnt lime production technology at Kiuic and in the Puuc Region more broadly is an example of communal environmental resource management (see image facing title for burnt lime production episode using pit-kiln).

Shifting the Focus from “Collapse” to Resilience

In order to appreciate the importance of shifting the focus to Classic Maya conservation practices, we must first explore the appeal of studying societal disruption. Fascination with the breakdown or “collapse” of complex societies likely emerged soon after the earliest complex societies broke down. When used in reference to sociopolitical systems, the term ‘collapse’ connotes a degree of suddenness that cultivates curiosity but is often inappropriate for the given set of circumstances (Diamond 2005; McAnany and Yoffee 2010; Middleton 2012; Tainter 1988, 2006). Although there are indeed several examples of rapid sociopolitical fragmentation or transformation in the past, more often, societal breakdowns are more accurately understood as gradual declines. Individuals living through what we might now view as a period of rapid dissolution may never have conceived of their lifetimes as having encompassed such calamitous downward trends. Thus, timescale is an important dimension that must be considered in any discussion of collapse, especially when the focus is on human-environment relationships. It is also important to consider issues of geographic and population scale, as local community-level sociopolitical trends may differ from those of sub-regions or broader cultural areas.

One of the factors likely contributing to our contemporary fascination with ancient societal breakdowns attributed to socio-ecological causes is the superficially comforting idea that we are (or can be) better at managing our resources today (Middleton 2012). We believe that with our molecular-level scientific understanding of nature and advanced technology, we can avoid ecological calamities or fend off climatic disasters that doomed societies past. Even with the blaring warning signs all around us, some of us take comfort in our *potential* to save ourselves. A related notion is that even if we accept the impermanence of our own society, surely our demise will not be as “catastrophic” as societies past. We can look to the past for examples of societal breakdown that will allow us to take solace in our relative success. A final related line of thinking posits that our fascination with smoking gun natural disaster explanations (earthquakes, volcanoes, drastic climatic changes, etc.) for the fall of past societies may stem from a desire to exculpate human agency from societal breakdowns. Thus, almost to hedge our bets, we think that if we cannot or *choose not* to act, it does not matter because “nature” would win in the end anyway.

Although societal stability may not be as attention grabbing as societal collapse, if we can instill an appreciation for the broad time-scale of Classic Maya civilization, it should be awe-inspiring how long such a complex set of interlocking structures was able to survive. For instance, 700 years ago, Europe was reeling from the black plague, the khanates of the Mongol Empire were thriving, and the first *tlatoani* of the Mexica was about to be consecrated. Whether one uses the end of World War II or the Cold War as the benchmark, our current global order is well shy of 100 years old.

One of the factors contributing to the longevity of the Classic Maya system was socio-ecological adaptive capacity, a point to which I will return in the following section. Complex societies are often composed of several sociopolitical factions and socioeconomic groups that differ in

access to wealth, power, and decision-making opportunities (Hornborg 2005). Archaeologists investigate the material record for evidence of compromises between factions (cooperation and/or collective action), imposition of one group's interests on the society as a whole, or a mixture of the two. Oftentimes it is very difficult to distinguish one set of circumstances from another. In strictly hierarchical societies, powerful factions could make decisions relating to human-environmental relations that reflected their own interests at the expense of the community at large (Demeritt 2005; Middleton 2012; Tainter 2006). Compromises between competing factions may lead to short-term solutions that over time lower risk thresholds and weaken the potential resilience of societies faced with sharp environmental or external crises (Butzer 2012). This situation is unfortunately visible today in the hesitancy of contemporary governments to change energy policies in the face of human-induced climate change.

In recent decades, the combination of increased environmental consciousness and decolonization efforts in academia have led to a shift in archaeological studies of socio-ecological relationships toward a focus on sustainability instead of environmental overexploitation and mismanagement (Ford and Nigh 2009; Lentz et al. 2018; McAnany and Yoffee 2010; Scarborough et al. 2012). However, while there are a handful of examples (Erickson 1988; Morrison 2015), we as archaeologists are often unable to take methods and/or technologies from the archaeological record and directly apply them to the modern day. Archaeological studies do however help us better understand the past and recognize what aspects of sociopolitical and ecological systems are adaptable or changeable in order to improve modern policies and practices, rather than conceptualizing current systems as so ingrained that they have immutable 'built-in' impediments (Redman 2005; Redman et al. 2009). Archaeological investigations of sub-regional scale responses to changing human-environment circumstances and their outcomes, such as this current study, contribute to the growing body of data emphasizing the importance of adaptability. Lessons from sunk cost analyses of past societies indicate that no matter how difficult, societies need to find ways to change the underlying principles of socio-ecological relations before they exhaust options for course correction (Fisher and Feinman 2005:65; Janssen et al. 2003). Instead of sating the contemporary public's appetite for cross-temporal *schadenfreude*, we should focus instead on promoting the socio-ecological resilience of the Classic Maya.



Classic Maya Conservation Research

A brief overview of three broad areas of Maya conservation research demonstrates that socio-ecological resilience and proactivity were prominent aspects of Classic Maya societies. The first aspect of the Maya environmental resource conservation concerns agricultural adaptations. Maya communities took several steps to manage their agricultural resources, including using a wide array of terracing methods (Beach et al. 2002:391; Beach et al. 2015; Dunning and Beach 1994) and supplementing milpa fields with house gardens (Ford and Nigh 2009; Lentz et al. 2018). Terracing hillslopes not only increases the scale of food production, but also limits negative effects such as soil erosion and loss of soil nutrients. Terraces represent Maya adaptation to feed growing populations and sustain resources over the course of the Classic Period (Battistel et



Figure 3. Photo of a partially collapsed vault at the site of Kiuic showing the amount of lime mortar that would have been necessary to construct these buildings (photo by author).

al. 2018; Beach 1998; Dunning and Beach 1994). Scholars have begun to abandon early models of a slash-and-burn agriculture (Anderson et al. 2012), and terrace systems dating in some cases as far back as the Preclassic Period have been identified across the Maya lowlands (Arnauld et al. 2013; Beach et al. 2002; Brennan et al. 2013; Dunning et al. 2012; Canuto et al. 2018; Chase et al. 2011; Garrison et al. 2019; Golden et al. 2016; Lamoureux-St-Hilaire et al. 2015; Inomata et al. 2018:32; Neff 2012; Robin 2015; Turner and Sabloff 2012).

Likewise, studies of water management in the Lowlands have demonstrated that the Maya engineered intricate systems to capture and store water. Household-level management systems (Brewer 2018; Chase 2016) were supplemented by larger more elaborate polity-wide projects that likely had some degree of central organization and could better withstand fluctuations in annual rainfall (Ertsen and Wouters 2018). Individual household cisterns, large reservoirs, irrigation systems, and wetland agriculture have all been identified across the lowlands (Brennan et al. 2013; Brewer et al. 2017, 2018; Fedick et al. 2000; Ferrand et al. 2012; Glover 2012; Golden et al. 2016:305; Isendahl 2011; Lucero 2002; Luzzadder-Beach et al. 2016; McAnany 1990; Scarborough et al. 2012; Thompson 1897; Zralka and Kaszkul 2015).

A third component of the Prehispanic Maya conservation program, directly related to lime production, was forest management. Increasingly nuanced understandings of the roles that the Prehispanic Maya played in shaping their tropical forest homes are leading to a greater appreciation for the productivity and ecological balance they were able to maintain. Paleoenvironmental

reconstructions demonstrate that from the time of the earliest settled villages in the Lowlands, the Maya carefully began to modify the natural environment into sustainable “forest gardens” (Ford and Nigh 2009). The Classic Maya anthropogenic ecosystem demonstrably supported large populations by employing not only the agricultural and water management practices mentioned above, but also a mixture of fallow swidden cycles and sophisticated arboricultural practices (Gomez-Pompa 1987; Lentz et al. 2014, 2016, 2018; Luzzadder-Beach et al. 2016; Scarborough et al. 2012; Steinberg 2005).

Prehispanic Maya Burnt Lime Production and Socio-Ecological Resilience

Burnt Lime Production and Conservation

Burnt lime production factors into discussions of Prehispanic Maya resource conservation because of the amount of wood fuel that would have been necessary to produce massive amounts of burnt lime for construction (Figure 3), dietary, and sanitary purposes (Seligson et al. 2017a). Historical accounts of the Maya using large aboveground pyres to produce lime led to hypotheses regarding its role in deforestation as far back as the early 20th century (Hansen et al. 2002; Morris et al. 1931; Schreiner 2002). This technique includes a relatively high ratio of wood fuel to burnt lime and is known as the “traditional” method for Maya lime production due to a lack of evidence suggesting alternative Prehispanic production methods. Although the idea that lime production played a significant role in deforestation and environmental degradation throughout the Lowlands has been successfully challenged (Abrams and Rue 1988; Seligson et al. 2017a; Wernecke 2008), methods of burnt lime production and levels of consumption likely varied by region, site, and time period (Seligson et al. 2018). Regardless of whether lime production would have severely strained fuel resources in the Northern Lowlands, the identification of a distinctive fuel-efficient lime pit-kiln technology in this region suggests that Prehispanic lime producers were indeed concerned with the possibility of dwindling fuel resources.

Recent excavations in the Puuc region and Northwestern coastal plains of the Yucatan Peninsula have uncovered evidence of a Prehispanic pit-kiln technology (Figures 4, 5) that was

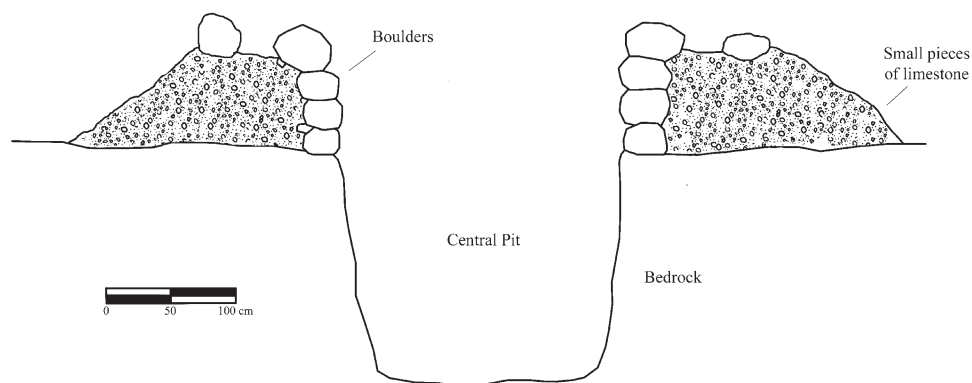


Figure 4. Schematic rendering of a profile cut view of a burnt lime pit-kiln modeled on a pit-kiln excavated at Kiuic (drawing by author).



Figure 5. Photo of a pit-kiln prior to excavation (photo by author).

likely more fuel-efficient than “traditional” aboveground pyres (Ortiz Ruiz et al. 2015; Seligson et al. 2017a. 2017b; Seligson et al. 2018). Pit-kiln use in the Puuc became increasingly common during the Late and Terminal Classic Periods (ca. 650-950 AD) when many sites in the region were experiencing population increases and architectural expansion (Gallareta Negrón et al. 2014; Seligson et al. 2017a). While aboveground pyres produce burnt lime with an average range of 5:1 to 12:1 wood fuel to burnt lime (Gallareta and May 2003; Levy and Hernandez 1995; Morris et al. 1931; Russell and Dahlin 2007; Schreiner 2002;), experimental firing of a model pit-kiln near the site of Kiuic resulted in ratio of 3.94:1 (Figure 6) (Seligson et al. 2017a). The demonstration that the pit-kiln method could provide at least a 20% increase in fuel efficiency over the “traditional” method may explain its widespread adoption in the Puuc and surrounding areas. Lime producers in the region may have recognized the potentially disastrous effects of meeting the growing demand for lime using only aboveground pyres that required significant quantities of wood, a finite resource. Pit-kilns may have been one of a number of alternative experimental techniques with the aim of conserving resources by limiting the amount of wood required to produce the burnt lime used for a variety of purposes.

Ethnographic analogy provides insight into another possible element in this conservation program. Working with local collaborators just outside the Puuc region, Dean Arnold (see Seligson et al. 2017b:573) demonstrated the extent to which contemporary limestone specialists were able to pick out specific types of stone that would maximize the efficiency of lime production. Such esoteric knowledge prevents wasting wood fuel to attempt to calcine grades of limestone that would never transform regardless of how long or hot the fire burned. This specialized understanding

of limestone was likely passed down from generation to generation. Thus, detailed knowledge of raw materials would also have contributed to resource conservation.

Burnt Lime Production and Resilience Theory

Over the last several decades, resilience theory has been adapted by archaeologists to address issues of social complexity (Blanton 2010; Bradtmoller et al. 2017; Redman et al. 2009;). At its most basic, the adaptive cycle at the heart of the socio-ecological resilience model consists of four stages (growth/expansion, conservation/storage, release, and reorganization). The conservation/storage stage is characterized by a measure of stability, while the release stage refers to the breakdown or collapse of the existing system. In this model, resilience is a measure of the adaptive capacity of a given social system to survive unpredictable disruptions (Blanton 2010; Holling 2001:394; Lentz et al. 2018). Fascination with the dynamism of phase changes, mainly from an era of stability to one of disruption or chaos, draws scholars and the public alike in to try to understand the factors involved (Blanton 2010). I, instead, would like to call greater attention to the adaptive mechanisms at play *during* the conservation phase that supported Classic Maya socio-ecological resilience. Although resilience frameworks have been applied to archaeological cultures on the broadest societal scales, there have been relatively few studies applying these



Figure 6. Photo of the experimental pit-kiln soon after the burn began (photo by author).

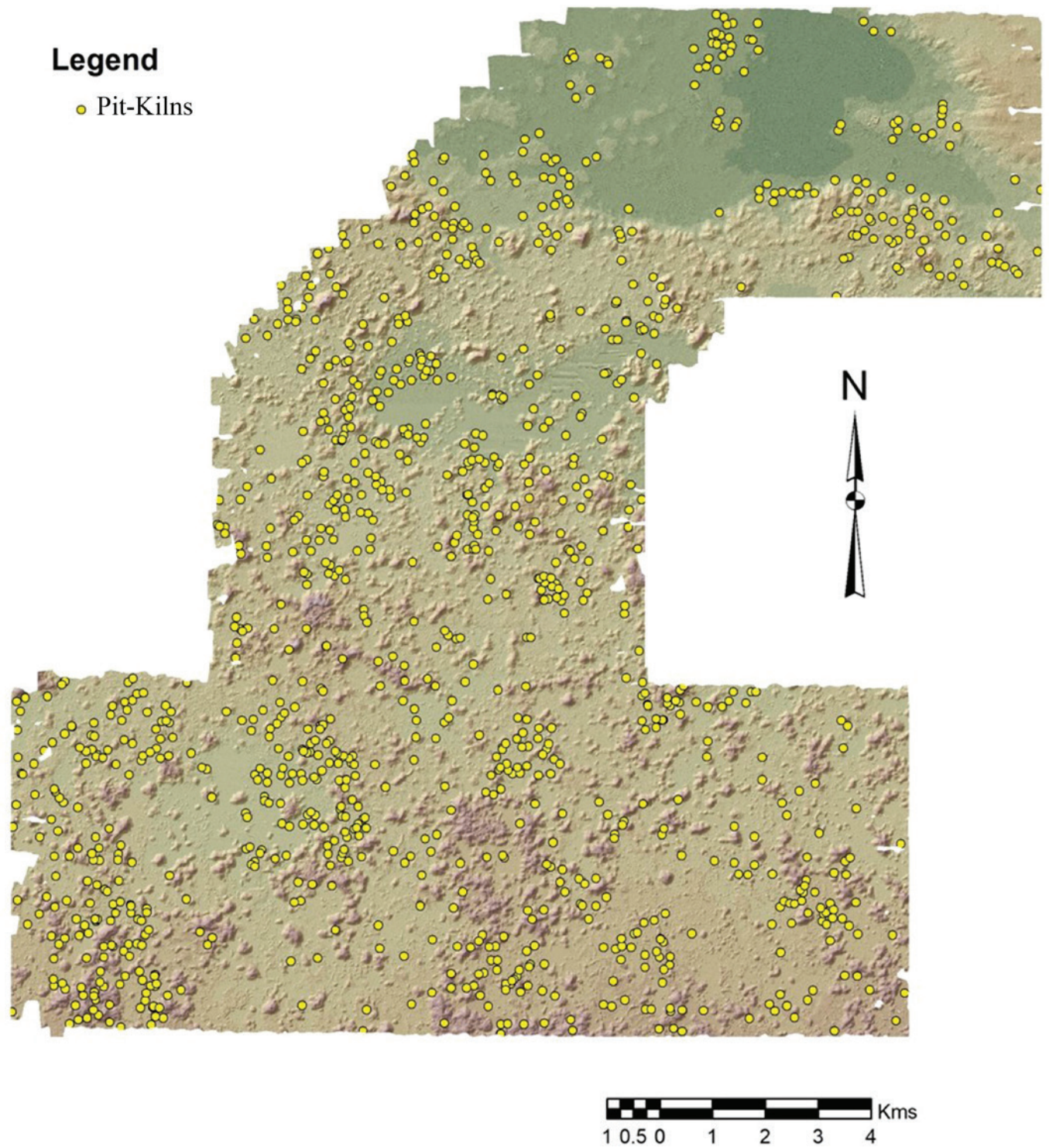


Figure 7. A map of 238-sq-km LiDAR flyover zone of the Eastern Puuc region highlighting the locations of pit-kilns (map credit: William Ringle).

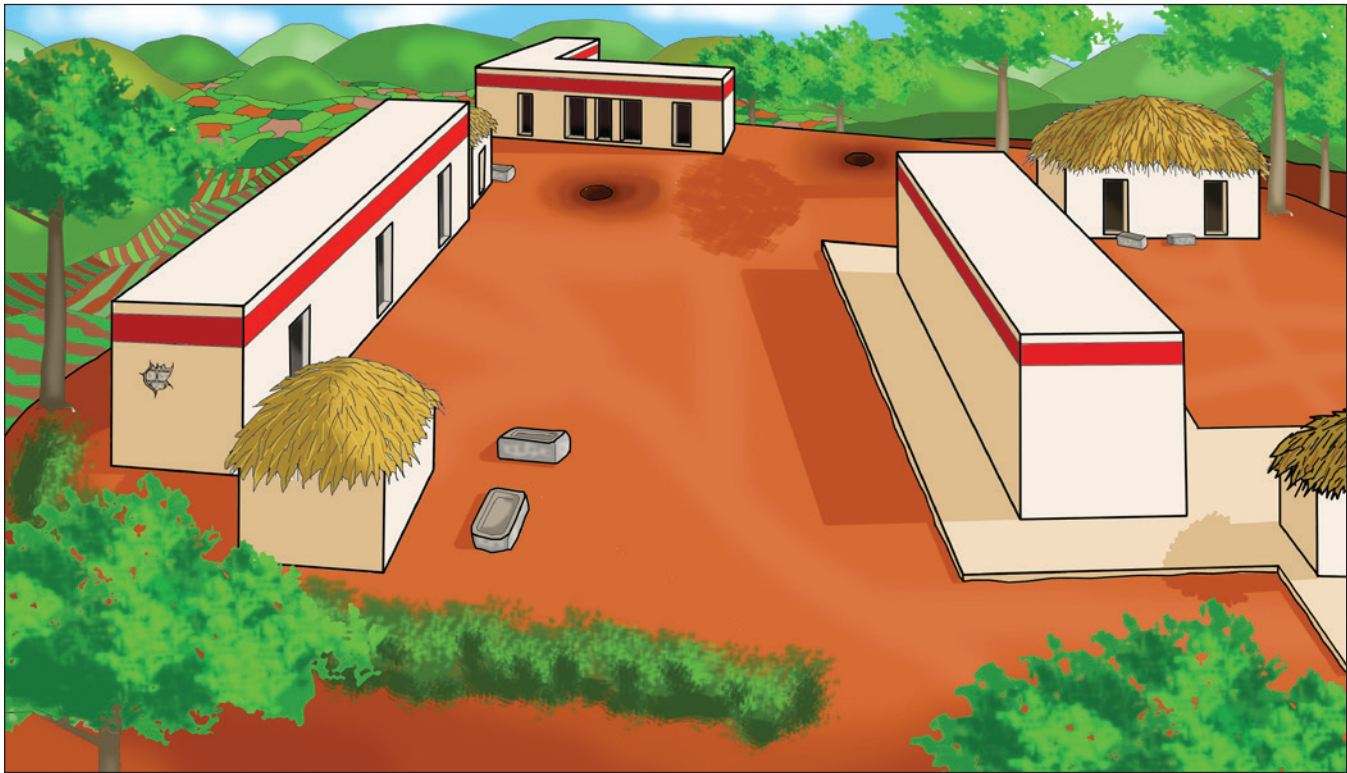


Figure 8. Artistic rendering of the hilltop complex of *Escalera al Cielo* located to the west of the Kiuic site center demonstrating the amount of architectural lime used in this residential group (drawing by author).

models at the site scale of analysis (Bradtmoller et al. 2017).

The development and widespread adoption of lime pit-kiln technology at the site of Kiuic represents an adaptive strategy on the part of the Prehispanic Maya that serves as a lesson in resilience for us today. During the Late and Terminal Classic Periods, Kiuic either transitioned very rapidly from the growth to the conservation phase of an adaptive cycle, or experienced overlapping cycle phases at different social scales. The site was experiencing population growth, which required new and innovative ways of efficiently using and conserving resources in order to maintain a functioning society. The adoption of fuel-efficient pit-kiln technologies during this time is consistent with the idea that Kiuic was experiencing the conservation phase of the adaptive cycle. A broader Lowland Maya adaptive cycle experiencing the release and reorganization phases of its cycle may have exerted external pressures on Kiuic and other Puuc sites, but inhabitants of the region took steps to absorb the shock by conserving wood resources. Significant demographic expansion in the Puuc began in the Late Classic and yet over two hundred years later the Kiuic community was still thriving enough to begin construction on new palace complexes (Gallareta Negrón et al. 2014; Ringle 2005). Additionally, the frequency of vaulted non-royal architecture increased during the Late and Terminal Classic Periods in the Puuc, indicating that communities were thriving. Communal conservation efforts exemplified by, but likely extending beyond, the adoption of the pit-kiln technology would thus appear to have been successful in helping to manage fuel availability and should be seen as a measure of the adaptive flexibility of

the system. Lime production may have actually been somewhat negligible compared with some other fuel needs, such as for ceramic production, tools, construction, and furniture (Farahani et al. 2017:994; Lentz et al. 2018), but a 20% increase in fuel efficiency for any facet of fuel consumption would have contributed to long-term resilience. Additionally, it is quite possible that the more fuel-efficient pit-kilns were used to fire ceramics, though no wasters or other direct lines of production evidence were uncovered. The high levels of potassium and phosphorous identified within the excavated pit-kilns suggests that they may have served other burning function as well, such as trash disposal or fertilizer production, though future studies are needed to confirm all of these possibilities.



One final issue is that of the organizational level of the lime pit-kiln conservation program. Looking beyond Kiuic, Bill Ringle and colleagues (2018) have recently identified over 1,000 pit-kilns in a 238-km² area of the Eastern Puuc region using data gathered from a LiDAR flyover (Figure 5). These numbers indicate that the Eastern Puuc as a whole adopted this technology, which may be viewed as an example of collective action to address environmental stress factors. Although the widespread availability of limestone suggests that it would have been accessible to almost everyone, the greater possibility for wood fuel supply exhaustion would have likely fostered the development of a community-wide mechanism to regulate usage (Carballo et al. 2014). Lentz and colleagues (2018) in their analysis of forest management practices at Tikal hypothesize that there must have been some sort of societal control to protect forest resources, and suggest that a central authority would be the most likely basis for such management.

It is unclear whether the widespread adoption of burnt lime pit-kilns was the result of communal cooperation or a top-down decree, but the community-wide benefits resulting from widespread adoption supports grassroots collective action as a viable scenario. Community members would likely have been eager to adopt a technology that limited the amount of raw materials and labor necessary for production (Figures 7, 8). Within the much smaller communities of the Eastern Puuc, such as Kiuic, it is possible that it would have been that much easier for a central authority to exert control over fuel consumption. However, it is also more likely that in a smaller, closer-knit community, moral codes and neighbor monitoring could have played just as important an incentive to join a program that benefited the broader community (Blanton 2010:43; Houston and Inomata 2009:40-41; Lichbach 1996). Future excavation of additional pit-kilns to refine chronologies regarding their construction and use may help clarify this issue.

