Ancient Mesoamerica, **32** (2021), 519–544

doi:10.1017/S0956536121000420

LOWLAND MAYA GENESIS: THE LATE ARCHAIC TO LATE EARLY FORMATIVE TRANSITION IN THE UPPER BELIZE RIVER VALLEY

Jaime J. Awe,[a] Claire E. Ebert,[b] W. James Stemp,[c] M. Kathryn Brown,[d] Lauren A. Sullivan,[e] and James F. Garber[f]

[a]Department of Anthropology, Northern Arizona University, 5 E. McConnell Drive, Flagstaff, Arizona 86011-5200, United States
[b]Department of Anthropology, University of Pittsburgh, 3302 WWPH, S Bouquet St, Pittsburgh, Pennsylvania 15260, United States
[c]Department of Sociology, Anthropology and Criminology, Keene State College, 229 Main Street, Keene, New Hampshire 03435-3400, United States
[d]Department of Anthropology, University of Texas at San Antonio, 1 UTSA Circle, San Antonio, Texas 78249-1644, United States
[e]Department of Anthropology, University of Massachusetts Boston, Boston, Massachusetts 02125, United States
[f]Department of Anthropology, Texas State University, 266 Evans Liberal Arts, 601 University Drive, San Marcos, Texas 78666-4684, United States

Abstract

The transition from the Late Archaic to the Late Early Formative period witnessed profound changes in the Maya lowlands. In addition to the establishment of the first settlements and agrarian communities, this critical phase of cultural development heralded the introduction of