Conclusion

Ford and Nigh (2009) have argued that instead of viewing the Classic Maya as steadily building toward socio-ecological disaster or deforestation, we should appreciate Classic resource management practices for the 700-plus year sustainability that they supported in many subregions. From agricultural terraces, elaborate reservoir systems and careful agroforestry practices to burnt-lime pit-kilns, Classic Maya civilization sustained massive populations in a challenging tropical forest environment for over 700 years. The Puuc Maya recognized that they were dealing with population-induced environmental stresses, possibly exacerbated by climatic changes. This

paper is by no means arguing that the Prehispanic Maya had some type of mysterious knowledge of how to live in harmony with their natural environment that has been lost through the ages, nor that they achieved a net zero carbon balance. Instead, the purpose of this case study is to emphasize the importance of adaptability, the willingness to change in response to climatic or environmental variability.

This paper is far from the first to highlight the value to contemporary society of the examination of societal processes on an extremely long time-scale by archaeologists, but I want to close with a specific, feasible way in which our long time-scale approach can help underline the importance of socio-ecological adaptability. We must try to instill an appreciation for the long arc of human actions and effects, a mindfulness that geologist Marcia Bjornerud (2018) has recently referred to as “Timefulness.” While archaeological time is not quite as deep as geological time, there is utility in carefully choosing how we discuss sociopolitical declines and what aspects of pre-modern civilizations we choose to emphasize. We must work to popularize our understandings of pre-modern societal breakdowns as the attenuated declines that they often were. The so-called Classic Maya “collapse” spanned a period of roughly 250 years – for reference, the United States is just shy of its 250th birthday.

We can point to the success of such pre-modern conservation efforts as fuel-efficient pit-kiln technology as proactive examples of long-term planning by societies that lacked modern technology. The Puuc Maya took steps to stave off societal breakdown while other areas of the lowlands were in decline, and even though their system eventually succumbed, their proactivity and recognition of the importance of taking steps to confront future crises can serve as a model for us today. Although we may not see the positive or negative effects of our actions as soon as tomorrow, this should not discourage us from taking collective action now to expand our socio-ecological adaptability in order to prevent future crises.

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References

Abrams, Elliot M, and David J. Rue

1988 The Causes and Consequences of Deforestation among the Prehistoric Maya. *Human Ecology* 16:4:377–395.

Anderson, David S., Blair, Daniel A., and Richard E. Terry

2012 Soil Geochemical Analyses at the Preclassic Site of Xtobo, Yucatan, Mexico. *Ancient Mesoamerica* 23:2:365–377.

Arnauld, M. Charlotte, Michelet, Dominique, and Philippe Nondédéo

2013 Living Together in Río Bec Houses: Coresidence, Rank, and Alliance. *Ancient Mesoamerica* 24:2:469–493.

- Battistel, D., Roman, M., Marchetti, A., Kehrwald, N.M., Radaelli, M., Balliana, E., Toscano, G., and C. Barbante
2018 Anthropogenic impact in the Maya Lowlands of Petén, Guatemala, during the last 5500 years. *Journal of Quaternary Science* 33(2):166–176.
- Beach, Timothy
1998 Soil Constraints on Northwest Yucatán, Mexico: Pedoarchaeology and Maya Subsistence at Chunchucmil. *Geoarchaeology* 13(8):759–791.
- Beach, Timothy, Luzzadder-Beach, Sheryl, Dunning, Nicholas, Hageman, Jon, and Jon Lohse
2002 Upland Agriculture in the Maya Lowlands: Ancient Soil Conservation in Northwestern Belize. *Geographical Review* 92(3):372–397.
- Beach, Tim, Luzzadder-Beach, Sheryl, Cook, Duncan, Dunning, Nicholas, Kennett, Douglas J., Krause, Samantha, Terry, Richard, Trein, Debora, and Fred Valdez
2015 Ancient Maya impacts on the Earth's surface: An Early Anthropocene analog? *Quaternary Science Reviews* 124:1–30.
- Bjornerud, Marcia
2018 *Timefulness: How Thinking Like a Geologist Can Help Save the World*. Princeton University Press, Princeton.
- Blanton, Richard
2010 Collective Action and Adaptive Socioecological Cycles in Premodern States. *Cross-Cultural Research* 44(1):41–59.
- Bradtmoeller, Marcel, Grimm, Sonja, and Julien Riel-Salvatore
2017 Resilience theory in archaeological practice – An annotated review. *Quaternary International* 446:3–16.
- Brennan, Michael L., King, Eleanor M., Shaw, Leslie C., Walling, Stanley L., and Fred Valdez
2013 Preliminary geochemical assessment of limestone resources and stone use at Maya Sites in the Three Rivers Region, Belize. *Journal of Archaeological Science* 40:3178–3192.
- Brewer, Jeffrey L.
2018 Householders as Water Managers: A Comparison of Domestic-Scale Water Management Practices from Two Central Maya Lowland Sites. *Ancient Mesoamerica* 29:197–217.
- Brewer, Jeffrey L., Carr, Christopher, Dunning, Nicholas P., Walker, Debra S., Anaya Hernandez, Armando, Peuramaki-Brown, Meaghan, and Kathryn Reese-Taylor
2017 Employing airborne lidar and archaeological testing to determine the role of small Depressions in water management at the ancient Maya site of Yaxnohcah, Campeche, Mexico. *Journal of Archaeological Science: Reports* 13:291–302.
- Butzer, Karl W.
2012 Collapse, environment, and society. *PNAS* 109:10:3632–3639.
- Canuto, Marcello A., Estrada-Belli, Francisco, Garrison, Thomas G., Houston, Stephen D., Acuña, Mary Jane, Kovac, Milan, Marken, Damien, Nondedeo, Philippe, Auld-Thomas, Luke, Castanet, Cyril, Chatelain, David, Chiriboga, Carlos R., Drapela, Tomas, Lieskovsky, Tibor, Tokovinine, Alexandre, Velasquez, Antolin, Fernandez-Diaz, Juan C., and Ramesh Shrestha
2018 Ancient lowland Maya complexity as revealed by airborne laser scanning of northern Guatemala. *Science* 361:1–17.

- Carballo, David M., Roscoe, Paul, and Gary M. Feinman
2014 Cooperation and Collective Action in the Cultural Evolution of Complex Societies. *Journal of Archaeological Method and Theory* 21:98–133.
- Chase, Adrian S.Z.
2016 Beyond elite control: residential reservoirs at Caracol, Belize. *WIREs Water* 3(6):885–897.
- Chase, Arlen E., Chase, Diane Z., Weishampel, John F., Drake, Jason B., Shrestha, Ramesh L., Slatton, K. Clint, Awe, Jaime J., and William E. Carter
2011 Airborne LiDAR archaeology, and the ancient Maya landscape at Caracol, Belize. *Journal of Archaeological Science* 38:387–398.
- Demeritt, David
2005 Comment. Perspectives on Diamond’s Collapse: How Societies Choose to Fail or Succeed.” *Current Anthropology Forum on Anthropology in Public. Current Anthropology* 46:S5:S92–S94.
- Diamond, Jared
2005 *Collapse: How Societies Choose to Fail or Succeed*. Penguin Books, New York.
- Dunning, Nicholas P., and Timothy Beach
1994 Soil Erosion, Slope Management, and Ancient Terracing in the Maya Lowlands. *Latin American Antiquity* 5(1):51–69.
- Dunning, Nicholas P., Beach, Timothy P., and Sheryl Luzzadder-Beach
2012 Kax and kol: Collapse and resilience in lowland Maya civilization. *PNAS* 109(10): 3652–3657.
- Erickson, Clark L.
1988 Raised Field Agriculture in the Lake Titicaca Basin: Putting Ancient Agriculture Back to Work. *Expedition* 30:3:8–16.
- Ertsen, Maurits W., and Kyra Wouters
2017 The drop that makes a vase overflow: Understanding Maya society through daily Water management *WIREs Water* 5(3):e1281.
- Farahani, Alan, Chiou, Katherine L., Harkey, Anna, Hastorf, Christine A., Lentz, David L., and Payson Sheets
2017 Identifying ‘plantscapes’ at the Classic Maya village of Joya de Cerén, El Salvador. *Antiquity* 91:980–997.
- Fedick, Scott L., Morrison, Bethany A., Juhl Andersen, Bente, Boucher, Sylviane, Ceja Acosta, Jorge, and Jennifer P. Mathews
2000 Wetland Manipulation in the Yalahau Region of the Northern Maya Lowlands. *Journal of Field Archaeology* 27(2):131–152.
- Ferrand, Ezgi Akpınar, Dunning, Nicholas P., Lentz, David L., and John G. Jones
2012 Use of Aguadas as Water Management Sources in Two Southern Maya Lowland Sites. *Ancient Mesoamerica* 23(1):85–101.
- Fisher, Christopher T., and Gary M. Feinman
2005 Introduction to ‘Landscapes over Time’. *American Anthropologist* 107:1:62–69.

- Ford, Anabel, and Ronald Nigh
2009 Origins of the Maya Forest Garden: Maya Resource Management. *Journal of Ethnobiology* 29(2):213–236.
- Garrison, Thomas G., Houston, Stephen, and Omar Alcover Firpi
2019 Recentering the rural: Lidar and articulated landscapes among the Maya. *Journal of Anthropological Archaeology* 53:133–146.
- Gallareta Negrón, Tomás, and Rossana May Ciau
2003 Investigaciones Arqueológicas y Restauración Arquitectónica en Labná, Yucatán, Mexico: La Temporada de Campo de 2002. Merida, Centro Yucatán del INAH.
- Gallareta, Tomas, George J. Bey III, and William Ringle
2014 Investigaciones Arqueológicas en las Ruinas de Kiuic y la zona Labná-Kiuic, Distrito de Bolonchén, Yucatán, México. Informe técnico al Consejo de Arqueología de INAH, Temporada 2013.
- Glover, Jeffery B.
2012 The Yalahau Region: A Study of Ancient Maya Sociopolitical Organization. *Ancient Mesoamerica* 23(2):271–295.
- Golden, Charles, Murtha, Timothy, Cook, Bruce, Shaffer, Derek S., Schroder, Whittaker, Hermitt, Elijah J., Alcover Firpi, Omar, and Andrew K. Scherer
2016 Reanalyzing environmental lidar data for archaeology: Mesoamerican applications And implications. *Journal of Archaeological Science Reports* 9:293–308.
- Gómez-Pompa, Arturo
1987 On Maya Silviculture. *Mexican Studies/Estudios Mexicanos* 3(1):1–17.
- Gunderson, L., and C.S. Holling
2001 *Panarchy: understanding transformations in human and natural systems*. Island Press, Washington, D.C.
- Hansen, Richard, Bozarth, Steven, Jacob, John, Wahl, David, and Thomas Schreiner
2002 Climatic and Environmental Variability in the Rise of Maya Civilization: A Preliminary perspective from northern Peten. *Ancient Mesoamerica* 13(2):273–295.
- Holling, C.S.
2001 Understanding the Complexity of Economic, Ecological, and Social Systems. *Ecosystems* 4(5):390–405.
- Hornborg, Al
2005 Comment. Perspectives on Diamond’s Collapse: How Societies Choose to Fail or Succeed. *Current Anthropology Forum on Anthropology in Public*. *Current Anthropology* 46:S5:S94–S95.
- Houston, Stephen D., and Takeshi Inomata
2009 *The Classic Maya*. Cambridge University Press, Cambridge.
- Inomata, Takeshi, Triadan, Daniela, Pinzon, Flory, Burham, Melissa, Ranchos, Jose Luis, Aoyama, Kazuo, and Tsuyoshi Haraguchi
2018 Archaeological application of airborne LiDAR to examine social changes in the Ceibal region of the Maya lowlands. *PLOS One* 13(2):0191619.

Isendahl, Christian

2011 The Weight of Water: A New Look at Pre-Hispanic Puuc Maya Water Reservoirs. *Ancient Mesoamerica* 22(1):185–197.

Janssen, Marco A., Timothy A. Kohler, and Marten Scheffer

2003 Sunk-Cost Effects and Vulnerability to Collapse in Ancient Societies. *Current Anthropology* 44:5:722–728.

Lamoureux-St-Hilaire, Maxime, Macrae, Scott, McCane, Carmen A., Parker, Evan A., and Gyles Iannone

2015 The Last Groups Standing: Living Abandonment at the Ancient Maya Center of Minanha, Belize. *Latin American Antiquity* 26(4):550–569.

Lentz, David L., Dunning, Nicholas P., Scarborough, Vernon L., Magee, Kevin S., Thompson, Kim M., Weaver, Eric, Carr, Christopher, Terry, Richard E., Islebe, Gerald, Tankersley, Kenneth B., Grazioso Sierra, Liwy, Jones, John G., Buttles, Palma, Valdez, Fred, and Carmen E. Ramos Hernandez

2014 Forests, fields, and the edge of sustainability at the ancient Maya city of Tikal. *PNAS* 111(52):18513–18518.

Lentz, David L., Graham, Elizabeth, Vinaja, Xochitl, Slotten, Venicia, and Rupal Jain

2016 Agroforestry and ritual at the ancient Maya center of Lamanai. *Journal of Archaeological Science: Reports* 8:284–294.

Lentz, David L., Dunning, Nicholas P., Scarborough, Vernon L., and Liwy Grazioso

2018 Imperial resource management at the ancient Maya city of Tikal: A resilience model of sustainability and collapse. *Journal of Anthropological Archaeology* 52:113–122.

Levy Tacher, Samuel, and Efrain Hernandez-Xolocotzi

1995 Aprovechamiento forestal tradicional de los Hubches en Yucatan. In *La milpa en Yucatan: Un sistema de producción agrícola tradicional*. Vol. 1, edited by Efrain Hernandez-Xolocotzi, Eduardo Bello Baltazar, and Samuel Levy Tacher, pp. 247-270. Colegio de Postgraduados, Mexico City.

Lichbach, M.I.

1996 *The cooperator's dilemma*. University of Michigan Press, Ann Arbor.

Lucero, Lisa J.

2002 The Collapse of the Classic Maya: A Case for the Role of Water Control. *American Anthropologist* 104(3):814–826.

Luzzadder-Beach, Sheryl, Beach, Timothy, Hutson, Scott, and Samantha Krause

2016 Sky-earth, lake-sea: climate and water in Maya history and landscape. *Antiquity* 90:426–442.

McAnany, Patricia A.

1990 Water Storage in the Puuc Region of the Northern Maya Lowlands: A Key to Population Estimates and Architectural Variability. In *Precolumbian Population History in the Maya Lowlands*, edited by T.P. Culbert and Don S. Rice, pp. 263-284. University of New Mexico Press, Albuquerque.

McAnany, Patricia A., and Norman Yoffee

2010 *Questioning Collapse: Human Resilience, Ecological Vulnerability, and the Aftermath of Empire*. Cambridge University Press, Cambridge.

Middleton, Guy D.

2012 Nothing Lasts Forever: Environmental Discourses on the Collapse of Past Societies. *Journal of Archaeological Research* 20:257–307.

Morris, E.H., Jean Charlot, and Ann Axtell Morris

1931 *The Temple of the Warriors*. Charles Scribner's Sons, New York.

Morrison, Kathleen D.

2015 Archaeologies of Flow: Water and the landscapes of Southern India past, present, and future. *Journal of Field Archaeology* 40(5):560–580.

Neff, L. Theodore

2012 Late Classic Period Terrace Agriculture in the Lowland Maya Area. In *Ancient Households of the Americas*, edited by John G. Douglass and Nancy Gonlin, pp. 299–321. University of Colorado Press, Fort Collins.

Ortiz Ruiz, Soledad, Goguitchaichvili, Avto, and Juan Morales

2015 Sobre la Edad de Los Hornos de Cal en el Area Maya. *Arqueologia Mexicana* 28:9–15.

Redman, Charles L.

2005 Resilience Theory in Archaeology. *American Anthropologist* 107:1:70–77.

Redman, Charles L., Margaret C. Nelson, and Ann P. Kinzig

2009 The Resilience of Socioecological Landscapes: Lessons from the Hohokam. In *The Archaeology of Environmental Change: Socionatural Legacies of Degradation And Resilience*, edited by C. T. Fisher, J.B. Hill, and G.M. Feinman, pp. 15–39. University of Arizona Press, Tucson.

Ringle, William M.

2005 The 2001 Field Season of the Labna-Kiuc Archaeological Project. Famsi.org.www.famsi.org/reports/00019/index.html.

Ringle, William M, Gallareta Negrón, Tomás, Seligson, Kenneth, and David Vleck

2018 Hidden in the Hills No Longer: LiDAR-aided Survey in the Puuc Region of Yucatan, Mexico. Paper presented at the 83rd Annual Meeting of the Society for American Archaeology, Washington, D.C.

Robin, Cynthia

2015 Of Earth and Stone: The Materiality of Maya Farmers' Everyday Lives at Chan, Belize. *Archaeological Papers of the American Anthropological Association* 26:40–52.

Russell, Bradley, and Bruce Dahlin

2007 Traditional Burnt-Lime Production at Mayapán, Mexico. *Journal of Field Archaeology* 32(4):407–423.

Scarborough, Vernon L., Dunning, Nicholas P., Tankersley, Kenneth B., Carr, Christopher, Weaver, Eric, Grazioso, Liwy, Lane, Brian, Jones, John G., Buttles, Palma, Valdez, Fred, and David L. Lentz

2012 Water and sustainable land use at the ancient tropical city of Tikal, Guatemala. *PNAS* 109(31):12408–12413.

Schreiner, Thomas Paul

2002 Traditional Maya Lime Production: Environmental and Cultural Implications of a Native American Technology. PhD Dissertation, University of California, Berkeley.

Seligson, Kenneth, Gallareta Negrón, Tomás, May Ciau, Rossana, and George J. Bey III

2017a Lime Powder Production in the Maya Puuc Region (A.D. 600–950): An Experimental Pit-Kiln. *Journal of Field Archaeology* 42(2):129–141.

- Seligson, Kenneth E., Gallareta Negrón, Tomás, May Ciau, Rossana, and George J. Bey III
2017b Using Multiple Lines of Evidence to Identify Prehispanic Maya Burnt-Lime Kilns in The Northern Yucatan Peninsula. *Latin American Antiquity* 28(4):558–576.
- Seligson, Kenneth E., Ortiz Ruiz, Soledad, and Luis Barba Pingarrón
2018 Prehispanic Maya Burnt Lime Industries: Previous Studies and Future Directions. *Ancient Mesoamerica* June 2018:1-21.
- Smith, Monica L., and Rabindra Kumar Mohanty
2018 Monsoons, rice production, and urban growth: The microscale management of ‘too much’ water. *The Holocene* 28(8):1325–1333.
- Steinberg, Michael K.
2005 Mahogany (*Swietenia macrophylla*) in the Maya Lowlands: Implications for Past Land Use and Environmental Change? *Journal of Latin American Geography* 4(1):127– 134.
- Tainter, Joseph A.
1988 *The Collapse of Complex Societies*. Cambridge University Press, Cambridge.
2006 Archaeology of Overshoot and Collapse. *Annual Review of Anthropology* 35:59–74.
- Thompson, Edward H.
1897 *Los Chultunes of Labná, Yucatan*. Memoirs of the Peabody Museum of American Archaeology and Ethnology, Vol. 1, No. 3. Harvard University, Cambridge.
- Turner, B.L., and Jeremy A. Sabloff
2012 Classic Period collapse of the Central Maya Lowlands: Insights about human-Environment relationships for sustainability. *PNAS* 109(35):13908–13914.
- Wernecke, David C.
2008 A Burning Question: Maya Lime Technology and the Maya Forest. *Journal of Ethnobiology* 28:2:200–210.
- Zralka, Jaroslaw, and Wieslaw Koszkuł
2015 Archaeological evidence for ancient Maya water management: the case of Nakum, Petén, Guatemala. *Antiquity* 89:397–416.

Organization of Masonry Technology in the Eastern Puuc: Evidence from Escalera al Cielo, Yucatán

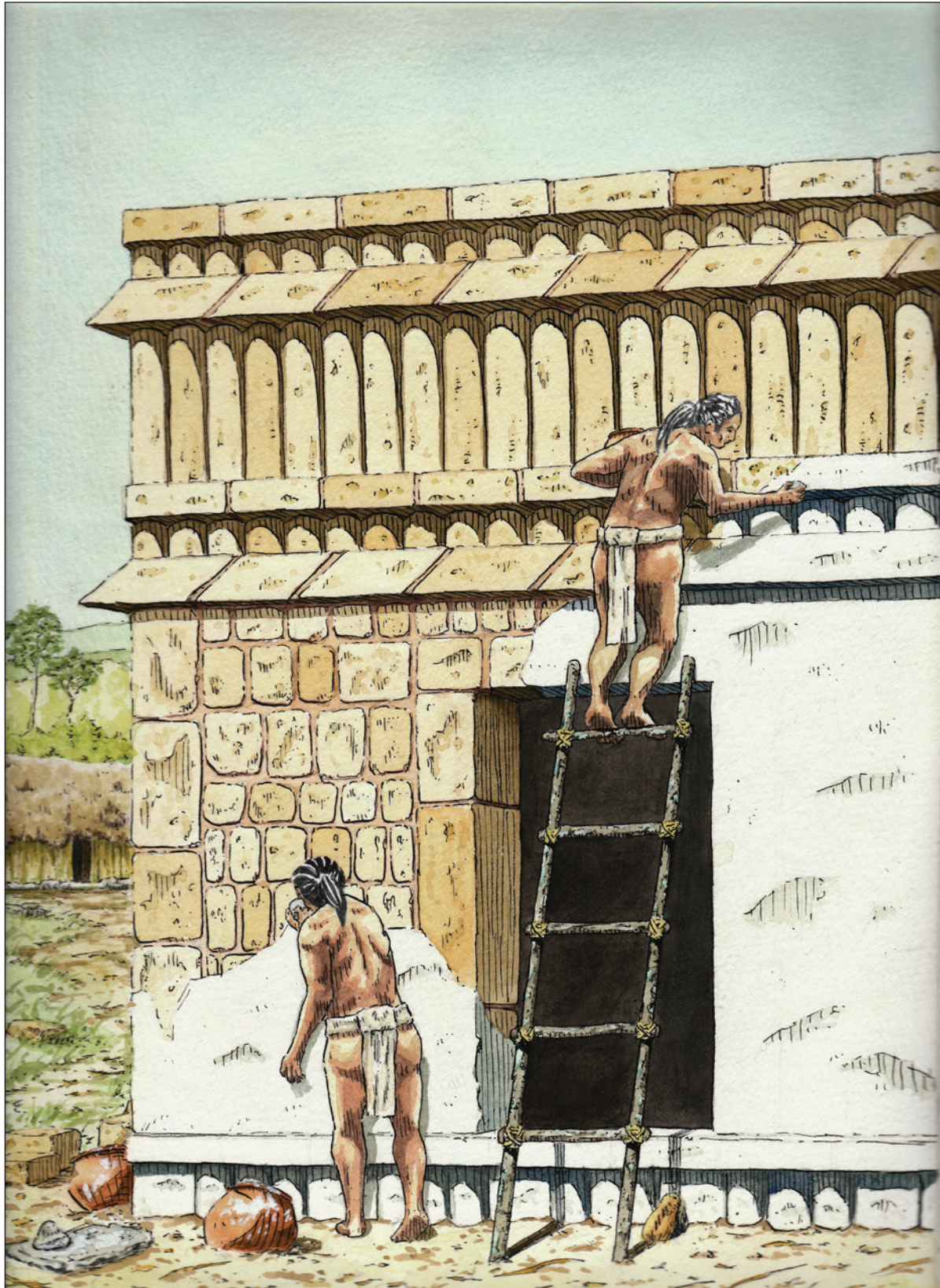
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Vaulted masonry buildings in the Puuc region of Yucatán have been studied from technological perspectives and from their socio-economic organization. They functioned not only as palaces, residences, and council houses, but were the principal material repositories for wealth in the Puuc, leading to their proliferation across the landscape. While it is crucial to understand the significance of these buildings for the Maya of the Puuc, it is also important to consider the methods of construction and maintenance of these buildings along with the technological organization of masonry activities. In this article, we explore the organization of masonry technology via the analysis of a set of masons' tools from a suburban hilltop complex on the periphery of the Eastern Puuc site of Kiuic. The masons residing at this hilltop complex were attached specialists who produced goods and performed services for high status elites. This suggests that elites actively managed and controlled sources of building materials, but more importantly, they exerted considerable influence over the labor force that built these monumental constructions. The persistent construction of masonry buildings over several centuries suggests elite kin groups maintained affiliative ties with masonry craft specialists across generations, and these affiliative ties played a prominent role in the major expansion of Puuc economies and populations during the Terminal Classic period.

Keywords: Lithic technology, Puuc region, craft specialization, intermediate elites, Terminal Classic period



Many of the most elaborate and well-constructed stone buildings in the ancient Maya world are in the Puuc region of Yucatán, México. Abundant sources of limestone, proper ingredients for manufacturing high-strength cements, and a mode of socio-economic organization that incentivized the deposition of wealth into stone buildings led to the proliferation of vaulted masonry architecture across Puuc landscapes. In lieu of interring wealth into sizeable jade assemblages, complex hieroglyphic inscriptions on stone, or the production of polychrome pottery, the Maya of the Puuc region instead channeled their wealth into constructing vaulted masonry buildings that served multiple functions. These included palaces, council houses (*popol nahs*), temples, and residential buildings.

Vaulted masonry buildings in the Puuc have been studied from multiple thematic, methodological, and theoretical perspectives. The most common approaches are focused on the organization of technology, such as examining methods of construction and material composition (e.g. Abrams 1994). Thousands of pit-kilns used to produce hydrated lime as a base for creating mortar for masonry construction and plaster for surfacing buildings and floors have been documented across the Eastern Puuc region (Ringle et al. in press; Seligson et al. 2018). Elite households galvanized power via control of preferred sources of stone, and the quality of limestone utilized in building materials was a direct reflection of social hierarchy and accumulated capital (Carman et al. 2011:155).

These buildings were also the most important and recognizable repositories of wealth in the Puuc region. Due to constraints on the accumulation of surplus staples, a lack of evidence for non-perishable commodities, and a much higher ratio of masonry-to-perishable architecture than elsewhere in the Maya lowlands (Ringle 2019), the Maya of the Puuc began to find new, visible, and permanent expressions of accumulated wealth. Vaulted masonry architecture fulfills that need, and also facilitates the intergenerational transmission of wealth, as older buildings can be inherited, and new buildings can be constructed for branching kin lines (Gallareta Negrón and Bey III 2012; Gallareta Negrón 2013:339).

While it is crucial to understand the significance of these buildings for the Maya of the Puuc, it is also important to consider the methods of construction and maintenance of these buildings along with the technological organization of masonry activities. In this article, we explore the organization of masonry technology via the analysis of a set of masons' tools from a suburban hilltop complex on the periphery of the Eastern Puuc site of Kiuic (Figure 1). The masons residing at this hilltop complex were attached specialists who produced goods and performed services for high status non-royal elites. This suggests that elites actively managed and controlled sources of building materials, but more importantly, they controlled the labor involved in the construction of masonry architecture (Brumfiel and Earle 1987; Costin 1991:7, 1998:5, 2016; Horowitz 2017; Janusek 1999:109). The increasing investiture of power and wealth into stone buildings in the Puuc also necessitated the attachment of these specialists to elite households.

Masonry Tool-Kits and Residences among the Lowland Maya

Despite the prevalence of masonry buildings across the Maya Lowlands, few mason toolkits have been identified or published. What types of tools actually characterized a toolkit for an ancient Maya mason? Eaton (1991) offers a summary of the full range of tools in masons' kits, but it is worth examining those non-perishable tools made of stone that are typically found in

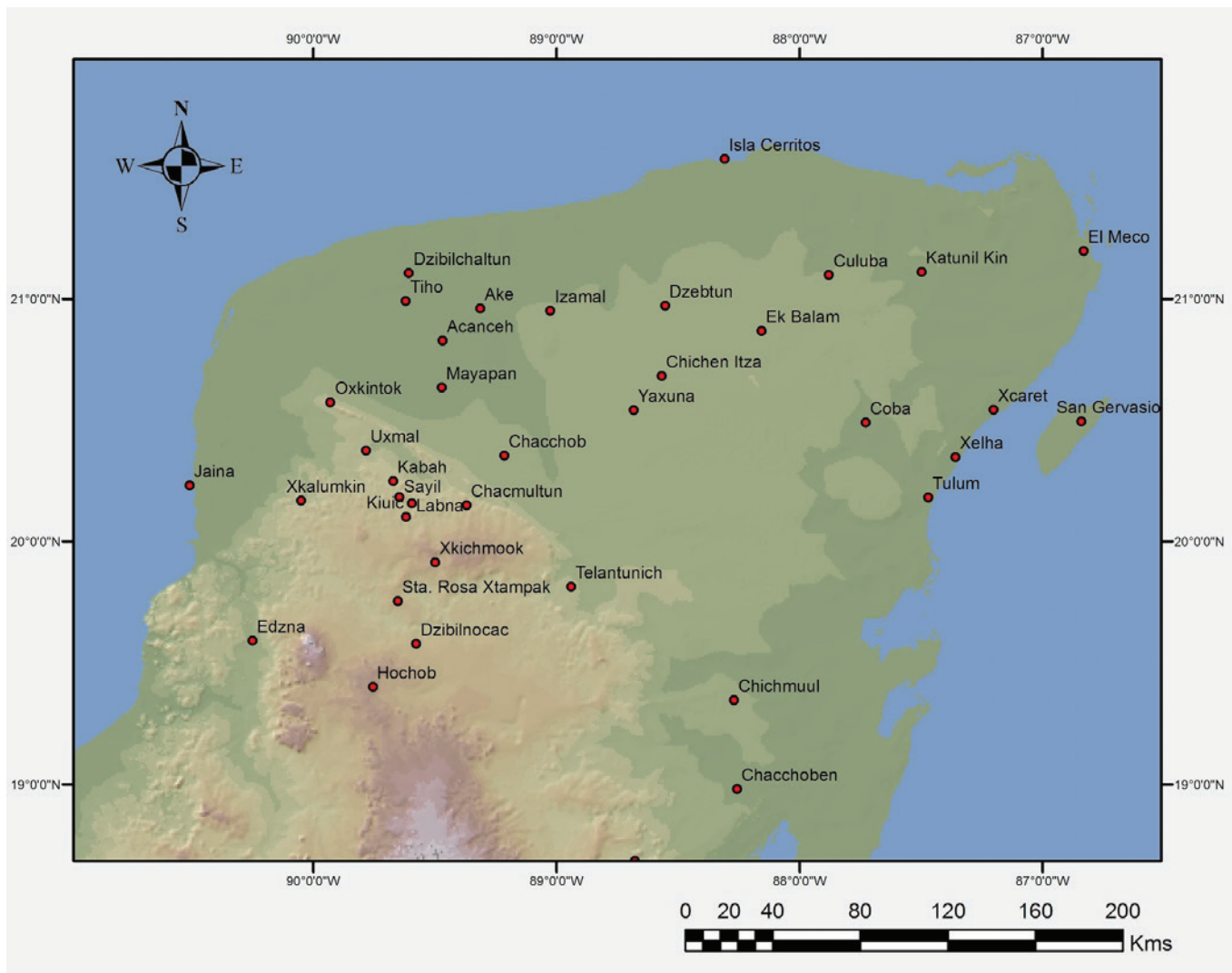


Figure 1. Archaeological sites of the Northern Maya Lowlands.

archaeological contexts. First, it is important to note that not all pestles recovered from Maya sites were utilized for masonry. For example, Inomata (1997:122) recovered numerous stone pestles with mortars that were utilized for pigment preparation. The pestles, smoothers, and buffers used for masonry differ from these quite substantially. First, they are considerably larger, both in length, width, and circumference of the pounding or buffering surface. Mortar and stucco smoothers are made of ground limestone and are often banana shaped, with longitudinal concave faces bearing an oval, flat working facet (Andrews IV and Rovner 1975:93-94). Other smoothers are bell or shoe-shaped with flat bases (Andrews IV and Rovner 1975:95). Bell and shoe shaped pestles often have tapering dorsal elements that narrow substantially. These functioned either to facilitate grip, or to facilitate hafting to long poles. These smoothers would then be utilized to apply plaster to the sides of buildings and then smooth it to a fine finish. The faces of these smoothers also appear to have been functional, with some being entirely circular and others rectangular, most likely to efficiently reach into the corners of rooms or architectural

junctions. Smaller hand-held ground-stone tools utilized for polishing have also been recovered (Rovner and Lewenstein 1997:58).

Andrews IV and Rovner (1975) reported on the discovery of two caches of masonry tools from Dzibilchaltún and Muná in the Northern Lowlands. These were specialized instruments used to cut stones and apply stucco to the façades of masonry residences. The assemblage from Muná was looted in the 1960s, but locals noted that they were cached beneath the floor surface of a masonry vaulted building. The assemblage included nine limestone smoothers and pestles and four chert adzes (Andrews IV and Rovner 1975:84–85). The cache of masons' tools from Dzibilchaltún were found beneath the floor of a two-room unvaulted stone-walled rectangular building (Structure 742) that dated to the "Late Early period", which in modern chronologies corresponds to around 600 AD (Andrews IV 1980:273). This structure was then covered by a new platform construction around 800 AD. It is unclear whether the cached masonry tools date to this construction event or were placed in a later intrusive cut through the floor of the platform. The assemblage consisted of four limestone smoothers, five chert chisels, a graver, and an abrading stone. Four additional limestone smoothers of unknown date and provenience were also described in their study (Andrews IV and Rovner 1975:86–87). The limestone smoothers bore surface encrustations of plaster, and the tapering ends suggest they were intended to be hafted to wooden implements. The masonry tools from Dzibilchaltún were found in a sealed context, suggesting they were indeed meant to be part of a complete toolkit, though any perishable wooden elements such as haftings have certainly decayed.



Chert tools were also common components of these masons' tool kits, though determining whether a flaked stone tool is used for masonry is hampered by their multi-functionality. Chert adzes, thinned bifaces, and stemmed/unstemmed chisels were all found in association with various groundstone buffers and smoothers from the masons' caches at Muná and Dzibilchaltún (Andrews IV and Rovner 1975:86–87). Tear-drop shaped and abrasive chert tools were also part of these assemblages. Based on microscopic use-wear analyses, chert bifaces also appear to have been used to cut stone masonry blocks at Aguateca (Aoyama 2009).

Elsewhere, Proskouriakoff (1962:339) describes a "pear-shaped pestle" with a polished surface from "an early deposit" from Mayapán, though no additional description or context for the artifact was offered. Excavations conducted by Carlos Peraza Lope beneath the plaza floor associated with Hall Q-72 at Mayapán uncovered two conical chert pestles, two chert polishers, and a chert knife, most likely another ritually cached mason's tool kit (Peraza Lope and Masson 2014:125–126). Outside of the Northern Lowlands, a limestone pestle was found from the site of Tajumulco in Guatemala (Dutton and Hobbs 1943:48). Peraza Lope and Masson (2014:125–126) dubbed a bedrock cavity in front of Hall Q-72 at Mayapán "La Casa del Albañil" due to the discovery of a cache of masons' tools that consisted of a mano, two conical chert pestles, two chert polishers, a conch shell trumpet, two jade beads, and a chert knife. Such a ritual cache most likely commemorated either the construction of the elaborate colonnaded Hall Q-72 or the surfacing of the main plaza at the site.

At Aguateca, excavations of Structure L8-8, a temple that was abandoned during construction,

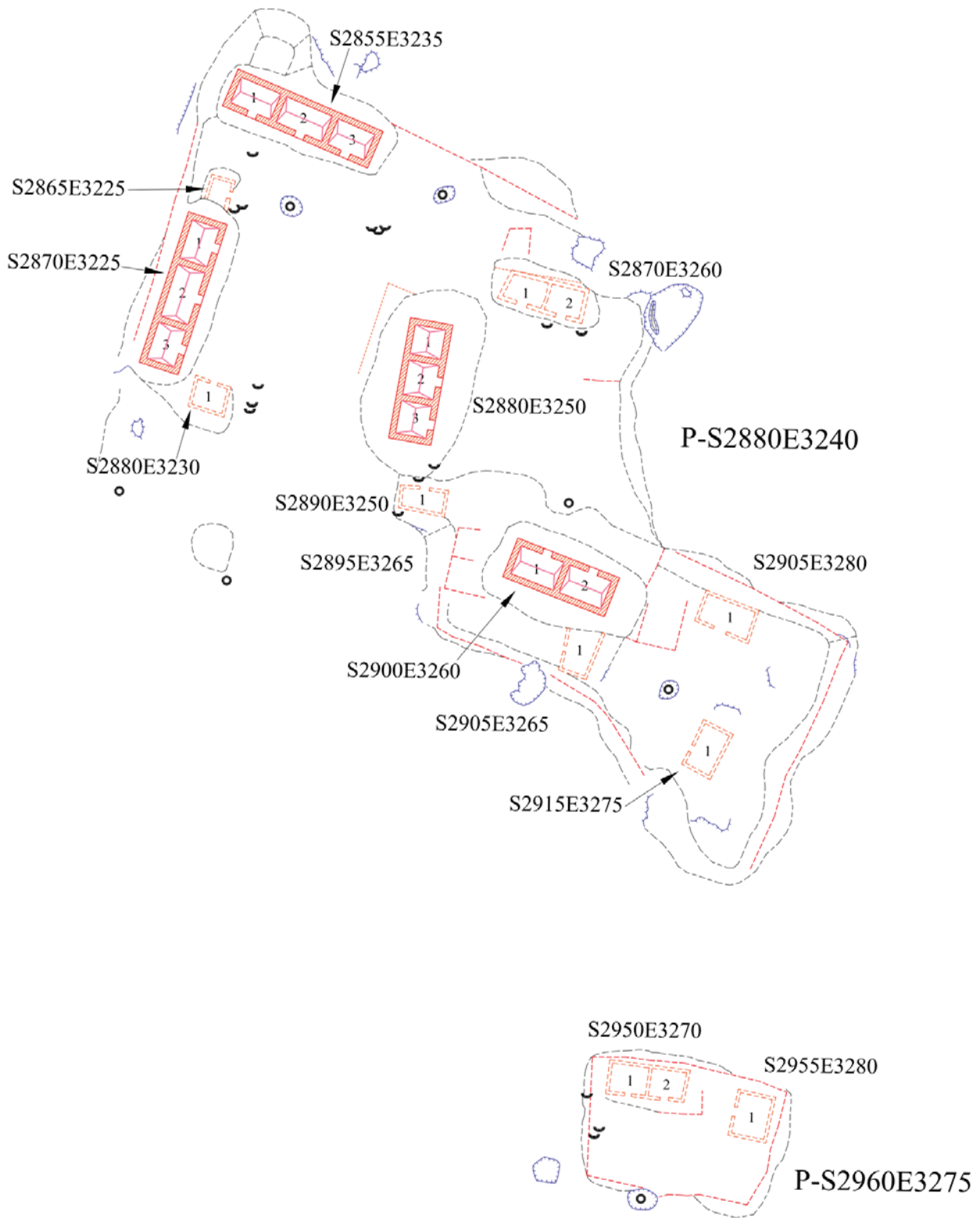


Figure 2. Northern and central groups of Escalera al Cielo, Yucatán. Map by William M. Ringle.



Figure 3. Mason's house from central group of Escalera al Cielo. Note the finely cut stone wall braces and high quality of the door jambs.

revealed large quantities of chipped and ground stone artifacts that were integral to the construction process (Aoyama 2006:20–21). These stone tools were concentrated behind the structure, and included 1,339 pebble smoothers, a polished chert celt, and 11 stucco smoothers. Seven of the stucco smoothers were made of limestone, three of chert, and one of basalt.

Identifying the houses of masons has proven more difficult. At the Bolonchén site of Huntichmúl, several domestic basal platforms on the slopes of hills surrounding the site core have been identified as being associated with the stone-working industry (Ringle et al. in press). These platforms contain standard perishable residential structures, but are associated with other vacant platforms that may contain debitage from stone working. Ringle et al. (in press) posit that these households were the direct clients of the high-status individuals living in the palatial compounds on hilltops. Becker (1973:402) argues that the residents of Gr. 4G-1 at Tikal were masonry specialists due to twice as many “plaster-smoothing” tools being found in excavations there versus other groups at the site, though he offers no descriptions of these tools nor does he offer additional information regarding their context.

Masonry Tool Kits of Escalera al Cielo, Yucatán

The Bolonchén Regional Archaeological Project (BRAP) conducted survey and excavations at a small hilltop settlement on the suburban edge of the Terminal Classic center of Kiuc from 2008 to 2014. The settlement, Escalera al Cielo (EAC) is circumscribed and isolated due to being

located on the cusp of a 60 m tall hill (Figure 2). Spatially, the site is composed of five residential patio groups. A group of five vaulted buildings surrounding a central patio is located on the southern edge of the hill, and most likely functioned as a civic-ceremonial center or even a palatial compound (Bey III et al. 2009). A monumental staircase was the main access point for this group. Two elite residential groups are in the northern sector of the hill. The western group consisted of two collapsed vaulted masonry buildings constructed in the Puuc Colonette style, though the buildings in the western group lacked the same amount of decorative façade stones that the eastern group possessed. Due to an increase in either population and/or wealth, a new patio group in a later variant of the Puuc Colonette style was constructed just to the east (Bey III et al. 2015). It consisted of two vaulted masonry buildings in addition to six ancillary perishable structures that functioned as kitchens, storage units, and activity areas. Chronologically, ceramics recovered from excavations fall into the Late Classic and Terminal Classic Cehpech ceramic sphere. Bracketing the abandonment of the site has been difficult, though the prevalence of Late Terminal Classic ceramics, the paucity of Early Postclassic pottery, and the presence of some Puuc Colonette style architecture lead us to place the abandonment of the hilltop between 950 and 1150 A.D. Radiocarbon dates from wood charcoal from the floor surface in the south room of the westernmost vaulted structure suggest an abandonment before 1020 A.D (Beta-286658; CAL 980–1060 AD and 1080–1150 at 2 σ , Simms et al. 2012:274).

Simms et al. (2012) excavated two of the ancillary structures and one of the vaulted buildings in the western patio group and uncovered extensive on-floor assemblages. These assemblages consisted of reconstructible pottery vessels and stone tools placed along the walls of the interiors of buildings. Assemblages were uncovered on the floors of masonry vaulted buildings as well as perishable structures and are present in all three patio groups that have been excavated. This patterning of *de facto* refuse suggests that EAC was rapidly abandoned, yet what remained did not constitute the full material inventory of its inhabitants, indicating that they most likely planned to return (Lamoureux-St-Hilaire et al. 2015; Simms et al. 2012). Because so many objects were left in storage contexts at EAC, the material from excavations offers a stronger means of interpreting where, how, and by whom certain objects such as masons' toolkits were utilized. Excavations conducted in two patio groups at EAC indicate that attached masonry specialists resided at the settlement and were engaged in the construction and maintenance of vaulted masonry buildings on the hilltop. A small platform (Platform S2960E3275, 19 x 12 m) located to the south of the elite households served as the residence for these masons (Figure 3). The platform included two fully excavated perishable structures, both of which contained extensive on-floor assemblages. Several lines of evidence suggest masons inhabited the platform. First, it was located adjacent to two marl quarries. These were utilized for the mining of *sascab*, a chalky limestone-based powder that was an essential ingredient for the manufacture of mortar and stucco. Second, the architecture of the principal residential structure (Structure S2955E3280, 3.4 x 2.55 m) of the platform was of higher quality than any other perishable structure on the hilltop. Typically, these types of structures consist of four walls composed of parallel stone braces. These braces are generally roughly hewn and advantageously drawn from any nearby source of stone, provided it was roughly rectangular in shape. However, the wall braces for this structure were of exceptional quality. They were finely cut with smoothly modelled faces, and the corner stones were substantially larger than necessary for a perishable structure. Often door jambs for these types of buildings are no more than 20 cm tall, yet the jambs for this structure were finely

carved on all four sides and measured 60 cm in height. Third, this is the only platform group other than the major vaulted patio groups that possesses its own *chultun*, typically a key marker of permanent residence for an architectural group in the Puuc region. Finally, two chert chisels were found along the side-wall of the western two-room structure of the group (Figure 4). These chert tools bear close resemblance to those recovered from the masons' toolkits from Muná and Dzibilchaltún, and their placement is indicative of either a primary or storage context.

This household also possessed several high value objects that were not removed upon abandonment. Two worked shell pendants and a small ceramic figurine were recovered from the floor surface in addition to five reconstructible vessels. Two Yokat Striated jars, a Muna Slate basin, and an Akil Impressed dish were ritually cached under the floor. The adjacent structure (Structure S2950E3270) contained substantial on-floor assemblages, including at least four large Yokat Striated storage jars and a Muna Slate bowl. A "Fat God" ceramic pendant was found along the back side of the building (Figure 4). The Fat God deity is related to material wealth and excess, and is depicted as a fattened older male individual with swollen eyes and a rounded pot belly (Miller and Taube 1997:86). It is the most prevalent iconographic subject at EAC, most likely because the source of power for the wealthy residents of vaulted buildings at EAC was not necessarily divine, but economic. Sub-floor offerings included a secondary burial covered by an inverted dish placed next to a bowl. A large complete storage jar was the final offering uncovered.

The evidence from one housing compound is not enough to establish the presence of attached masonry craft specialists at EAC; excavations of one of the elite patio groups cements this link. As mentioned above, the eastern elite compound is composed of two collapsed masonry vaulted buildings and six ancillary perishable structures that functioned as kitchens and store-rooms. Excavation and consolidation of one of the largest vaulted masonry structures (Structure 2900E3260) in 2012 and 2013 revealed that it is the only structure in the northern complex with decorative features on the facades, specifically colonnettes on the basal, medial, and upper moldings. The west exterior wall of the two-room structure did not feature basal moldings or cut stones for the upper façade (Figure 5). Such a feature suggests that the building had yet to be fully constructed, and that when completed, would have eventually stood as a three-room vaulted structure. Such uncompleted buildings are quite common in the Puuc and suggests that either 1) construction of masonry buildings was still occurring just up to the moment of a precipitous demographic collapse or 2) buildings were purposefully constructed in a manner to easily facilitate expansion upon the accrual of wealth later in time.

To the northwest of the principal vaulted structure, we uncovered remains of a single course of stones that delimited an activity area under a *palapa* (Structure S2895E3250). On the floor of the *palapa*, a square masonry limestone buffer was found directly adjacent to a finely cut piece of limestone that was a segment of molding for a vaulted structure (Figure 6). The close association of these two artifacts suggests that this stone was undergoing carving and burnishing just prior to abandonment.

To the south of the large vaulted masonry building is a single-room, westward-oriented pole-and-thatch structure (Structure S290E3265). Excavations uncovered an on-floor assemblage placed in the back corner of the structure that consisted of a tripodal dish with modeled legs in the image of the Fat God. Importantly, two limestone smoothers used for applying stucco and mortar were found on the floor as well (Figure 7). One smoother featured only a single, circular facet, which was worn exceptionally smooth and featured multidirectional scratches, suggesting



a



b

Figure 4. (a) Chert chisels found in storage context on side of masons' house; (b) Fat God ceramic pendant found cached along exterior of masons' house.



Figure 5. Western side of the principal vaulted masonry building in the northern group of Escalera Cielo. The lack of lower molding stones indicates that residents planned a future expansion of the structure but did not complete construction either due to lack of funds or because of the abandonment of the settlement.

that smoothing could have been achieved in both unidirectional and circular motions (Figure 8). The surface of the applicator contained calcite encrustations, most likely dried mortar that would be worn down over time. The dorsal side tapers sharply on one side, but hardly at all on the other. This would have allowed space for a pole to be easily attached if necessary, meaning ceilings and sides of masonry structures could be easily buffed without need for scaffolding,



Figure 6. Limestone polisher found on floor of perishable structure in association with a medial molding stone that was undergoing smoothing.

though it could just as likely have been held in one hand to buff while the other hand or another individual applied plaster. The other smoother features a facet that is more rectangular in shape, with the shorter ends rounded. It has the same types of striations, pitting, and calcite encrustations as the other smoother. No banana-shaped smoothers were recovered in the assemblage. Across the patio from the vaulted building, a two-room perishable structure (Structure S2870E3260) that functioned as a kitchen was excavated by Maggie Morgan-Smith in 2008. Two chert chisels were piled outside the eastern door of the structure, once again provisioned in storage context. These chisels would typically be classified as broken lanceolates, but given their placement in storage contexts, they were still being

utilized and therefore were most likely hafted as chisels possibly utilized for cutting stone blocks. Of course, one of the benefits of bifacial chert technology is its flexible nature; chisels could be used for wood-working, stone-carving, or fulfill any type of splitting function. Microscopic use-wear analysis could determine what purposes these stone tools fulfilled (Aoyama 2007).

Given the large number of vaulted residences at EAC, frequent maintenance and ongoing construction necessitated keeping the proper tools on-hand. A lime pit-kiln excavated by Kenneth Seligson on the northern cusp of the hill indicates that lime was not being imported from the urban core and that consumption of lime used for mortar and plaster was high enough to invest in the construction of a large pit-kiln (Seligson 2016:178). The demands of ongoing construction and the need to resurface buildings and floors with new layers of plaster every ten years or so necessitated the presence of skilled artisans in addition to the infrastructure needed for these tasks. The construction of masonry buildings most likely took place during the dry season, when wet plaster and cement could more thoroughly set, though the quarrying of stone, construction of water cisterns, and plastering of the interiors of masonry structures could occur year-round.

Discussion and Conclusion

The abandonment of EAC was relatively rapid, but its inhabitants planned to return based on their placement of many objects in storage contexts. Given the amount of wealth left at the settlement and the fact that its most ornate masonry residence was still being constructed, the socio-economic lifeways of its inhabitants remained relatively unchanged up until the very



Figure 7. Fat God platter and limestone polishers found in storage context in corner of a perishable structure behind masonry vaulted structure undergoing construction.

moment of the abandonment. More importantly, it suggests that masons maintained close affiliative ties with elites until the abandonment, and that both the elites and their attached specialists left at roughly the same time. Although masonry tools have been recovered from other sites in the Northern Lowlands, those contexts are confined to ritual caches. While such caching preserves the entirety of the toolkit, it does diminish opportunities for understanding how, where, and when masonry specialists utilized their tools, and how they organized their technological knowledge. By recovering masonry tools in storage contexts and excavating the housing compounds of masons, it is possible to elucidate the model of technological organization employed in the Eastern Puuc for the construction and maintenance of stone buildings. Because these buildings were crucial for the creation, maintenance, and transmission of wealth among elites, it is imperative to understand how it impacted the craft specialists engaged in this labor.

It is disingenuous to argue that the masons of EAC are either simply attached or independent specialists. More likely this technology was organized on a continuum between the two. The finely cut stones and amount of wealth left in the masons' compound suggest that their skills and knowledge paid dividends. Their craft skills were likely transmitted intergenerationally, as suggested by the presence of Batres Red and Qunital Unslipped in the construction fill of the masons' house, both Early Classic types. Furthermore, the proximity of marl and stone quarries denotes knowledge not just of how to construct stone buildings, but also how to properly identify source materials and maintain some control over them. At least sixteen pit and ledge quarries of variable size are located adjacent to the northern elite residential group of Escalera al Cielo, used for quarrying *sascab* as well as limestone for architectural fill, veneer stones, and material for producing plasters and cements.

However, the bulk of the masons' tools, primarily smoothers and chisels, were not found associated directly with their house platform. Instead, they were found stored in ancillary buildings owned and operated by elites. Given the proximity of the masons' house to these elite compounds and the possession of masonry tools by these elites, it appears that attached specialization was the dominant mode of organizing this technology. This study confirms Carmean et al.'s (2011:156) observation that "high ranking persons did not quarry, shape, and haul stone to build stone houses and monuments; rather, much like land and water, people of high-rank controlled stone resources and distributed quarry labor and cut stone through long strands of patron-client networks." Given the long history of construction of vaulted buildings at EAC, elites were not only investing wealth into the stone buildings themselves, but they were also investing

in affiliative ties with masonry specialists both synchronically and diachronically.

Ringle et al. (in press) assert that stone workers were the clients of the highest ranking elites who directed labor toward the construction of vaulted masonry buildings toward engendering binding ties with lower-level elites. The constant labor demands constituted a form of non-material tribute that these craft specialists could offer. Furthermore, they argue that the persistent construction of new buildings



Figure 8. Limestone polishers.

and the addition of rooms to existing buildings fueled the Puuc economy; these were not only repositories of wealth but operated to some extent outside a system of traditional economic exchange due to the inalienability of stone buildings. As such, demand could never truly be satiated for the construction of these buildings, leading to continual construction projects.

In a holistic examination of Maya construction practices at Copán, Abrams (1994:111) notes that most building activity would have been organized via reciprocal labor exchange which required common knowledge of general construction practices among wide swathes of the population. The monumental vaulted constructions of the Classic era required specialized and skilled laborers, yet Abrams estimates that most stone buildings could have easily been built with a combination of just a few masonry specialists and a greater number of unskilled laborers. Such a perspective is supported at Aguateca, where Aoyama (2006:30) notes a close association between masonry and scribal tools around an unfinished temple, such that scribes may have supervised masons or even have served as chief architects. Abrams also notes that painters would have employed a lime-based whitewash as the foundation for later pigments applied to the exterior of buildings, and that specialized knowledge was needed for the application of plasters and paints (Abrams 1994:117).

To add to Ringle et al.'s conclusions, wealth is not simply measured in terms of material possessions, but also relationally in terms of the accumulation of social capital, in this case the attachment of masonry specialists to non-royal elites. Regardless, environmental processes, warfare, and macroeconomic trends spared neither the non-royal elites nor their attached masonry specialists around 1000 AD, resulting in both groups rapidly departing the hilltop together.



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References

Abrams, Elliot M.

1994 *How the Maya Built their World: Energetics and Ancient Architecture*. University of Texas Press.

Andrews IV, E. Wyllys

1980 *Excavations at Dzibilchaltun, Yucatan, Mexico*. Publication 48. Middle American Research Institute, Tulane University, New Orleans.

Andrews IV, E. Wyllys, and Irwin Rovner

- 1975 Archaeological Evidence on Social Stratification and Commerce in the Northern Maya Lowlands: Two Masons' Tool Kits from Muna and Dzibilchaltun, Yucatan. In *Archaeological Investigations on the Yucatan Peninsula*, pp. 81–102. Middle American Research Institute, New Orleans, LA.

Aoyama, Kazuo

- 2006 Political and Socioeconomic Implications of Classic Maya Lithic Artifacts from the Main Plaza of Aguateca, Guatemala. *Journal de la Société des Américanistes* 92(1):7–40.
2007 Elite Artists and Craft Producers in Classic Maya Society: Lithic Evidence from Aguateca, Guatemala. *Latin American Antiquity* 18(1):3–26.
2009 *Elite Craft Producers, Artists, and Warriors at Aguateca: Lithic Analysis*. Monographs of the Aguateca Archaeological Project first phase ; v. 2. University of Utah Press, Salt Lake City.

Becker, Marshall Joseph

- 1973 Archaeological Evidence for Occupational Specialization among the Classic Period Maya at Tikal, Guatemala. *American Antiquity* 38(4):396–406.

Bey III, George J., Betsy Kohut, Beniamino Volta, and Maggie Morgan-Smith

- 2009 Excavaciones Estratigráficas en Escalera al Cielo. In *Proyecto Arqueológico Regional de Bolonchén, Temporada de Campo 2008. Informe Técnico al Consejo de Arqueología del Instituto Nacional de Antropología e Historia, México*, edited by Tomás Gallareta Negrón, George J. Bey III, and William M. Ringle, pp. 6–1--6–51.

Bey III, George J., Evan Parker, and Betsy Kohut

- 2015 Excavaciones Estratigráficas en Escalera al Cielo Norte. In *Proyecto Arqueológico Regional de Bolonchén, Temporada de Camp 2014: Informe Técnico al Consejo de Arqueología del Instituto Nacional de Antropología e Historia, México*, edited by Tomás Gallareta Negrón, George J. Bey III, and William M. Ringle, pp. 5–1--5–43.

Brumfiel, Elizabeth M., and Timothy K. Earle

- 1987 Specialization, Exchange, and Complex Societies: An Introduction. In *Specialization, Exchange, and Complex Societies*, edited by Elizabeth M. Brumfiel and Timothy K. Earle, pp. 1–9. Cambridge University Press, Cambridge.

Carmean, Kelli, Patricia A. McAnany, and Jeremy A. Sabloff

- 2011 People Who Lived in Stone Houses: Local Knowledge and Social Difference in the Classic Maya Puuc Region of Yucatán, Mexico. *Latin American Antiquity* 22(2):143–158.

Costin, Cathy Lynne

- 1991 Craft Specialization: Issues in Defining, Documenting, and Explaining the Organization of Production. *Archaeological Method and Theory* 3:1–56.
1998 Introduction: Craft and Social Identity. *Archeological Papers of the American Anthropological Association* 8(1):3–16.
2016 *Making Value, Making Meaning: Techné in the Pre-Columbian World*. Dumbarton Oaks Pre-Columbian symposia and colloquia. Dumbarton Oaks Research Library and Collection, Washington, D.C.

Dutton, Bertha P., and Hulda Hobbs

- 1943 *Excavations at Tajumulco*. University of New Mexico Press, Albuquerque, NM.

Eaton, Jack D.

- 1991 Tools of Ancient Maya Builders. In *Maya Stone Tools: Selected Papers from the Second Maya Lithic Conference*, edited by Thomas R. Hester and Harry J. Shafer, pp. 219–228. Monographs in World Archaeology 1. Prehistory Press, Madison, WI.

Gallareta Negrón, Tomás

- 2013 The Social Organization of Labna, a Classic Maya Community in the Puuc Region of Yucatan, Mexico. Unpublished Dissertation, Tulane University, New Orleans, LA.

Gallareta Negrón, Tomás, and George J. Bey III

2012 The Role of Economics in the Success of 8th-10th Century Maya Society in the Puuc Region, Yucatan, Mexico. Paper presented at the 77th Annual Meeting of the Society for American Archaeology, Memphis, TN. In .

Horowitz, Rachel

2017 Understanding Ancient Maya Economic Variability: Lithic Technological Organization in the Mopan Valley, Belize. Unpublished Dissertation, Tulane University, New Orleans, LA.

Inomata, Takeshi

1997 Classic Maya Elite Competition, Collaboration, and Performance in Multicraft Production. In *Craft Production in Complex Societies: Multicraft and Producer Perspectives*, edited by Izumi Shimada, pp. 120–133. University of Utah Press, Salt Lake City.

Janusek, John Wayne

1999 Craft and Local Power: Embedded Specialization in Tiwanaku Cities. *Latin American Antiquity* 10(2):107–131.

Lamoureux-St-Hilaire, Maxime, Scott Macrae, Carmen A. McCane, Evan A. Parker, and Gyles Iannone

2015 The Last Groups Standing: Living Abandonment at the Ancient Maya Center of Minanha, Belize. *Latin American Antiquity* 26(4):550–569.

Miller, Mary Ellen, and Karl A. Taube

1997 *The Gods and Symbols of Ancient Mexico and the Maya: An Illustrated Dictionary of Mesoamerican Religion*. Thames & Hudson.

Peraza Lope, Carlos, and Marilyn A. Masson

2014 An Outlying Temple, Hall, and Elite Residence. In *Kukulcan's Realm: Urban Life at Ancient Mayapan*, edited by Marilyn A. Masson and Carlos Peraza Lope, pp. 105–147. University Press of Colorado, Boulder, CO.

Proskouriakoff, Tatiana

1962 The Artifacts of Mayapan. In *Mayapan, Yucatan, Mexico*, pp. 321–442. Publication 619. Carnegie Institution of Washington, Washington D.C.

Ringle, William M.

2019 What Lies Beneath: Searching for the Ancient Maya in the 21st Century. Paper presented at the Ninth Annual Maya at the Lago Conference, Davidson, NC. In .

Ringle, William M., Tomás Gallareta Negrón, and George J. Bey III

in press Stone for My House: The Economics of Stoneworking and Elite Housing in the Puuc Hills of Yucatan. In *Nuts and Bolts of the Real "Business" of Ancient Maya Economic Exchange*, edited by Marilyn A. Masson, David A. Freidel, and Arthur A. Demarest. University Press of Florida, Gainesville, FL.

Rovner, Irwin, and Suzanne M. Lewenstein

1997 *Maya Stone Tools of Dzibilchaltún, Yucatán, and Becán and Chicanná, Campeche*. Publication 65. Middle American Research Institute, Tulane University, New Orleans, LA.

Seligson, Kenneth E.

2016 The Prehispanic Maya Burnt Lime Industry: Socio-Economy and Environmental Resource Management in the Late and Terminal Classic Period Northern Maya Lowlands (650-950 CE). Unpublished Dissertation, University of Wisconsin at Madison, Madison, WI.

Seligson, Kenneth E., Soledad Ortiz Ruiz, and Luis Barba Pingarrón

2018 Prehispanic Maya Burnt Lime Industries: Previous Studies and Future Directions. *Ancient Mesoamerica*:1–21.

Simms, Stephanie R., Evan Parker, George J. Bey III, and Tomás Gallareta Negrón

2012 Evidence from Escalera al Cielo: Abandonment of a Terminal Classic Puuc Maya Hill Complex in Yucatán, Mexico. *Journal of Field Archaeology* 37(4):270–288.

Building Quality of Life and Social Cohesion at Ucanha During the Terminal Preclassic

by

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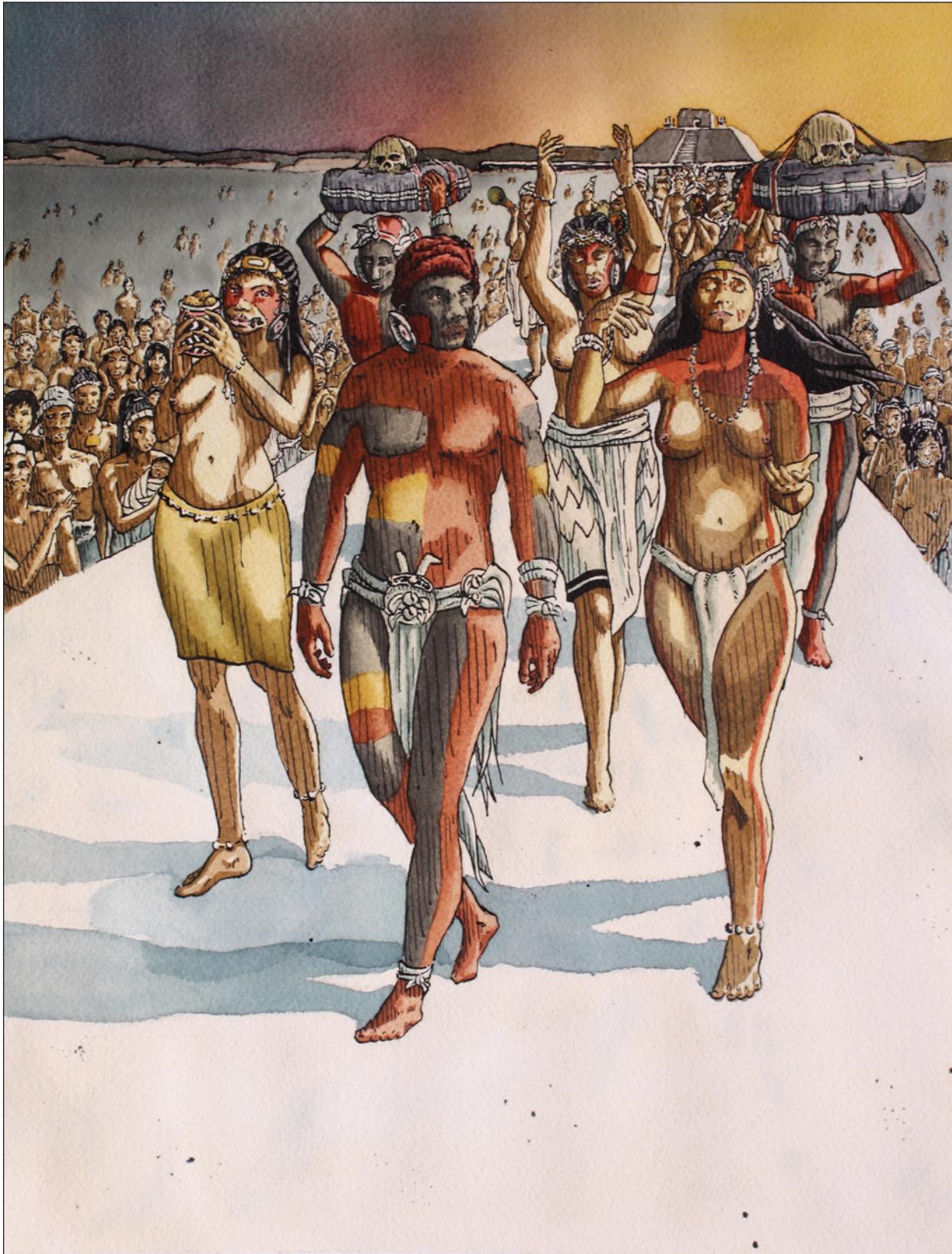
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Late Preclassic life in the Northern Maya Lowlands is a period of material and social experimentation, a balancing act between emerging social differentiation and an ideology of communal integration. During this period, the site of Ucanha was physically integrated into a micropolity via an 18-km-long roadway and experienced the creation of integrative civic spaces, a population apogee, and an influx of ceramic heterogeneity. Followers donated labor to build a monumental landscape, and incipient rulers provided an array of aesthetically pleasing ceramics and social events that helped forge collective trust. Ceramic distributions and the widespread use of megalithic architecture indicate a high quality of life for households. A built landscape that references a place of creation and stucco friezes and architecture attest to emergent claims of hereditary rulership and community prosperity. Evidence from Ucanha's central plaza indicate this area was more-widely accessed during the Late Preclassic but then became more restricted to the general public during the Early Classic. Likewise, during the Early Classic, the distribution of decorated ceramics became more circumscribed, indicating economic changes that favored gifting elites rather than provisioning the populace. During this period architecture associated with elite rulership was interred and households were abandoned. Thus, around the time of broader integration during the Late Preclassic, political institutions provided for all; yet, during the Early Classic, elites turned from an inclusive, community strategy towards a more exclusionary strategy of reinforcing an elite identity. As a result, leaders lost the support of their constituents and populations declined.

Keywords: household archaeology, quality of life, integration, causeways, social differentiation



Integration and Quality of Life

Processes of sociopolitical integration are negotiated by a variety of actors and at various scales of interaction. The relatively low-density, agrarian settlements of the Maya world simultaneously have centripetal and centrifugal forces that impact integration. Historically, perspectives were top-down-city-level or bottom-up-household-level, with the more middle-scale resolution of the neighborhood (Hutson 2016; Lemonnier 2012; Smith and Novic 2012) and the community (Hendon 2003; Yaeger and Canuto 2000) emerging as a heuristic rather recently. By comparing different scales of integration (i.e., household, community, and micro-regional), we discuss how components of the built environment and quality of life (QOL), or wellbeing, facilitated and constrained integration over time along an 18-km-long causeway that passed through four sites (Ucú, Kancab, Ucanha and Cansahcab) in Yucatán, México (Figure 1). Wellbeing was a process negotiated



between the household and community levels of interaction as a result of emergent rulers trying to recruit and retain followers. In this paper we examine how different scales of settlement negotiated wellbeing during the Terminal Preclassic by using the distribution of megalithic architecture and decorated ceramics as a proximate measure of household wellbeing in conjunction with monumental construction and supra-household interactions as a measure of community prosperity. However, during the Early Classic, changes in access to public space and decorated ceramics indicate a decrease in wellbeing and prosperity.

The success of polity integration is rooted in how rulers and followers meet one another's ecological, economic, and social needs. Among the ancient Maya, rulers typically provided protection, economic opportunities, and entertaining performances, while followers provided labor and tribute (Golden and Scherer 2013; Houston et al. 2003; Joyce 2008). Authority, therefore, rested in a moral obligation to fulfill expectations of QOL and promote a sense of trust among the community through "highly charged events, such as marketing, feasting, participation in royal spectacles...and collaboration in construction efforts... [that]...served to reinforce the sense of morality and trustworthiness (or un-trustworthiness) of individuals" (Golden and Scherer 2013:402). These ideas of trust-building and moral authority underscore that political success and QOL is a give-and-take relationship between rulers and followers.

The concept of QOL attempts to measure how rulers and followers alike negotiate wellbeing in ways that are bound by moral obligation. Smith (2015; see also 1987) argues household QOL can be measured in terms of wealth and capabilities. For Smith, wealth, or economic wellbeing, is measured by domestic architecture and durable, portable goods. Capabilities, on the other hand, strive to assess social or psychological wellbeing, which Smith (2015) argues is measured by the diversity of possessions and external social networks, such as exchange systems (i.e., foreign goods) and style networks (i.e., local goods that emulate foreign styles (Table 1). For example, a household with numerous spindle whorls would have higher capabilities because these possessions improve functionings, which are defined as "the various things a person may value doing or being" (Sen 1999:75). The capability approach moves beyond just the material and

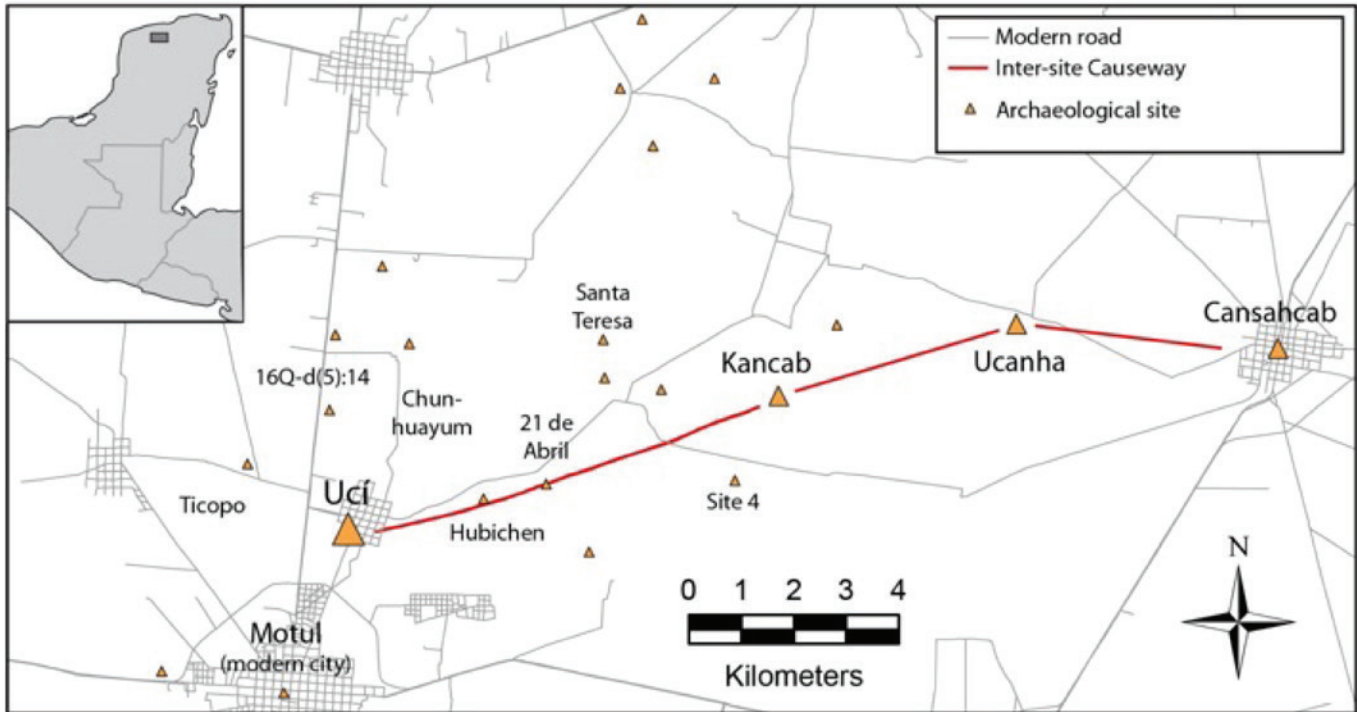


Figure 1. Map of the Ucí-Cansahcab causeway with sites demarcated by triangles. Map courtesy of Scott Hutson.

urges one to extend the artifact out to envision the social networks needed not only to procure and produce the artifact but also the ways in which a possession can help be a means to end. Deneulin and McGregor (2010:503) add that capabilities exist between structure and agency or the individual and society as a negotiated “living well together”. Arponen et al. (2016), for example, convincingly argue that during the Late Neolithic the ability of one group to diminish access to rituals by another group had negative implications for capabilities and overall QOL

Table 1. Component of household and community wealth and capabilities adapted from Smith 2015.

	Wealth	Capabilities
Household	<ul style="list-style-type: none"> • Domestic Architecture • Durable, Portable Goods 	<ul style="list-style-type: none"> • Diversity of Possessions • External Social Networks • Domestic Feasting / Rituals
Community	<ul style="list-style-type: none"> • Sum of Household Wealth 	<ul style="list-style-type: none"> • Collective Construction Projects • Stability of Residence • Population Growth • Longevity of Settlement • Resilience to External Shocks • Collective Rituals

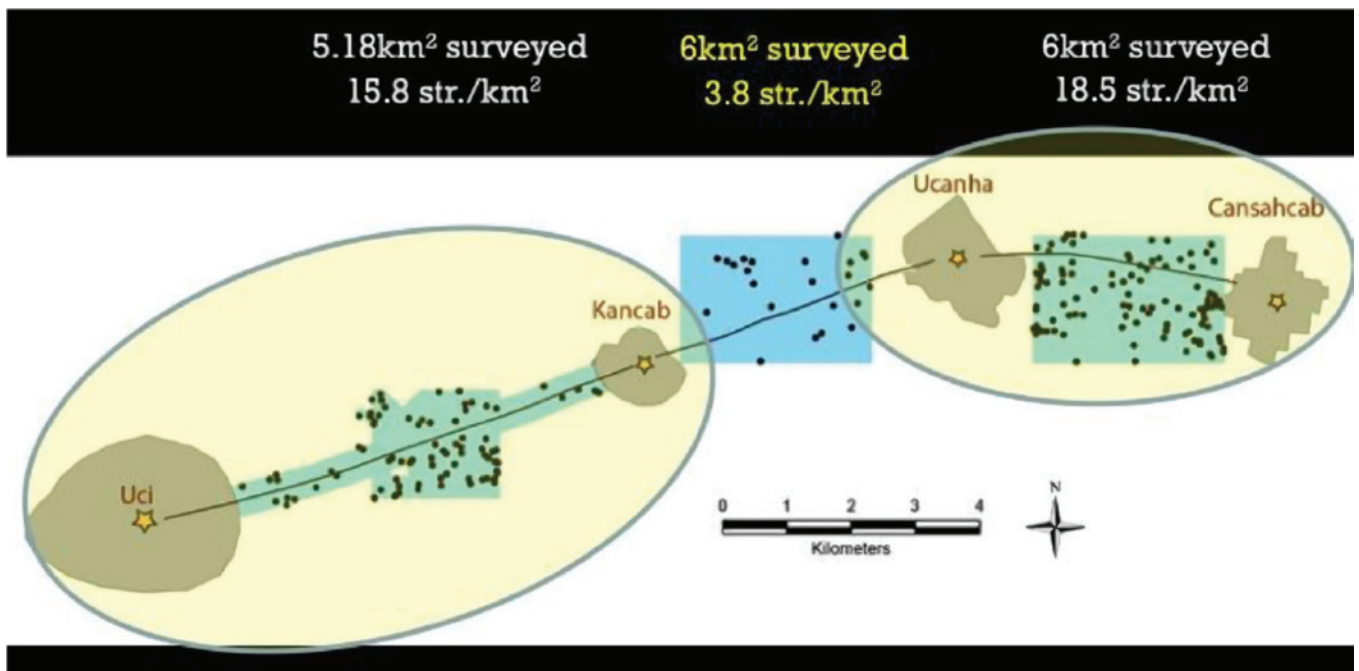


Figure 2. Map of hinterland residential platforms showing relatively low settlement density between Kancab and Ucanha.

At the community level, Smith (2015) uses the term prosperity, where wealth is the aggregate wealth of households and capabilities consist of collective construction projects, stability of residence, population growth, settlement longevity, and resilience to external shocks (Table 1). Since communities are (re)produced through face-to-face interactions, frequent interpersonal interactions of differentially situated actors reinforce generalized trust, which can promote social cohesion, reciprocity networks, and morally-embedded economic practices (Golden and Scherer 2013; Houston et al. 2003). As such, individual wellbeing and community success are intertwined processes that are negotiated between households and higher-scale political and economic institutions (Deneulin and McGregor 2010). Since enjoyment of social participation is a critical component of the capability approach (Arponen et al. 2016), we would also argue that the ability of a household or a larger political institution to provide opportunities for social engagement—whether through feasting, ritual processions, theatrical performances, etc.—would also indicate a higher range of capabilities at both the household and community levels. Therefore, it is imperative to consider how capabilities at different scales, such as the household and community, promote “living well together” (Deneulin and McGregor 2010:501).

Ucanha: Physical Integration and Emerging Micropolities

At the largest scale of integration, the Uci-Cansahcab polity was physically connected during the Terminal Preclassic (75 BCE – CE 400; Glover and Stanton 2010) by an 18-km-long causeway (Figure 1). The causeway would have required significant labor inputs to construct and would have functioned as political symbol, or marker of identity, used to define polity boundaries (Kurjack and Andrews 1976). Furthermore, the causeway itself would have been a transformative

component of the built landscape for future generations as it physically connected new people thereby augmenting the scale of sociopolitical interactions.

Given the amount of labor input required to build this roadway, this monumental endeavor would have not only physically integrated the polity but would have also been a material reminder of its inter-personal integration, an embodiment of the micro-regional community on the

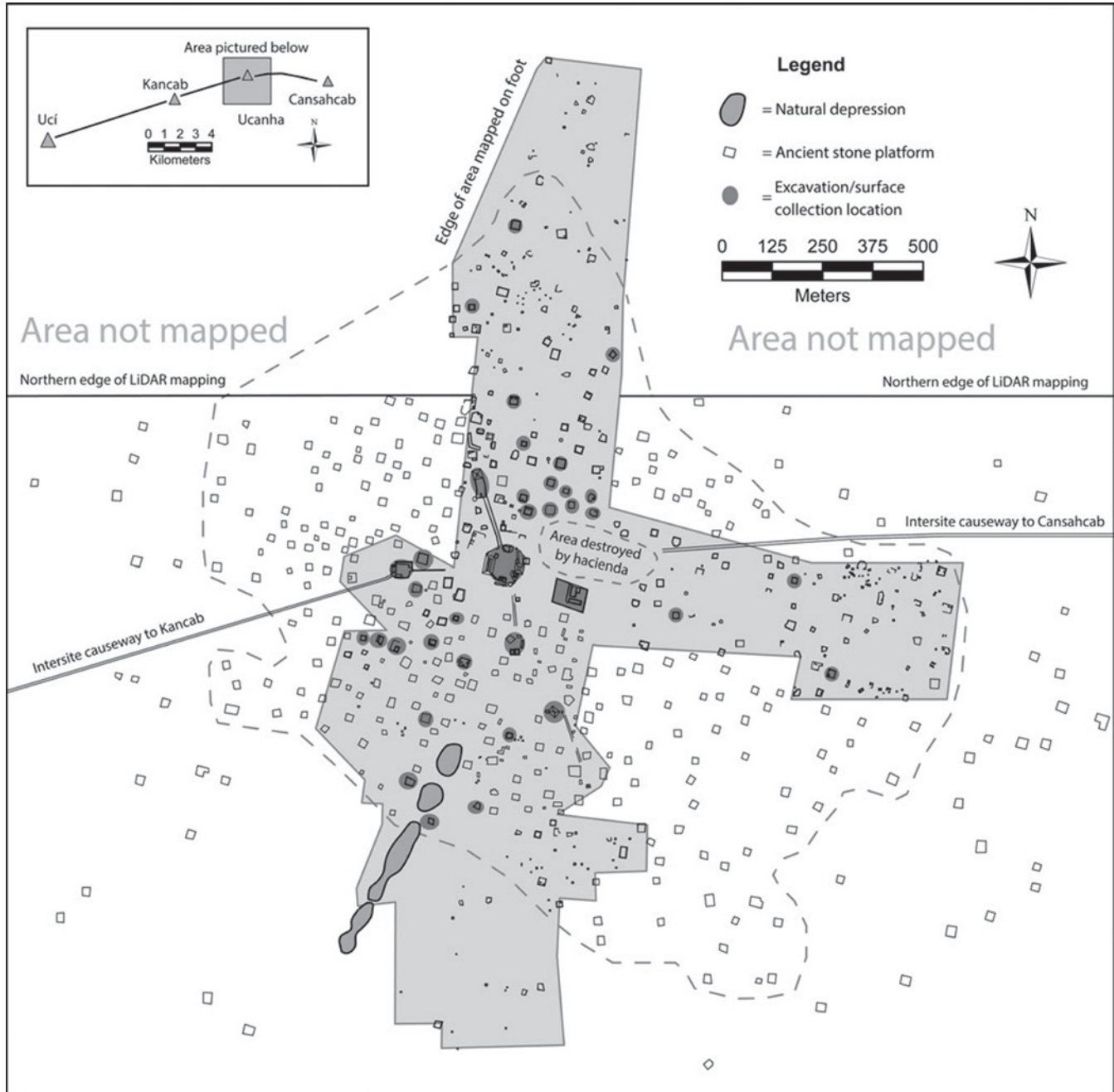


Figure 3. Map of Ucanha showing extent of intensive survey in light grey, locations of test excavations in dark grey, and proposed site edges based on LiDAR mapping.



Figure 4. Image of megalithic stones from the basal platform of a residential structure.

landscape (Hutson 2002; Pauketat 2000; Pauketat and Alt 2005). As a monumental construction it would have indexed an increased community prosperity. Once thought to be constructed solely at the behest of the regional center Ucí (Maldonado C. 1979, 1995), investigations at major centers and hinterland sites indicate the causeway was constructed in three episodes (Hutson et al. 2016). Data from excavations, survey, and LiDAR indicate Ucí and Ucanha were emerging micro-polities during the Late Preclassic, each undergoing massive monumental constructions at their respective centers with evidence of autonomous political authority (Hutson and Welch 2014). Here, the term polity includes a spatial boundary, a community of people formed through face-to-face interactions, and a seat of political authority (Marken and Fitzsimmons 2015:5). These construction projects would have been mechanisms for galvanizing local support and integrating the community (Ringle 1999). The area between Kancab and Ucanha is relatively sparsely occupied—only 3.8 structures/km² as compared to over 16 structures/km² between Ucanha and Cansahcab and Kancab and Ucí—suggesting it may have functioned as a buffer zone between Ucí and Ucanha (Figure 2). Thus, the intersite causeway was built in three segments with each episode highlighting elevated community prosperity and bolstering a sense of generalized trust through interpersonal interactions of people from various households.

The areal extent of Ucanha is 2.205 km² as mapped by LiDAR and pedestrian survey. In total we mapped 394 households—with a total estimated number of 416—yielding a settlement

density of 189 houses per km², the highest of all sites located on the intersite causeway (Figure 3). Ninety residential platforms were of the megalithic style, and these were more voluminous—thereby reflecting higher labor investments and more wealth—than non-megalithic platforms. The megalithic style of architecture consists of large rectangular limestone blocks with rounded corners that are roughly 60 cm in length (Figure 4) and dates roughly to the Terminal Preclassic (Mathews and Maldonado C. 2006; Taube 1995). Ceramic evidence recovered from monumental and residential contexts shows population peaks during the Late Preclassic and the Late Classic with a noticeable decline by the latter half of the Early Classic (~CE 400 – 600) as indicated by a lack of Yucatan Gloss wares and Oxkintok wares (see also Anderson [2011]). Of the 15 residential platforms test-pitted (Figure 5), 56.7% of the total identifiable ceramics dated to the Late

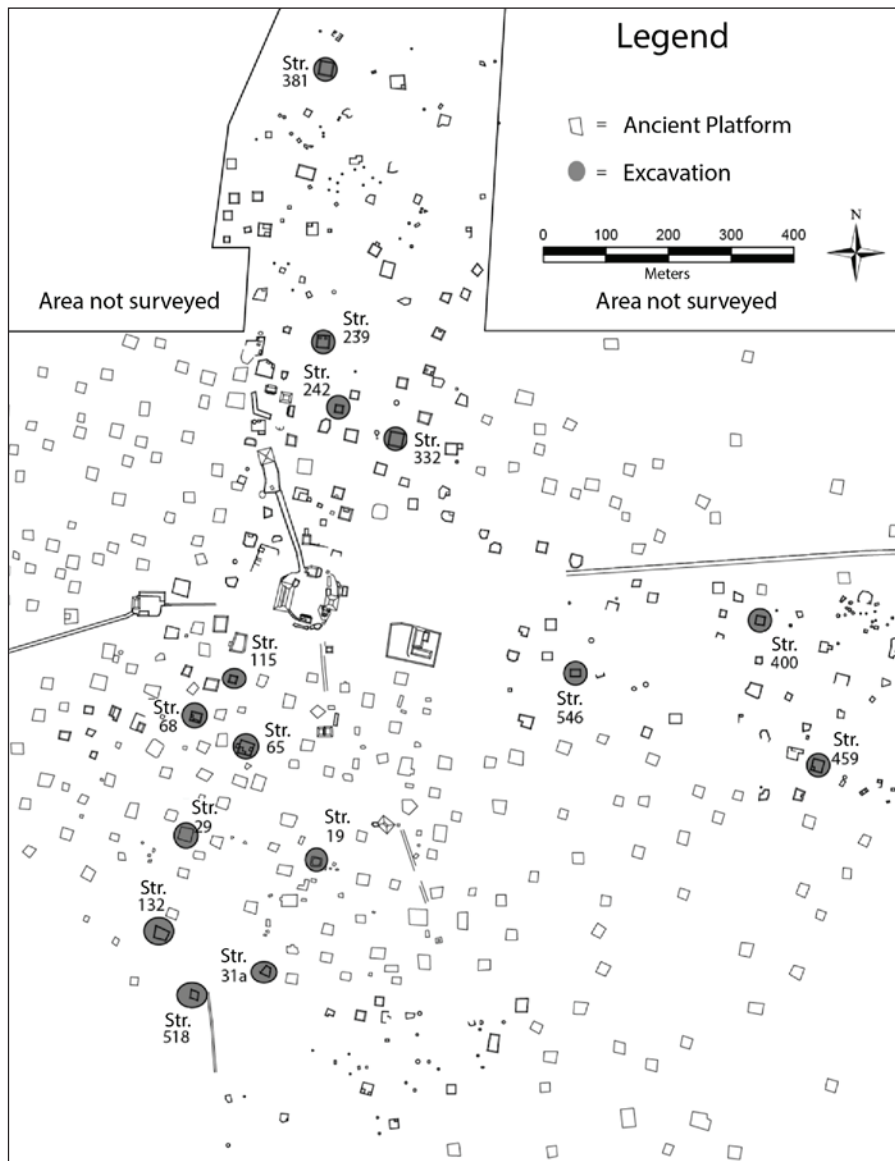


Figure 5. Map of Ucanha showing the fifteen residential architectural groups that were test-pitted.

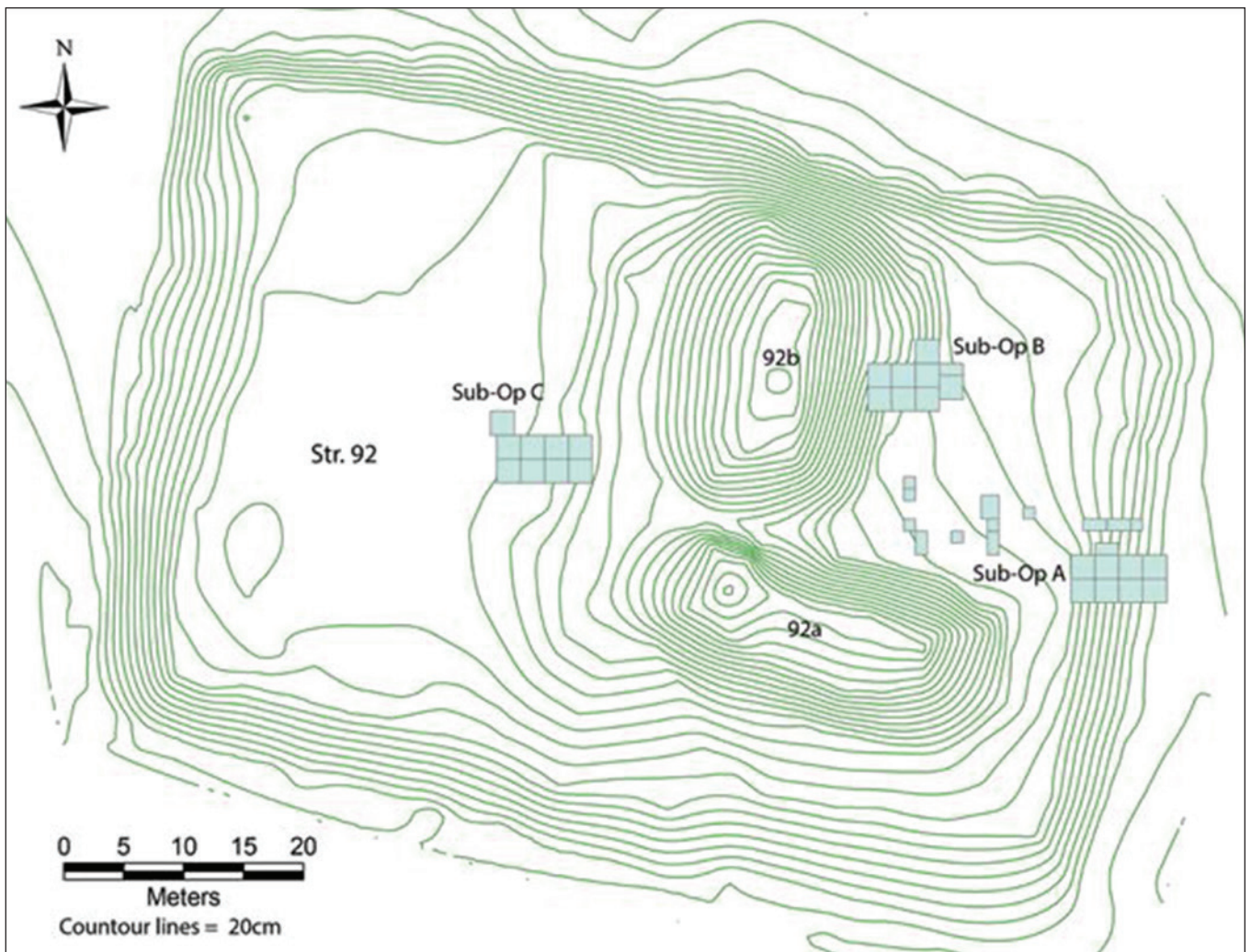


Figure 6. Map of Structure 92 with excavation units shown in grey.

Preclassic and 25.8% dated to the Late Classic. Eleven of the platforms that received off-mound test-pitting had a majority of sherds from the Late Preclassic, while the remaining five had a majority of Late Classic sherds. Surface collections overwhelmingly dated to the Late Classic, a trend at odds with ceramics from test pitting; therefore, these collections were not included in subsequent calculations. Ceramic evidence indicates the vast majority of Ucanha's built landscape—including three pyramids over 8 m tall (Structures 147, 148, and 151); a series of intrasite *sacbeob* and associated termini groups (Structures 13, 150, and 120); and early iterations of a palace (Structure 92)—were in place by the end of the Late Preclassic. Finally, excavations from Structure 92 uncovered (Figure 6) the presence of a Terminal Preclassic substructure (92c-Sub-IV) that had exterior walls covered in stucco and painted in a red mat motif, which is an icon that is associated with rulership (Fash 1991; Justeson et al. 1985) (Figure 7a and 7b). Elsewhere we have argued this structure was an animate part of the landscape that protected and highlighted political authority (Hutson et al. in press). Interestingly, 92c-SubIV was carefully buried by the



a



b

Figure 7. Images of the outside of 92c-subIV showing walls covered in stucco and painted red with mat motif (a) and a close up of the red mat motif (b).

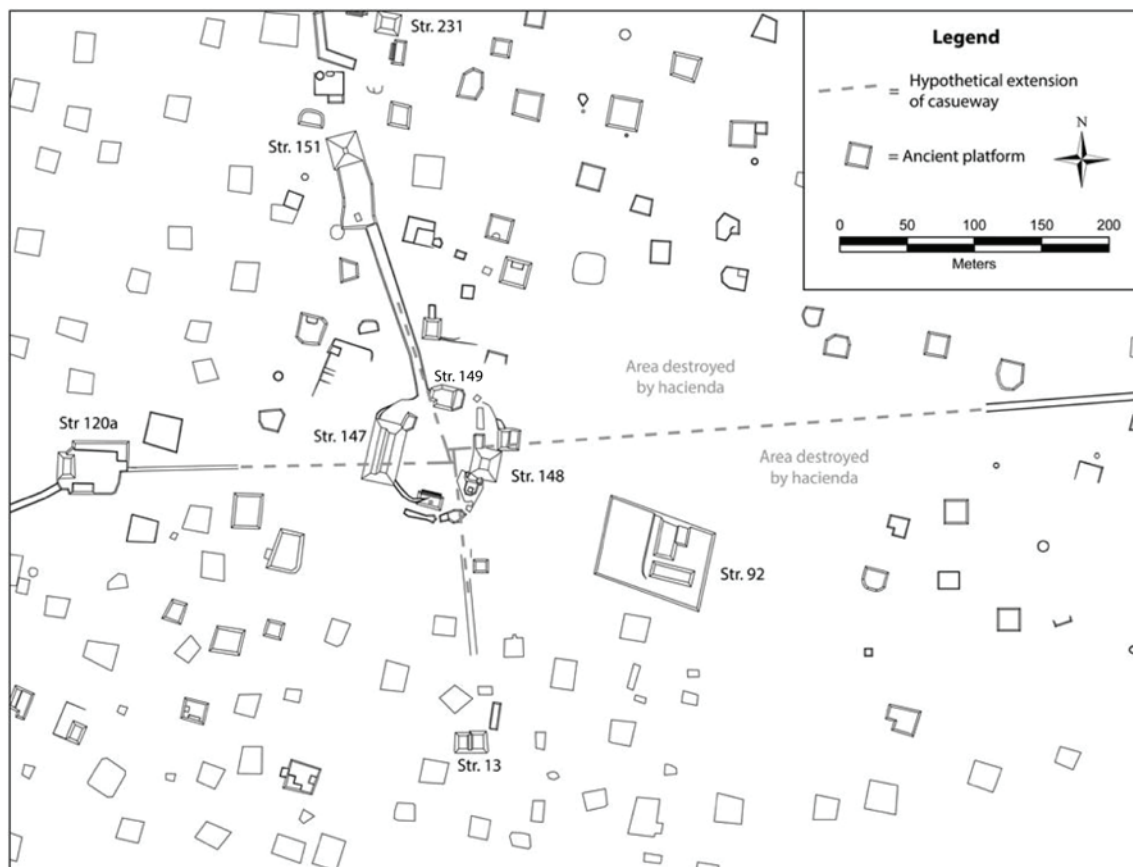


Figure 8. Map of the central portion of Ucanha showing causeways and termini structures. The causeways have been extended to show how they would converge in the central plaza.

end of the Terminal Preclassic (~CE 400), suggesting a loss of political autonomy. Nevertheless, by the end of the Preclassic, multiple monumental buildings had been constructed, the site population had reached its apex, and residential compounds had consumed diverse household ceramics, all of which attest to the communal prosperity of the site.

Sacred Landscapes: Community-Level Prosperity and Building Social Cohesion

During the Terminal Preclassic, Ucanha underwent major monumental construction episodes, which attests to prosperity at the community-level. Civic-ceremonial construction at this time across the Northern Lowlands was widespread and likely the result of emerging elites trying to “recruit and retain migrants” (Bey 2006:29); therefore, monumental construction projects during this time were a source of communal pride and a materialization of collective ideology (Glover and Stanton 2010; Ringle 1999; Ringle et al. 2014; see also Hutson 2002; Pauketat 2000). Ucanha’s built landscape incorporated components of sacredness into the landscape, including four causeways converging towards the main plaza (Figure 8), which can be seen as an idealized representation of the Maya cosmos (Mathews and Garber 2004; Stanton and Freidel 2005; cf. Normark 2008, 2010). Excavations of these causeways and respective terminus groups indicate

they were constructed during the Terminal Preclassic and were probably important integrative features associated with communal events, such as theatrical performances and pilgrimage fairs, that provided economic opportunities in addition to moments of sociality (Freidel 1981). All of these *sacbeob* terminate at structures with plaza areas that were built during the Late Preclassic, with the exception of the eastern *sacbe*, which likely had a terminus structure destroyed by a modern hacienda (Figure 9). These causeways likely facilitated ritual processions from the core to the periphery, which helped forge a wider sense of inclusion and trust through moments of *communitas* (see image facing title for an artist’s reconstruction of a ritual procession along a *sacbe* at Ucanha; see also Ringle 1999).

The central plaza of Ucanha would be an ideal setting for a community-wide ritual since it could have fit the entire population (following Inomata 2006:812) and would be the axis mundi of a quincunxial site layout. Evidence from the central plaza suggests it was a more accessible space during the Late Preclassic—thereby facilitating integration of the general populace—however, by the transition to the Early Classic, access to this area was restricted by a series of walls built around it. Excavations directly in front of an east-west pyramid complex—Str. 147 and 148 (Figure 8)—yielded ceramics and a radiocarbon sample (2,079 +/- 43 years BP; 2 sigma 202 BCE – CE 18) from beneath a series of floors indicating this plaza was largely constructed during the Late Preclassic. Additionally, Str. 149 (Figure 8), which lies immediately to the east of the northern *sacbe* that runs to the tallest pyramid at Ucanha, contains a construction phase

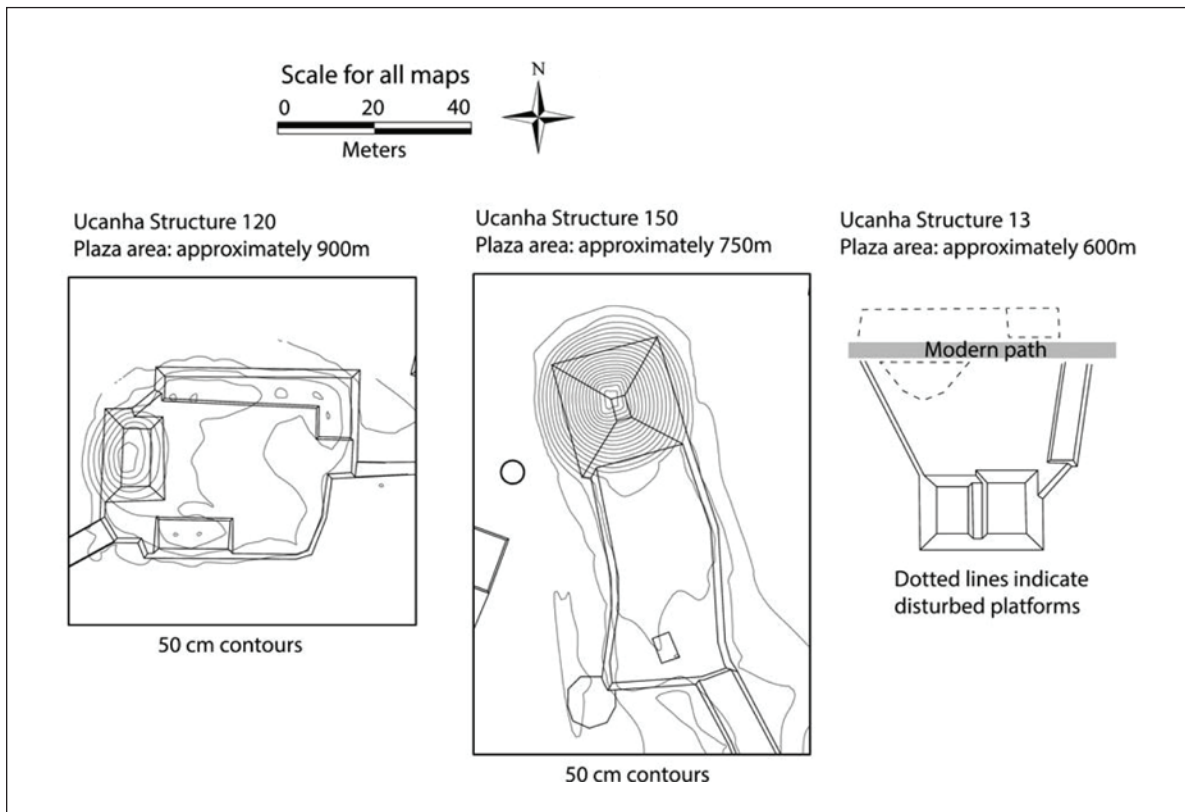


Figure 9. Terminus groups of Ucanha’s roadways with estimated plaza areas. Map modified from Hutson and Welch 2014.

with a megalithic staircase that leads to the central plaza. This broad, flat structure would have likely functioned as theatrical focal point elevated 2.5 m over the plaza-filled crowd. While it is tempting to envision these monumental constructions, and the organized labor they represent, as aspirations to legitimize centralized authority, it is important to remember the laborers who donated their energy were not duped into doing so, but rather were taking part in a social process of integration that only later possibly became a material component of “naturalized” hierarchy (Pauketat 2000; Ringle 1999). Yet, the construction of a wall around the central plaza toward the end of the Preclassic indicates this space became less accessible to the general populace. Around the same time, Izamal emerges as a regional superpower, possibly covering an area over 53 km² (Hutson 2012; Millet Cámara 1999), and 92c-SubIV is buried, indicating a loss of political autonomy at Ucanha.

Quantifying Household Quality of Life Through Gini Coefficients

Households are not autonomous but are linked together through economic, political, and ecological relations and can influence the broader political success of a community. Moreover, the household is one the most salient components of identity where successful integration into the larger community means satisfactory levels of wellbeing must be sustained for broader sociopolitical prosperity. As such, inter-household inequalities, which can accompany broader political-economic changes, can be a point of tension that threaten community success (Brumfiel 1994; Joyce 2008). Since other artifact classes such as obsidian and jade are, to date, largely absent from households at Ucanha, we use ceramic assemblages and architectural elaborations as proxies for QOL. While attempts to reconstruct QOL in the past will inherently be incomplete and part of wellbeing is experiential and subjective, recent methods strive to quantify aspects of social distinction. This methodological approach is useful because it (1) helps connect empirical data and high-level theory through testable models (Smith 2011) and (2) allows data sets to be compared across time, space, and degree of social complexity (Oka et al. 2018; Peterson and Drennan 2018; Smith et al. 2018). One method of quantifying access to resources is calculating Gini coefficients. A Gini coefficient measures the degree of concentration of a given unit among the population where a coefficient of 0 would indicate complete equality of distribution (all households have the same amount of a given unit) and a coefficient of 1 would indicate complete inequality of distribution (one household would have all of that given unit). One way to calculate a Gini coefficient is the “spreadsheet method” (Chase 2017). Common archaeological constructions of Gini coefficients include measuring architectural volume and surface area, domestic artifacts, and burial goods (Smith et al. 2018:Figure 1.2).

Megalithic Architecture as Quality of Life

The use of megalithic stones is a hallmark of the greater Ucanha area as well as an indicator of greater household quality of life as it would have required extra-household networks to procure, shape, and transport. Megalithic architecture would have also been a measure of wealth according to Smith’s construct of household QOL. The construction of megalithic structures would have integrated people through the “sociality of stone” at the intimate, albeit comparatively short-lived, level of intra-household interactions (Hutson and Davies 2015). These individual

stones—weighing between 1250 and 2700 kilograms per m³ according to experimental studies (Sidrys 1978)—would require the coordinated movement between two or more laborers, a practice that would strengthen intra-household, and possibly inter-household, relations (Hutson and Davies 2015:14-15).

In Mesoamerica, architectural investment has been used as a proxy for a household's ability to mobilize labor and resources and, as such, an indicator for wealth and social distinction (Abrams 1994; Carmean 1991; Feinman et al. 2018; Hirth 1993; Hutson 2010; Kowalewski et al. 1992; Smith 1987). More specifically, recent investigations have calculated Gini coefficients as a method to quantify these energetic differences (Chase 2017; Feinman et al. 2018; Hutson 2016). In an attempt to quantify household QOL, we calculated the Gini score for volume and surface area of 11 platforms (Figure 4, excluding structures 19, 29, 400, and 518), all of which had megalithic architecture and at least 35% of each platform's ceramics dated to the Late Preclassic. At Ucanha, the Gini score for volume was 0.480, which serves as a proximate measure for the ability to mobilize labor. Since cross-cultural comparisons of households show larger living spaces also positively correlate with wealth (Netting 1982; Reid and Whittlesey 1982; Wilk and Rathje 1982), Gini scores for surface area were also calculated for these 11 platforms (0.38). To put these numbers in context, intensive agriculturalists in non-urban settlements had a mean Gini score of 0.57 for overall distribution of wealth (ranging from 0.45 – 0.71; Smith et al. 2010). In other studies across Mesoamerica (Chase 2017:Table 2), Gini scores for living area ranged from 0.10 – 0.71 (mean 0.32) and from 0.19 – 0.63 (mean 0.34) for architectural volume. Thus, compared to other sites in Mesoamerica, Gini scores for architecture at Ucanha were above average, indicating that the built environment at the household scale was a node of inequality.



Ceramic Diversity as Quality of Life

In the absence of diverse household assemblages indicating broader capabilities (e.g., craft production tools or long-distance commodities), access to a variety of decorated ceramics can be used to quantify household wellbeing. For example, greater access to visually ostentatious serving wares, such as painted pottery, can indicate an elevated wealth and QOL because these households have the material ability to host more rituals, such as extra-household feasts, and these would require the ability to garner substantial resources such as foodstuffs, labor to prepare and cook meals, and costly ceramic wares (Fry 2003; Smith 1987:313). Paint and other surface treatments also add to a labor theory of value as seen in the production step measure (Feinman et al. 1981). Indeed, during the Terminal Preclassic, Glover and Stanton (2010:72) propose five ceramic spheres emerged vis-à-vis “from growing populations attempting to differentiate themselves in a social environment marked by increasing stratification.”

Since the capabilities component of QOL is quantified by the diversity of possessions in and access to external social networks, we argue that calculating Gini coefficients for ceramic distribution can help quantify QOL across time. If “higher levels of artifact diversity point to a higher quality life” (Smith 2015:4) then measuring access to different varieties of finely-made, decorated ceramics can help quantify wellbeing. These decorated types include bichromes (Huachinango,

Dzilam Verde, and Carolina); cream slipped wares from the Peten (Flor); numerous Xanaba types with surface treatments and/or zoned bichrome slips (Caucel, Dzulpach, Kana, Chuchen, and Pixoy); similar types within Sierra (Laguna Verde and Altamira); and red-to-yellow-to-orange slips wares such as Shangurro and Iberia Ixcanrio. During the Late Preclassic, all but one of the 15 households had access to at least one type of bichrome or imported decorated ceramics. Indeed, the average number of different decorated ceramic types is 3.27 ($s = \pm 2.054$) for households that had at least 35% of ceramics dating to this period.

In order to analyze ceramic distribution from the Late Preclassic to the Early Classic, we also compiled the number of distinct bichrome varieties and the percentage of bichromes per household assemblage for the Late Preclassic and compared these to the number of distinct polychrome varieties for the Early Classic. Households with greater number of bichrome varieties have greater QOL since diversity of possessions within an artifact class and stylistic breadth equates to elevated capabilities. Some structures (19, 29, 400, and 518) were ephemerally occupied during the Late Preclassic (<5% of the ceramics), so they were excluded. During the Late Preclassic, presence/absence of bichrome varieties yielded a Gini coefficient of 0.0960 suggesting households had relatively equal access to a number of decorated ceramics. The distribution of bichromes percentages was more uneven, however, with a Gini coefficient of 0.502, suggesting household QOL was not equal with regard to the proportion of decorated ceramics. Nevertheless, nearly every platform occupied during the Late Preclassic had access to decorated bichromes.

Furthermore, the relatively elevated access of Huachinango and Shangurro at Ucanha and throughout the greater region index external networks (i.e., capabilities) with Ek Balam and Izamal, which are, respectively, possible production locales of these bichromes (Bey et al. 1998; Dzul Gongora et al. 2017; Plank et al. 2018). Looking at the percentage of non-monumental contexts (Table 2), over 83% of households in hinterland settlements and roughly the same percentage at the major sites of Ucanha and Ucí have access to Shangurro. Households at Ucanha also have greater access to Huachinango as well as Dzilam, which indicates higher capabilities and, therefore, a higher QOL than other settlements along the causeway. If a variety Shangurro was produced around Izamal, as preliminary X-ray diffraction studies indicate (Dzul Gongora et al. 2017; Plank et al. 2018), this wide distribution would suggest broader political and economic ties to Izamal. Given the scope of access throughout the region, Shangurro's distribution possibly occurred through some incipient market exchange (see also Hutson in press).

This trend of near-universal access to decorated ceramics, however, is almost completely inverted in the distribution of Early Classic polychromes (i.e., Dzidzibachi, Tituc, Timucuy, Aguila, and Dos Arroyos), which had a Gini coefficient of 0.851, a score indicating a highly unequal distribution. By the Early Classic, only six of the 15 households had access to decorated polychrome ceramics. While higher diversity counts in the Late Preclassic are probably the result of ceramic heterogenization in the Northern Lowlands in general during this time (Glover and Stanton 2010), it is clear that by the first couple of centuries into the Early Classic the allocation of decorated ceramics is more circumscribed than previous periods. Some authors (Glover and Stanton 2010; Reese-Taylor and Walker 2002) claim the narrower distribution of Early Classic polychromes is the result of elite gift-giving economic transactions that tried to solidify alliances. Given the expansion of Izamal's sociopolitical power during this period, local elites at Ucanha might have strategically disseminated polychromes to reinvigorate sociopolitical ties

with wealthier households.

Therefore, by the Terminal Preclassic the overall prosperity of Ucanha, as measured by the sum of household QOL, appears relatively high. At the household level, capabilities as manifested by ceramic diversity appears relatively equal with regard to bichromes, but the overall access to different ceramic varieties and the style networks represented therein suggest that materializations of social distinction and variations of QOL were present during the Late Preclassic. With the introduction of Early Classic polychromes, ceramic materializations of social distinctions become pronounced as the distribution of fine ceramics becomes more circumscribed to fewer households thereby diminishing household QOL.

Table 2. Percentage of households with access to bichrome ceramics from two largest sites (Ucanha and Ucí) and a hinterland occupation on the intersite causeway.

	Carolina (% of contexts with access)	Dzilam (% of contexts with access)	Huachinango (% of contexts with access)	Shangurro (% of contexts with access)
Ucanha (n =11)	45.45%	81.82%	81.82%	90.91%
Ucí (n = 18)	27.78%	50%	61.11%	72.22%
Hinterlands (n = 12)	0%	0%	41.76	83.33%

Conclusion

The material end-results of integration are the culmination of negotiation between ruler and subjects alike: as Joyce (2008:223) states, “The outcome of the negotiation of power may bolster the social position of nobles, but it usually does so in ways that reflect some degree of compromise resulting from the interactions of varied social actors.” This integration, furthermore, would have happened through more frequent, intimate interactions of the household compared to the more sporadic, yet grandiose scale of community-wide interactions. At Ucanha during the Late Preclassic, population booms, while large construction projects, community-wide processions, and relatively even household QOL all facilitated integration. However, by the middle of the Early Classic there are signs of decreasing QOL as populations decline, household access to decorated ceramics diminishes, and Structure 92c-subIV is buried. The central plaza of Ucanha also becomes less accessible by the conclusion of the Preclassic, suggesting it no longer functioned as a place of community-wide interaction. Throughout the project area, the Late Preclassic appears to be a time of elevated community prosperity and household QOL that falters during the Early Classic as moral authority is undermined by changing strategies of polity integration.

References

- Abrams, Elliot M.
1994 *How the Maya Built Their World: Energetics and Ancient Architecture*. University of Texas Press, Austin.
- Anderson, David S.
2011 Xtobo, Yucatan, Mexico, and the Emergent Preclassic of the Northern Maya Lowlands. *Ancient Mesoamerica* 22: 301–322.
- Arponen, V.P.J., Johannes Müller, Robert Hofmann, Martin Furholt, Arthur Ribeiro, Christian Horn, and Martin Hinz
2016 Using the Capability Approach to Conceptualise Inequality in Archaeology: The Case of the Late Neolithic Bosnian Site Okoliste c. 5200 - 4600 BCE. *Journal of Archaeological Method and Theory* 23(2): 541–560.
- Bey, George J., Tara M. Bond, William M. Ringle, Craig A. Hanson, Charles W. Houck, and Carlos Peraza Lope
1998 The Ceramic Chronology of Ek Balam, Yucatan, Mexico. *Ancient Mesoamerica* 9(1): 101–120.
- Bey, George J. III
2006 Changing Archaeological Perspectives on the Northern Maya Lowlands. In *Lifeways in the Northern Maya Lowlands: New Approaches to Archaeology in the Yucatán Peninsula*, edited by Jennifer P. Mathews and Bethany A. Morrison, pp. 13–37. University of Arizona Press, Tuscon.
- Brumfiel, Elizabeth M.
1994 Factional Competition and Political Development in the New World: An Introduction. In *Factional Competition and Political Development in the New World*, edited by Elizabeth M. Brumfiel and John W. Fox, pp. 3–13. Cambridge University Press, Cambridge.
- Carmean, Kelli
1991 Architectural Labor Investment and Social Stratification at Sayil, Yucatan, Mexico. *Latin American Antiquity* 2(2): 151–165.
- Chase, Adrian S. Z.
2017 Residential Inequality Among The Ancient Maya: Operationalizing Household Architectural Volume at Caracol, Belize. *Research Reports in Belizean Archaeology* 14: 31–39.
- Deneulin, Séverine, and J. Allister McGregor
2010 The capability approach and the politics of a social conception of wellbeing. *European Journal of Social Theory* 13(4): 501–519.
- Dzul Gongora, Sara, Yoly Paloma Carrillo, Rafael Burgos Villanueva, and Miguel Covarrubias Reyna
2017 *Reflejo de una Etapa Cerámica en Izamal: El Protoclásico, una Propuesta*. Instituto Nacional de Antropología e Historia, Mexico, DF.
- Eva Lemonnier
2012 Neighborhoods in Classic Lowland Maya Societies: Their Identification and Definition from the La Joyanca Case Study (Northwestern Petén, Guatemala). In *The Neighborhood as a Social and Spatial Unit in Mesoamerican Cities*, edited by M. Charlotte Arnauld, Linda Manzanilla, and Michael E. Smith, pp. 181–201. University of Arizona Press, Tuscon.

Fash, William L.

1991 *Scribes, Warriors, and Kings: The City of Copan and the Ancient Maya*. Thames and Hudson, London.

Feinman, Gary M., Ronald K. Faulseit, and Linda M. Nicholas

2018 Assessing Wealth Inequality in the Pre-Hispanic Valley of Oaxaca: Comparative Implications. In *Ten Thousand Years of Inequality: The Archaeology of Wealth Differences*, edited by Timothy A. Kohler and Michael E. Smith, pp. 262–287. The University of Arizona Press, Tuscon.

Feinman, Gary M., Steadman Upham, and Kent G. Lightfoot

1981 The Production Step Measure : An Ordinal Index of Labor Input in Ceramic Manufacture. *American Antiquity* 46(4): 871–884.

Glover, Jeffrey B., and Travis W. Stanton

2010 Assessing the Role of Preclassic Traditions in the Formation of Early Classic Yucatec Cultures, México. *Journal of Field Archaeology* 35(1): 58–77.

Golden, Charles, and Andrew K. Scherer

2013 Territory, Trust, Growth, and Collapse in Classic Period Maya Kingdoms. *Current Anthropology* 54(4): 397–435.

Hendon, Julia A.

2003 Feasting at Home: Community and House Solidarity among the Maya of Southeastern Mesoamerica. In *The Archaeology and Politics of Food and Feasting in Early States and Empire*, edited by Tamara L. Bray, pp. 203–234. Kluwer Academic/Plenum, New York.

Hirth, Kenneth G.

1993 Identifying Rank and Socioeconomic Status in Domestic Contexts: An Example from Central Mexico. In *Prehispanic Domestic Units in Western Mesoamerica*, edited by Robert S. Santley and Kenneth G. Hirth, pp. 121–146. CRC Press, Boca Raton, FL.

Houston, Stephen D., Hector Escobedo, Mark Child, Charles W. Golden, and René Muñoz

2003 The Moral Community: Maya Settlement Transformation at Piedras Negras, Guatemala. In *Social Construction of Ancient Cities*, edited by M. L. Smith, pp. 212–253. Smithsonian Institution Press, Washington, D.C.

Hutson, Scott R.

in press Distributional Heuristics in Unlikely Places: Incipient Marketing and Hidden Commerce. In *Urban Commerce in Ancient Mesoamerica*, edited by Elizabeth Paris. Archaeological Papers of the American Anthropological Association.

2002 Built space and bad subjects: Domination and resistance at Monte Alban, Oaxaca, Mexico. *Journal of Social Archaeology* 2(1): 53–80.

2010 *Dwelling, Identity, and the Maya: Relational Archaeology at Chunchucmil*. Altamira Press, Lanham, MD.

2012 Urbanism, Architecture, and Internationalism in the Northern Lowlands during the Early Classic. In *The Ancient Maya of Mexico: Reinterpreting the Past of the Northern Maya Lowlands*, edited by Geoffrey E. Braswell, pp. 117–140. Equinox Publications, Bristol, CT.

2016 *The Ancient Urban Maya: Neighborhoods, Inequality, and Built Form*. University Press of Florida, Gainesville.

- Hutson, Scott R., and Gavin Davies
2015 How Material Culture Acted on the Ancient Maya of Yucatan, Mexico. *Archaeological Papers of the American Anthropological Association* 26: 10–26.
- Hutson, Scott R., Barry Kidder, Céline Lamb, Daniel Vallejo-Cáliz, and Jacob Welch
2016 Small buildings and small budgets: making Lidar work in Northern Yucatan, Mexico. *Advances in Archaeological Practice* 4(3): 268–283.
- Hutson, Scott R., and Jacob A. Welch
2014 Sacred Landscapes and Building Practices At Uci, Kancab, and Ucanha, Yucatan, Mexico. *Ancient Mesoamerica* 25(02): 421–439.
- Hutson, Scott R., Jacob Welch, Shannon Plank, and Barry B. Kidder
In press Buried Alive: Buildings, Authority, and Gradients of Being in Northern Yucatán, Mexico. In *Sacred Matter: Animism and Authority in Pre-Columbian America*, edited by Steve Kosiba, John Janusek, and Tom Cummins. Dumbarton Oaks, Washington, D.C.
- Inomata, Takeshi
2006 Plazas, Performers, and Spectators: Political Theaters of the Classic Maya. *Current Anthropology* 47(5): 805–842.
- Joyce, Arthur A.
2008 Domination, Negotiation, and Collapse: A History of Centralized Authority on the Oaxaca Coast before the Late Postclassic. In *After Monte Alban: Transformation and Negotiation in Oaxaca, Mexico*, edited by J. Blomster, pp. 219–254. University Press of Colorado, Boulder.
- Justeson, John S., William M. Norman, Lyle Campbell, and Terrence Kaufman
1985 The Foreign Impact on Lowland Mayan Language and Script. Middle American Research Institute Publication 53. Tulane University, New Orleans.
- Kidder, Barry B., Joseph Stevenson, and Scott R. Hutson
2014 Transformations at a Secondary Center: Survey, Mapping and Excavation at Ucanha. In *Paper presented at the 79th Annual Meeting of Society for American Archaeology, Austin*.
- Kowalewski, Stephen A., Gary M. Feinman, and Laura Finsten
1992 “The Elite” and Assessment of Social Stratification in Mesoamerican Archaeology. In *Mesoamerican Elites: An Archaeological Assessment*, edited by Diane Z. Chase and Arlen F. Chase, pp. 259–277. University of Oklahoma Press, Norman.
- Kurjack, Edward B., and E. Wyllys V Andrews
1976 Early Boundary Maintenance in Northwest Yucatan, Mexico. *American Antiquity* 41(3): 318–325.
- Maldonado C., Rubén
1979 Izamal-Aké, Cansahcab-Ucí, Sistemas Prehispánicas del Norte de Yucatán. *Boletín de la Escuela de Ciencias Antropológicas de la Universidad de Yucatán* 6(36): 33–44.

- 1995 Los Sistemas de Caminos del Norte de Yucatan. In *Seis Ensayos sobre Antiguos Patrones de Asentamiento en el Area Maya*, edited by E. Vargas Pacheco, pp. 68–92. Universidad Nacional Autonoma de Mexico, Instituto de Investigaciones Antropologicas, Mexico, DF.
- Marken, Damien B., and James L. Fitzsimmons
2015 Introducing Maya Polities: Models and Definitions. In *Classic Maya Polities of the Southern Lowlands: Integration, Interaction, Dissolution*, edited by Damien B. Marken and James L. Fitzsimmons, pp. 3–37. University Press of Colorado, Boulder, CO.
- Mathews, Jennifer P., and James F. Garber
2004 Models of Cosmic Order: Physical expression of sacred space among the ancient Maya. *Ancient Mesoamerica* 15: 49–59.
- Mathews, Jennifer P., and Rubén Maldonado C.
2006 Late Formative and Early Classic Interaction Spheres Reflected in the Megalithic Style. In *Lifeways in the Northern Maya Lowlands: New Approaches to Archaeology in the Yucatán Peninsula*, edited by Jennifer P. Mathews and Bethany A. Morrison, pp. 95–118. University of Arizona Press, Tuscon.
- Millet Cámara, Luis
1999 Los mayas de Yucatán: Entre las colinas y el estero. *Arqueología Mexicana* 7(37): 4–13.
- Netting, R. M.
1982 Some Home Truths on Household Size and Wealth. *American Behavioral Scientist* 25(6): 641–661.
- Normark, Johan
2008 The Triadic Causeways of Ichmul: Virtual Highways Becoming Actual Roads. *Cambridge Archaeological Journal* 18(2): 215–238.
2010 Involutions of Materiality. *Journal of Archaeological Method and Theory* 17(2): 132–173.
- Oka, Rahul C., Nicholas Ames, Meredith S. Chesson, Ian Kujit, Chapurukha M. Kusimba, Vishwas D. Gogte, and Abhijit Dandekar
2018 Dreaming Beyond Gini: Methodological Steps Toward a Composite Archaeological Inequality Index. In *Ten Thousand Years of Inequality: The Archaeology of Wealth Differences*, edited by Timothy A. Kohler and Michael E. Smith, pp. 67–95. The University of Arizona Press, Tuscon.
- Pauketat, T., and S. M. Alt
2005 Agency in a Postmold? Physicality and the Archaeology of Culture-Making. *Journal of Archaeological Method and Theory* 12(4): 257–281.
- Pauketat, Timothy R
2000 The tragedy of the commoners. In *Agency in Archaeology*, edited by M.-A. Dobres and John Robb, pp. 113–129. Routledge, London.
- Peterson, Christian E., and Robert D. Drennan
2018 Letting the Gini Out of the Bottle: Measuring Inequality Archaeologically. In *Ten Thousand Years of Inequality: The Archaeology of Wealth Differences*, edited by Timothy A. Kohler and Michael E. Smith, pp. 39–66. The University of Arizona Press, Tuscon.

- Plank, Shannon, Rafael Burgos, Scott Hutson, Yoly Palomo, and Miguel Covarrubias
2018 Uci and Izamal: Influence and Interaction in the Northern Maya Lowlands. *Paper presented at the 83rd Annual Meeting of Society for American Archaeology, Washington, D.C.*
- Reese-Taylor, Katherine, and Debra S. Walker
2002 The Passage of the Late Preclassic into the Early Classic. In *Ancient Maya Political Economies*, edited by Marilyn A. Masson and David A. Freidel, pp. 87–122. Altamira Press, Walnut Creek, CA.
- Reid, J. J., and S. M. Whittlesey
1982 Households at Grasshopper Pueblo. *American Behavioral Scientist* 25(6): 687–703.
- Ringle, William M.
1999 Pre-Classic Cityscapes: Ritual Politics among the Early Lowland Maya. In *Social Patterns in Pre-Classic Mesoamerica*, edited by David C. Grove and Rosemary A. Joyce, pp. 183–223. Dumbarton Oaks, Washington, D.C.
- Ringle, William M., George J. III Bey, and Tomás Gallareta Negrón
2014 The Genesis of Social Complexity in the Puuc Hills of Northern Yucatan, Mexico. In *Paper presented at the 79th Annual Meeting of Society for American Archaeology, Austin.*
- Sen, Amartya K.
1999 *Development as Freedom*. Oxford University Press, Oxford.
- Sidrys, Raymond V.
1978 Megalithic Architecture and Sculpture of the Ancient Maya. In *Papers on the Economy and Architecture of the Ancient Maya*, edited by Raymond V. Sidrys, pp. 155–183. Institute. University of Chicago Press, Los Angeles.
- Smith, Eric Alden, Kim Hill, Frank W. Marlowe, David Nolin, Polly Wiessner, Michael Gurven, Samuel Bowles, Monique Borgerhoff Mulder, Tom Hertz, and Adrian Bell
2010 Wealth Transmission and Inequality among Hunter Gatherers. *Current Anthropology* 51(1): 19–34.
- Smith, Michael E.
1987 Household Possessions and Wealth in Agrarian States: Implications for Archaeology. *Journal of Anthropological Archaeology* 6: 297–335.
2015 Quality of Life and Prosperity in Ancient Households and Communities. In *The Oxford Handbook of Historical Ecology and Applied Archaeology*, edited by Christian Isendahl and Daryl Stump, pp. 1–15. Oxford University Press, Oxford.
- Smith, Michael E., Timothy A. Kohler, and Gary M. Feinman
2018 Studying Inequality's Deep Past. In *Ten Thousand Years of Inequality: The Archaeology of Wealth Differences*, edited by Timothy A. Kohler and Michael E. Smith, pp. 3–38. The University of Arizona Press, Tuscon.
- Smith, Michael E., and Juliana Novic
2012 Neighborhoods and Districts in Ancient Mesoamerica. In *The Neighborhood as a Social and Spatial Unit in Mesoamerican Cities*, edited by M. Charlotte Arnauld, Linda Manzanilla, and Michael E. Smith, pp. 1–26. University of Arizona Press, Tuscon.

Stanton, Travis W., and David A. Freidel

2005 Placing the Centre, Centring the Place: The Influence of Formative Sacbeob in Classic Site Design at Yaxuna, Yucatan. *Cambridge Archaeological Journal* 15(2): 225–249.

Taube, Karl

1995 The Monumental Architecture of the Yalahau Region and the Megalithic Style of the Northern. In *The View from Yalahau: 1993 Archaeological Investigations in Northern Quintana Roo, Mexico*, edited by Scott L. Fedick and Karl Taube, pp. 23–58. Latin American Studies Program, University of California, Riverside.

Wilk, Richard, and William Rathje

1982 Household Archaeology. *American Behavioral Scientist* 25(6): 617–640.

Yaeger, Jason, and Marcello A. Canuto

2000 Introducing an archaeology of communities. In *Archaeology of Communities: A New World Perspective*, edited by Marcello A. Canuto and Jason Yaeger, pp. 1–15. Routledge, London.

The Return of the Toltecs: Reconsidering the “Toltec Invasion Hypothesis” at Chichen Itza

by

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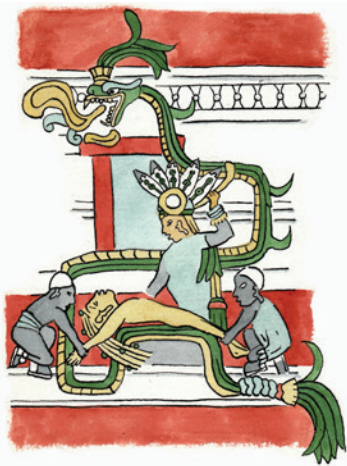
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Similarities in art and architecture between Tula, in Central Mexico, and Chichen Itza, in Yucatan, in the era between the Classic and Postclassic periods indicate a close relationship between these two sites. Yet, there has been much debate over the nature of this relationship. Late 20th century studies almost universally rejected the earlier interpretation of a Toltec conquest of Chichen Itza in favor of elite emulation hypotheses that argued this was only an “international style” adopted by many independent elites across Mesoamerica. However, the latest chronology produced at Chichen Itza no longer supports the elite emulation hypothesis, instead corresponding closely to that used in the earlier proposals of the Toltec conquest model. This change provides an excellent opportunity to revisit the topic. In this paper, often overlooked ethnohistoric evidence is presented to show that the early Colonial period Maya of Yucatan recognized that, around 500 years earlier, Central Mexicans had conquered Chichen Itza and dominated the peninsula. This convincing evidence is rarely referenced or analyzed by proponents of the elite emulation hypotheses, which have been very popular in the last 25 years.

Keywords: Toltec, Migration, Ethnohistory, Archaeology, Chichen Itza



One of the most controversial topics in Mesoamerican studies is the question of the chronology of Chichen Itza and its relationship with the Central Mexican site of Tula. In this short exposition I have the very limited goal of highlighting an often-overlooked set of facts that I believe are crucial to truly understanding this issue and the history of Chichen Itza. The nature of the so-called “Toltec” or “international” traits at this northern Yucatan site and their chronology have been at the heart of the well-published debate of whether these were the result of a “Toltec Conquest” from Tula or were the product of local Maya rulers simply emulating prestigious foreign art styles and/or participating in an international cult revolving around that of the famous Mesoamerican deity, the “Feathered Serpent” (see Boot 2005, Kristan-Graham 2007, and Gillespie 2007, among many others, for extensive recent discussion of the historiography of this debate). The list of similarities between Tula and Chichen Itza is long and there has been a long history of discussion of these, most famously with Alfred Tozzer’s magnum opus, *Chichen Itza and Its Cenote of Sacrifice* (Tozzer 1957). These similarities include the presence of feathered serpent iconography, especially on support columns and balustrades of major temples, as well as “galleries and halls whose roofs were supported by rows of columns or pillars; pillars bearing images of soldiers wearing related butterfly pectorals, “pillbox” helmets, and carrying atlatl spearthrowers; reclining chacmool sculptures; small atlanteans and standard bearers; and relief sculptures featuring “jaguar-serpent-bird” (or “Tlahuizcalpan-tecuhtli”) icons and images of predatory animals and raptorial birds holding human hearts” (Kristan-Graham & Kowalski 2007:13).



Do these similarities, which indicate a particularly close relationship between Tula and Chichen Itza, suggest a conquest of Chichen Itza by Toltecs (Tozzer 1957) or “Mexicanized Maya” (Thompson 1970) or do they indicate an adoption of these “International” styles of art and material culture by local, Maya elites (see Kowalski & Kristan-Graham 2007 for a recent collection of papers expressing this view)? Or is it due to something else entirely?

Early 20th century studies suggested that Chichen Itza was built in two separate phases. First, an earlier Maya phase was seen in the Terminal Classic period (A.D. 800-900) featuring buildings with dated Maya inscriptions in Puuc-style architecture and associated with Cehpech pottery of northern Yucatec origin. Then, at some point in the tenth century, at the start of the Early Postclassic period (A.D. 900-1200), the site was taken over by Itza from the Gulf Coast and/or Toltecs from Central Mexico who oversaw the construction of the structures of “New Chichen”, including the Castillo, the Great Ballcourt, and the Temple of the Warriors (Tozzer 1957, Thompson 1966, 1970).

The last quarter of the 20th century saw the pendulum of interpretation shift away from foreign conquest models to ones in which the similarities between Chichen Itza and Tula were seen as resulting from decisions of local Maya elites to emulate prestigious styles popular in western Mesoamerica (the term “Toltec” is usually eschewed in these proposals in favor of the term “International”). These interpretations argue there was significant overlap between “Old” and “New” Chichen, with the differences between these two areas not being due to chronological or cultural differences, but to distinct purposes and uses (see Ringle et al. 1998, Boot 2005, and Kowalski and Kristan-Graham 2007).

This debate was long fueled by uncertainty over the Chichen Itza chronology. While the “Old Chichen” buildings often bore hieroglyphic inscriptions with dedicatory dates, the “New Chichen” structures did not. Thus, there was much debate over the exact dates of their construction, with most elite emulation hypotheses proposing that these latter structures were built very close in time to those of the former. With the removal of the chronological distinction between the two “Chichens”, the entire site was argued to date to the Terminal Classic period, and the term “Early Postclassic” fell out of use in discussions about the site’s history.

Most recently, however, a new chronology of Chichen Itza has been proposed by combining a new interpretation of the site’s ceramic chronology (Pérez de Heredia 2010), a Bayesian analysis of radiocarbon dates, and a new study of the site’s stratigraphic chronology produced by recent excavations in both the site’s center and its periphery (Volta and Braswell 2014, Volta et al. 2018). The new chronology is, in fact, quite similar to the old chronology of the mid-20th century, with the buildings of “Old Chichen” being built in the 9th century and those of “New Chichen” being built between ca. A.D. 950 and 1000/1050, after a (near) hiatus at the site between A.D. 900 and 950 (Volta & Braswell 2014:386-389). The dating for “New Chichen” now places its buildings back into the Early Postclassic phase, a term revived by Volta and Braswell.

However, while Volta and Braswell have resurrected the “Early Postclassic” label, they have been quick to stress that they do not want their interpretation to be seen as a return to the Toltec Conquest hypothesis of the past:

“Despite our preference for the phrase “Early Postclassic” to describe the second great period of construction at Chichen Itza, we differ strongly from the traditional model in that we do not see evidence for positing a foreign invasion of either “Toltecs” from Tula or “Putun Maya” from the Gulf Coast. Instead, we believe that most of the Early Postclassic occupants of Chichen Itza were the descendants of the Terminal Classic Maya who lived in the great city and other parts of the northern Maya Lowlands. The emulation of foreign styles, wide-ranging trade relations, and a shared world religion are all plausible explanations for the participation of Chichen Itza in the Early Postclassic Mesoamerican world. Moreover, given that the second great period of Chichen Itza took place several decades after the collapse of powerful cities elsewhere on the peninsula, it seems more proper to explain the growth of the Early Postclassic Itza state in terms of opportunistic expansion into a political vacuum and demographic void rather than as a militaristic conquest. The Early Postclassic at Chichen Itza was a period of great reorganization and experimentation in the aftermath of a general Terminal Classic collapse felt throughout much of the north. But there is no need to resort to foreign migration, invasion, or even regional conquest models as explanations” (Volta and Braswell 2014:393).

While I find the arguments of Volta and Braswell compelling, I disagree with their conclusion. There is, in fact, evidence that has long been overlooked that cannot be easily explained by positing that local Maya elites of northern Yucatan were merely trading with and emulating other parts of Mesoamerica. This evidence strongly suggests the presence of Central Mexicans at Chichen Itza in positions of power. Before presenting this evidence, I should note that the new chronology of Volta and Braswell has not gone unchallenged (see Ringle 2017). However, it can be said that the evidence presented here must be accounted for by all elite emulation arguments, no matter which chronology they follow. Yet, in the last 40 years, when elite emulation arguments have dominated, this evidence has only rarely been referenced, let alone dealt with; something that I believe calls into serious question these hypotheses.

The Evidence for Central Mexicans in Positions of Power at Chichen Itza: The Hieroglyphic Inscriptions of “New Chichen”

Countless books and articles have been written about specific art and architectural motifs appearing at Chichen Itza and whether these derive from Central Mexican or Maya sources. I do not wish to enter that debate here. While I believe that Karl Taube (1994) and others have shown that many of these do indeed derive from Central Mexican “Toltec” sources, the truth is that stylistic arguments are never definitive, especially in the absence of a secure chronology. Even when the sources of certain motifs are clear it is always possible, without wider sources of evidence, to argue that the presence of such motifs in a foreign area are due to elite emulation rather than migration or imperialism. The following considerations cannot so easily be explained away.

The first evidence to consider comes in the form of the hieroglyphic inscriptions from the monuments of “New Chichen”, including the Great Ballcourt and the colonnades surrounding the Temple of the Warriors (Figure 1). There are relatively few of these but they are very unusual in comparison to not only the other inscriptions of Chichen Itza, but to the broader corpus of inscriptions from northern Yucatan and the Maya world in general. Maya hieroglyphic inscriptions, from their first appearance in the Late Preclassic period until their last appearance in the early Colonial period, were characterized throughout by combining logograms and syllabograms in glyphblocks. This contrasts with Central Mexican hieroglyphic writing, where hieroglyphs were simply pictures of the things depicted, with no attempt to squeeze the resulting images into any block form (Helmke & Nielsen 2011, Taube 2011, Zender 2008). Maya and Central Mexican hieroglyphs are visually distinctive and there is essentially no overlap in signs, with signs from each system being immediately recognizable, even if they are not deciphered. Many of the figures portrayed on the piers of the ballcourt and colonnade structures are identified by hieroglyphic names and, in every single instance, these names are written in Central Mexican hieroglyphs.

This case is unprecedented at any Maya site, nor was it ever repeated. These inscriptions are universally acknowledged to name the figures below them, who are pretty much exclusively warriors in “Toltec” costume. It can thus be noted that these are warriors in Central Mexican costume with their names spelled out using Central Mexican hieroglyphs. One of these name glyphs is a snake above a star (Figure 2) and, while it is possible to read this as Kan Ek’, “Snake Star” in Mayan (Schele and Mathews 1998:245), one can as easily read such a name in Nahuatl or other Central Mexican indigenous languages. In fact, the name Citlalcoatl (“Star Snake”) is one known to have been used by Aztec nobles, including a brother of Motecuhzoma I (Vigil 1878:249, 268). While one might object that this name at Chichen Itza is written with the snake above the star, and thus favor the Maya reading, it must be emphasized that the hieroglyphs in which the name is written are clearly part of the western Mesoamerican corpus of signs, not from the Maya one, and, in the Central Mexican writing system, there is no rule as to which sign should be read first in a multiple-sign hieroglyph. Furthermore, given the way calendrical signs are written at Chichen Itza (see below), with the coefficient below the main sign, it is clear that at least some of the Chichen Itza hieroglyphs are meant to be read from bottom to top.

The few calendric signs in the corpus of “New Chichen” inscriptions emphasize the foreign nature of these hieroglyphs and the people whom they name. Two of the most important figures in the Lower Temple of the Jaguar (in the Great Ballcourt) are also shown and named on the columns of the North Temple of the same complex (Figure 3); names written as day names in the

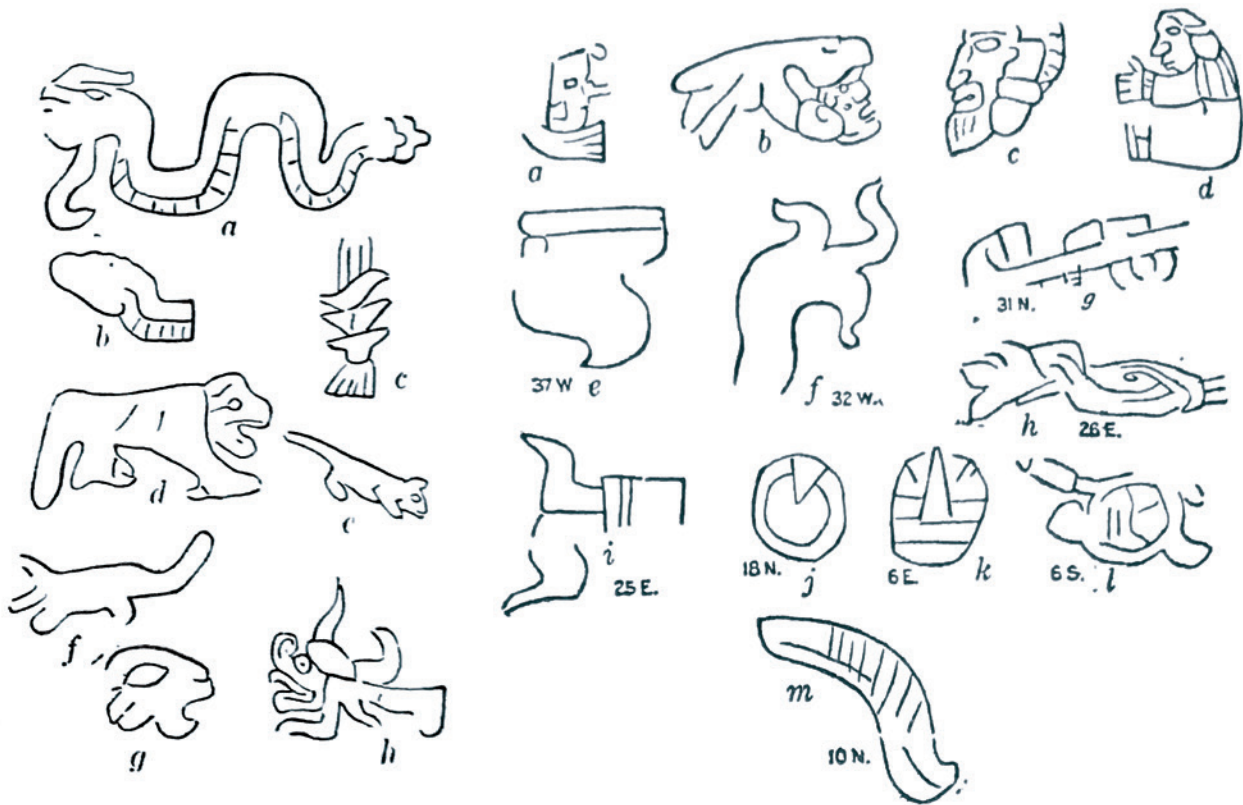


Figure 1. Non-Maya hieroglyphs used to name figures portrayed on the columns of the Northwest Colonnade, in front of the Temple of the Warriors, at Chichen Itza. Drawings after Morris et al. 1931:312.

Central Mexican sacred 260-day calendar (Schele and Mathews 1998:251-252). These day names are 1 “Reptile Eye” and 5/6 “Knot/Glyph A”. The closest analogy to these glyphs at Chichen Itza come from the stelae of Xochicalco and the murals of Cacaxtla – Late/Terminal Classic sites from Central Mexico with heavy Maya influence (Caso 1962, Helmke and Nielsen 2011, Smith and Hirth 2000). It is important to note that these day names are so clearly foreign, and definitely not simply variants of Maya day names, that we are not even certain which Maya day names they correspond to. Given that the use of day names as personal names in Mesoamerica seems to reflect the date on which someone was born, these individuals were likely born into a society using a Central Mexican calendar, something for which there is no attested use in Yucatan at any time.

Thus, during the period of most intense similarities between Chichen Itza and Tula, the ruling elite of Chichen Itza chose to portray themselves in Central Mexican “Toltec” attire and to record their names with Central Mexican hieroglyphs – some of which were derived from a Central Mexican calendar. While this does not confirm that these were definitely foreigners, it is exceedingly difficult to explain as mere elite emulation or even as part of some putative politico-religious “Cult of Quetzalcoatl”. Even in cases where Central Mexican sites such as Xochicalco and Cacaxtla exhibit heavily Mayanized art styles and iconography, the hieroglyphs are local and

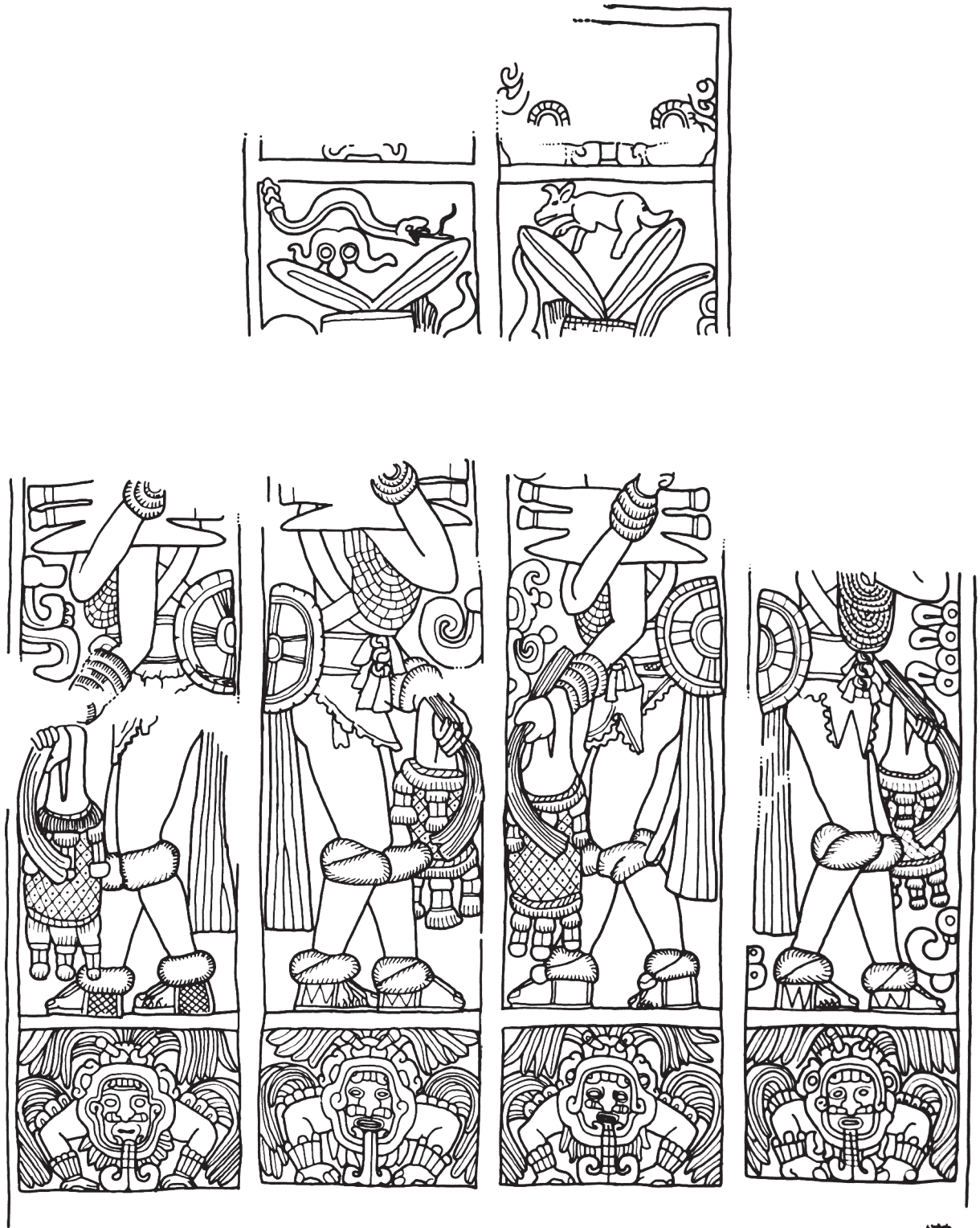


Figure 2. Carvings from Pier 5 of the South Temple of the Great Ballcourt at Chichen Itza. Drawing by Linda Schele, after Schele and Mathews 1998:Figure 6.43, used with permission, © David Schele.

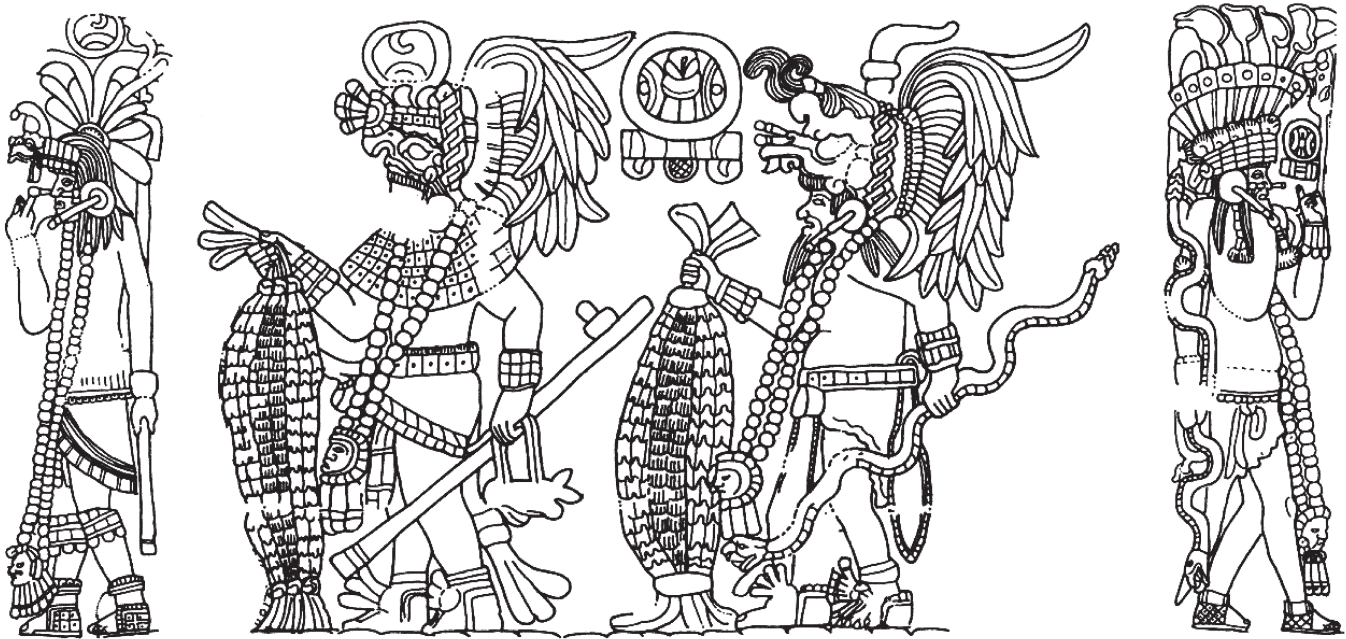


Figure 3. Figures portrayed in the middle register of the Lower Temple of the Jaguars (middle two) and their corresponding figures, identified by name glyphs, from the columns of the North Temple of the Great Ballcourt at Chichen Itza. Drawings by Linda Schele, after Schele and Mathews 1998:Figure 6.50, used with permission, © David Schele.

not Maya at all. And, even when we have major surge in Teotihuacan art and iconography in the Central Peten area in the Early Classic period and hieroglyphs from Tikal record the intrusion of foreign (apparently Teotihuacan) warlords who imposed a scion of their own dynasty on that site's throne (Stuart 2000, Martin and Grube 2008) – even in such a clear case of imperialism we do not see any texts at Tikal or other Maya sites in which the entire text is written in Teotihuacan script. The hieroglyphs of “New Chichen” thus stand out for many reasons and must be dealt with in any attempt to explain the rulership of Chichen Itza at this time period.

Ethnohistoric References to a Conquest of Yucatan by “Mexicans”

The second piece of evidence I wish to highlight comes in the form of multiple references in early Colonial era ethnohistoric documents, especially the *Relaciones de Yucatán* (1898) and Bishop Landa's *Relaciones de las Cosas de Yucatán* (Tozzer 1941). In these, the Yucatec Maya state that, according to their emic understanding of their history, they were subjects of (Central) Mexicans centuries before. It is thus hard to refute that these are references to the “Toltec” period of Chichen Itza. While these have long been known, they are almost always omitted from or glossed over in this debate and, if mentioned at all, the import of these indigenous statements on the ethnic identity of Chichen Itza's rulers and occupants is almost never discussed.

The first source is the famous *Relación de las Cosas de Yucatán* by Bishop Diego de Landa, which was written in the second half of the 16th century, only decades after the Spanish conquest of Yucatan. While what has been found and often republished under that title is unfortunately

not Landa's original manuscript and is definitely an abridgement (see Restall and Chuchiak 2002 for a fuller discussion of the issues with this important document), it is still a compilation of early colonial accounts about what the Maya, at that time, believed about their own history and can profitably be investigated as such. In his discussion of the history of Yucatan, Landa quotes his informants as telling him:

“Chichen Itza [...] was ruled by three lords who were brothers who came into that country from the west [...] It is believed among the Indians that with the Itzas who occupied Chichen Itza, there reigned a great lord, named Kukulcan, and that the principal building, which is called Kukulcan, shows this to be true. They say that he arrived from the west; but they differ among themselves as to whether he arrived before or after the Itzas or with them. They say that he was favorably disposed, and had no wife or children, and that after his return he was regarded in Mexico as one of their gods and called Quetzalcoatl; and they also considered him a god in Yucatan on account of his being a just statesman; and this is seen in the order which he imposed on Yucatan, after the death of the lords, in order to calm the dissensions which their deaths had caused in the country” (Tozzer 1941:19).

From this passage we can see that Landa's Maya informants saw that Chichen Itza's principal temple, the radial pyramid known today as the “Castillo”, was associated with “a great lord, named Kukulcan”. This structure is one of those of the *Gran Nivelación* of “New Chichen” containing great amounts of “Toltec” art. It is consequently apparent that Landa's early Colonial period Maya informants would have associated this art with western foreigners. While these informants were not entirely certain as to the exact relationship between the three fraternal Itza lords who first ruled Chichen Itza and the “great lord” Kukulcan, they did identify all of these as foreigners who arrived in Chichen Itza from the west. Furthermore, while Kukulcan is said to have been later worshipped as a god in both Mexico and Yucatan, the passage very clearly identifies this character first and foremost as a human lord who was not worshipped until he was apotheosized after he died or returned to Mexico.

We can combine this information with a passage in the *Relación de Quincama*, in the *Relaciones de Yucatán*:

“the elders of this province say that around 800 years ago they were not idolators and after that the Mexicans entered and took possession of it, [whose] captain was named Quetzalcoatl in the Mexican language” (*Relaciones de Yucatán* 1898:255, translation by the author).

This report not only confirms the association of Kukulcan/Quetzalcoatl as the leader of a group of Mexicans who entered Yucatan, but also explicitly asserts that this leader and his “Mexicans” took possession of the peninsula. A similar reference is found in the *Relación de Mutul*:

“Regarding worship, they had knowledge of a single god who created heaven and earth and all things and whose throne was in heaven, and for some time they knew only this one god, for whom they built a temple with priests and they gave presents and alms to them to offer to God. In this manner they worshipped until from outside this land arrived a great lord named Kukulcan with his people. He and his people worshipped idols and from this point the people of [this] land began to worship idols” (*Relaciones de Yucatán* 1878:78-79, translation by the author).

This passage provides yet further evidence that, in the 16th century at least, there was a widespread belief among the Maya of Yucatan that Kukulcan had originally been a lord – not a god

– who arrived from outside of Yucatan itself and was, thus, a foreigner. Combining this account with the previous, we see a consistent picture of how at least a number of Maya in the first few decades after the Conquest viewed the history and ethnicity of the Feathered Serpent lord of Chichen Itza. The lord Kukulcan, who was only later apotheosized as a deity, came to Chichen Itza from outside of the peninsula, specifically the west, and he came with “Mexicans” who took possession of the land, and, after ruling Chichen Itza justly and introducing idolatry, returned to Mexico. Thus, our ethnohistoric sources strongly contradict the basic premise of the elite emulation hypotheses, that the similarities noted between the material culture of Chichen Itza and Tula can – and should – be explained without resort to positing actual foreigners from Central Mexico in positions of power in Yucatan.

Now, it may be tempting to dismiss the two latter ethnohistoric examples given above due to the apparent Christian influence in these accounts, with their descriptions of the Maya not having or worshipping idols until the arrival of Kukulcan. And, there are many publications that in the past few decades have highlighted discrepancies and anachronisms in these accounts and many of these studies have argued that while these ethnohistoric sources may provide evidence as to Colonial era indigenous beliefs about their own history they may be of dubious value in recovering actual historical events in those earlier centuries (Carrasco 1982, Florescano 1993, 2004, Gillespie 1989). However, while the emphasis in the stories in question on Kukulcan bringing in idolatry may reflect a Christianizing of some indigenous memory of major religious changes brought in to Yucatan between the Terminal Classic and Postclassic periods; the idea that this account is entirely or mostly a Colonial era fiction would require us to believe something far more remarkable and unbelievable than that these accounts contain at least a kernel of truth.

If these stories about a foreign Kukulcan coming from outside Yucatan are merely 16th century fictions told to Spanish friars to absolve the Maya of the sin of their idolatry and foist the blame on foreign Mexicans, it would be an extraordinary coincidence that these indigenous prevaricators should have chosen to blame the one deity in their pantheon with the clearest foreign (Central Mexican) roots. Furthermore, they connected this foreign Kukulcan with a temple at Chichen Itza that has the clearest iconographic comparisons with Central Mexico and that was built in the same time period that Central Mexican ethnohistoric sources would place a voyage by a like-named lord from a site where nearly identical “Toltec” figures are to be found. All of this when both Chichen Itza and Tula were complete ruins and there is no evidence of contacts between early Colonial period Maya and Nahuatl elites. In this case Occam’s Razor must prevail and the far simpler hypothesis is that Landa and the other early Spanish recorders of these stories were (relatively) accurately recording what their native informants told them; and that these stories about a foreign lord Kukulcan arriving from Mexico to take control of Chichen Itza and oversee the construction of “New Chichen” are substantially true. This, of course, would directly contradict the elite emulation hypotheses.



The Maya Adoption of the Term *Macehual*

The third piece of evidence I would like to emphasize in this debate is the curious fact that, during the Colonial period, the Maya of northern Yucatan referred to themselves by the term *macehual* (Reed 1964, Restall 1997). While this term was used by the Maya to refer to themselves by the end of the Colonial period, it began as a term for “commoner” (Restall 2004, 2017). As has long been known, the Yucatek Maya term *macehual* is simply a borrowing from Nahuatl, where the word *mācehualli* is the term for “vassal or (Indian) commoner in general” (Bierhorst 1985:187).

This raises the obvious question of why the Maya of Yucatan would have themselves adopted the Nahuatl term for commoner. It may be tempting to think that the Spanish Colonial period authorities may have been already familiar with the term *macehualli* from the conquest of the Aztecs and applied it to the Maya when they subsequently conquered them a few decades later. Restall (2004) has noted that the term does not appear in the earliest Spanish or indigenous documents of Yucatan. However, he did find that the term *maceualthan*, meaning “vulgar speech”, did appear in the 16th century Motul dictionary (ibid) and thus there can be no doubt that *macehual* as a term for Maya commoner was common among the Maya from at least the early Colonial period. There is no evidence that the conquistadors of Yucatan were in the habit of using that Nahuatl term for the Maya they had conquered and the early dictionaries show that the Spanish used other words to refer to the Maya commoners who served them (ibid). Given the ethnohistoric references detailed above, we have a clear alternative explanation for the Maya use of this Nahuatl term. If the Maya were ever in their earlier history subjects of Central Mexicans speaking a Nahuatl language, such a usage would be easily explained and the Maya of Yucatan clearly did claim that they had been the subject of Mexicans centuries before the Spanish arrived (see Karttunen 1985 for a discussion of other Nahua words borrowed into Yucatek Maya.)

The Books of Chilam Balam begin their accounts of Maya history with the foundation and settling of Chichen Itza (Edmonson 1982, 1986, Roys 1933; for a discussion of how these Colonial-era documents merged legendary history, religious myth, and prophesy, see Christensen 2016, Gunsenheimer 2002, Knowlton 2012, Persson 2000). If the rulers of Chichen Itza included “Mexican” foreigners, they would have almost certainly spoken Nahuatl, the most common language in Postclassic Central Mexico. They could also have used their own term for “commoner” to refer to their Maya vassals. If that political domination was strong enough, the Maya could also easily have come to adopt the term, and later Maya lords could have used this familiar Nahuatl term to refer to their own vassals after the fall of Chichen Itza. Certainly, when the later city of Mayapan was established and came to dominate northern Yucatan, its rulers deliberately chose to model many of their new capital’s buildings after the most impressive and imposing structures at Chichen Itza (Milbrath & Peraza 2003, Pollock et al. 1962).

The curious use of the term *macehual* by the Colonial period Yucatec Maya to describe themselves makes sense if we see actual Toltecs from Central Mexico in positions of power in Chichen Itza. However, it is hard to explain why the local Maya would have taken to calling themselves by this term if the history of Chichen Itza is one of mere elite emulation of foreign art styles by local, purely Maya nobles.

Discussion

The three lines of evidence presented here strongly suggest that some Mayanists have been too quick to dismiss the presence of Toltecs or other Central Mexicans in Chichen Itza. It has been noted that most publications proposing elite emulation arguments to explain “New Chichen” almost never even address this evidence and, in those rare cases where they do, there is almost no attempt to explain these data. This is problematic, for these sources are the earliest Colonial-era records of what the Maya of Yucatan thought of their own history. Thus, these records are the closest we will likely ever get to an original Maya view of the history of Chichen Itza and the relationship of its rulers to other kingdoms and cultures and yet these are rarely discussed in the modern literature. No interpretation of Chichen Itza’s history can be considered complete without taking this evidence into account.

It should be noted that this evidence for a Central Mexican/Toltec presence at Chichen Itza does not invalidate the many studies that have noted Maya elements in the art and material culture of “New Chichen”. There certainly are many Maya elements, from elite jewelry to images of Maya gods, that appear in the art of the Great Ballcourt, the Castillo and Temple of the Chacmool, etc. There is no space here to fully discuss my views of the nature of the society that oversaw the construction of “New Chichen” but I will note that I prefer Tozzer’s combined term, “Toltec-Maya” (Tozzer 1957:20-21), to describe this era in the site’s history, a period known otherwise as “Modified Florescent” in the literature (Andrews 1965, Ringle 2017).

It is important to recognize, however, that this evidence of numerous elements within the art of “New Chichen” having origins in earlier Maya culture does not undermine a “Toltec Conquest” model, nor does it invalidate the evidence for the presence of foreigners at Chichen Itza. One need only look at the numerous Egyptian temples found throughout Ptolemaic Egypt to see that evidence of considerable strength of local cultures in a given region does not indicate the absence of an imperial regime (Arnold 1999, Hölbl 2001). This is not the venue for a discussion of the question as to whether Tula, Hidalgo, was ever the capital of an actual ancient empire (cf. Smith and Montiel 2001). Yet, there are multiple ways to interpret the likely presence of Toltecs at Chichen Itza and we should be open to distinct and multiple ways of interpreting these data. This paper is not intended to overturn many decades of significant and robust scholarship on the subject of Chichen Itza’s history. Rather, this short exposition is meant to present and emphasize long-overlooked evidence that should and must be included in all future discussions of the nature of “New Chichen”.

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References

Acosta, Jorge R.

1940 Exploraciones en Tula, Hidalgo, 1940. *Revista Mexicana de Estudios Antropológicos* 4:172-194.

1957 Interpretación de algunos de los datos obtenidos en Tula relativos a la época Tolteca. *Revista Mexicana de Estudios Antropológicos* 14(2):75-110.

Andrews IV, E. Wyllys Andrews

1965 *Progress Report on the 1960-1964 Field Seasons, National Geographic Society – Tulane University: Dzibilchaltun Program*. Middle American Research Institute, Tulane University, New Orleans.

Arnold, Dieter

1999 *Temples of the Last Pharaohs*. Oxford University Press, Oxford.

Bey III, George J., and William M. Ringle

2007 From the Bottom Up: The Timing and Nature of the Tula-Chichén Itzá Exchange. In *Twin Tollans: Chichén Itza, Tula, and the Epiclassic to Early Postclassic Mesoamerican World*, edited by Jeff Karl Kowalski & Cynthia Kristan-Graham, pp. 377-427. Dumbarton Oaks Research Library & Collection, Washington, D.C.

Bierhorst, John

1985 *A Nahuatl-English Dictionary and Concordance to the Cantares Mexicanos with an Analytic Transcription and Grammatical Notes*. Stanford University Press, Stanford.

Boot, Erik

2005 *Continuity and Change in Text and Image at Chichén Itzá, Yucatán, Mexico*. Research School CNWS, Leiden.

Carrasco, David

1982 *Quetzalcoatl and the Irony of Empire: Myths and Prophecies in the Aztec Tradition*. University of Chicago Press, Chicago.

Caso, Alfonso

1962 *Calendario y escritura en Xochicalco*. Sociedad Mexicana de Antropología, Mexico City.

Christensen, Mark Z.

2016 *The Teabo Manuscript: Maya Christian Copybooks, Chilam Balams, and Native Text Production in Yucatán*. University of Texas Press, Austin.

Edmonson, Munro S.

1982 *The Ancient Future of the Itza: The Book of Chilam Balam of Tizimin*. University of Texas Press, Austin.

1986 *Heaven Born Merida and Its Destiny: The Book of Chilam Balam of Chumayel*. University of Texas Press, Austin.

Florescano, Enrique

1999 *The Myth of Quetzalcoatl*. The Johns Hopkins University Press, Baltimore.

2004 *Quetzalcóatl y los mitos fundadores de Mesoamérica*. Santillana Ediciones Generales, Taurus, Mexico.

Gillespie, Susan D.

1989 *The Aztec Kings: The Construction of Rulership in Mexica History*. University of Arizona Press, Tucson.

2007 Toltecs, Tula, and Chichén Itza: The Development of an Archaeological Myth. In *Twin Tollans: Chichén Itza, Tula, and the Epiclassic to Early Postclassic Mesoamerican World*, edited by Jeff Karl Kowalski & Cynthia Kristan-Graham, pp. 85-127. Dumbarton Oaks Research Library & Collection, Washington, D.C.

Gunsenheimer, Antje

2002 *Geschichtstradierung in den yukatekischen Chilam Balam-Büchern: Eine Analyse der Herkunft und Entwicklung ausgewählter historischer Berichte*. Unpublished Ph.D. thesis, Universität Bonn.

Helmke, Christophe, and Jesper Nielsen

2011 *The Writing System of Cacaxtla, Tlaxcala, Mexico*. Boundary End Archaeology Research Center, Barnardsville.

Hölbl, Günther

2001 *A History of the Ptolemaic Empire*. Routledge, London.

Karttunen, Frances

1985 Nahuatl and Maya in contact with Spanish. In *Texas Linguistic Forum* 26, University of Texas, Department of Linguistics. Austin: 1-135.

Knowlton, Timothy W.

2010 *Maya Creation Myths: Words and Worlds of the Chilam Balam*. University Press of Colorado, Boulder.

Kowalski, Jeff, and Cynthia Kristan-Graham (editors)

2007 *Twin Tollans: Chichén Itza, Tula, and the Epiclassic to Early Postclassic Mesoamerican World*. Dumbarton Oaks Research Library & Collection, Washington, D.C.

Kristan-Graham, Cynthia, and Jeff Karl Kowalski

2007 Chichén Itza, Tula, and Tollan: Changing Perspectives on a Recurring Problem in Mesoamerican Archaeology and Art History. In *Twin Tollans: Chichén Itza, Tula, and the Epiclassic to Early Postclassic Mesoamerican World*, edited by Jeff Karl Kowalski & Cynthia Kristan-Graham, pp. 13-83. Dumbarton Oaks Research Library & Collection, Washington, D.C.

Martin, Simon, and Nikolai Grube

2008 *Chronicle of the Maya Kings and Queens*, Second Edition. Thames & Hudson, New York.

Milbrath, Susan, and Carlos Peraza Lope

2003 Revisiting Mayapan: Mexico's Last Maya Capital. *Ancient Mesoamerica* 14:1-46.

Morris, Earl H., Jean Charlot, and Ann Axtell Morris

1931 *The Temple of the Warriors at Chichén Itzá, Yucatán, Volume 1*. Carnegie Institution of Washington Publication 406. Washington, D.C.

Pérez de Heredia Puente, Eduardo J.

2010 *Ceramic Contexts and Chronology at Chichen Itza, Yucatan, Mexico*. Unpublished PhD dissertation, La Trobe University, Melbourne, Australia.

Persson, Bodil Liljefors

2000 *The Legacy of the Jaguar Prophet: An Exploration of Yucatec Maya Religion and Historiography*. Almqvist & Wiksell International, Stockholm.

Pollock, H.E.D., Ralph L. Roys, T. Proskouriakoff, and A. Ledyard Smith

1962 *Mayapan, Yucatan, Mexico*. Publication 619. Carnegie Institution of Washington, Washington, D.C.

Reed, Nelson

1964 *The Caste War of Yucatan*. Stanford University Press, Stanford.

Relaciones de Yucatan

1898 In *Colección de documentos inéditos relativos al descubrimiento, conquista y organización de las antiguas posesiones españolas de ultramar*. Segunda serie, Tomo Num. 11. Real Academia de la Historia, Madrid.

Restall, Matthew

1997 *The Maya World: Yucatec Culture and Society, 1550-1850*. Stanford University Press, Stanford.

2004 Maya Ethnogenesis. *Journal of Latin American Anthropology* 9(1):64-89.

Restall, Matthew, and John F. Chuchiak IV

2002 A Re-evaluation of the Authenticity of Fray Diego de Landa's *Relación de las cosas de Yucatán*. *Ethnohistory* 49(3):651-669.

Restall, Matthew, and Wolfgang Gabbert

2017 Maya Ethnogenesis and Group Identity in Yucatan, 1500-1900" in *"The Only True People": Linking Maya Identities Past and Present*, edited by Bethany J. Myers and Lisa LeCount, pp. 91-130. University Press of Colorado, Boulder.

Ringle, William M.

2017 Debating Chichen Itza. *Ancient Mesoamerica* 28(1):119-136.

Ringle, William M., Tomás Gallareta Negrón, and George J. Bey III

1998 The Return of Quetzalcoatl: Evidence for the Spread of a World Religion during the Epiclassic Period. *Ancient Mesoamerica* 9:183-232.

Roys, Ralph L.

1933 *The Book of Chilam Balam of Chumayel*. Carnegie Institution of Washington, Washington, D.C.

Schele, Linda, and Peter Mathews

1998 *The Code of Kings: The Language of Seven Sacred Maya Temples and Tombs*. Simon & Schuster, New York.

Smith, Virginia, and Kenneth G. Hirth

2000 A Catalog of Carved Monuments and a Guide to the Visual Characteristics of Xochicalco's Art Style. In *Archaeological Research at Xochicalco, Volume Two: The Xochicalco Mapping Project*, edited by Kenneth Hirth, pp. 17-56. The University of Utah Press, Salt Lake City.

Stuart, David

2000 "The Arrival of Strangers": Teotihuacan and Tollan in Classic Maya History. In *Mesoamerica's Classic Heritage: From Teotihuacan to the Aztecs*, edited by David Carrasco, Lindsay Jones, & Scott Sessions, pp. 465-513. University Press of Colorado, Boulder.

Taube, Karl

- 1994 The Iconography of Toltec Period Chichen Itza. In *Hidden Among the Hills: Maya Archaeology of the Northwest Yucatan Peninsula*, edited by Hanns J. Prem, pp. 212-246. Verlag von Flemming, Möckmühl.
- 2011 Teotihuacan and the Development of Writing in Early Classic Central Mexico. In *Their Way of Writing: Scripts, Signs, and Pictographies in Pre-Columbian America*, edited by E. Boone and G. Urton, pp. 77-109. Dumbarton Oaks Research Library & Collection, Washington, D.C.

Thompson, Eric S.

- 1966 *The Rise and Fall of Maya Civilization, Second Edition*. University Press of Oklahoma, Norman.
- 1970 *Maya History and Religion*. University of Oklahoma Press, Norman.

Tozzer, Alfred M.

- 1957 *Chichen Itza and Its Cenote of Sacrifice*. 2 Vols. Peabody Museum of Archaeology and Ethnology, Harvard University, Cambridge.

Vigil, Jose M. (editor)

- 1878 *Cronica Mexicana, escrita por D. Hernando Alvarado Tezozomoc*. Ireneo Paz, Mexico City.

Volta, Beniamino, and Geoffrey E. Braswell

- 2014 Alternative Narratives and Missing Data. In *The Ancient Maya and Their Central American Neighbors: Settlement Patterns, Architecture, Hieroglyphic Texts, and Ceramics*, edited by Geoffrey E. Braswell, pp. 356-402. Routledge, London.

Volta, Beniamino, Nancy Peniche May, and Geoffrey Braswell

- 2018 The Archaeology of Chichen Itza: Its History, What We Like to Argue About, and What We Think We Know. In *Landscapes of the Itza: Archaeology and Art History at Chichen Itza and Neighboring Sites*, edited by Linnea Wren, Cynthia Kristan-Graham, Travis Nygard, and Kaylee Spencer, pp. 28-64. University Press of Florida, Gainesville.

Zender, Marc

- 2008 One Hundred and Fifty Years of Nahuatl Decipherment. *The PARI Journal* 8(4):24-37.

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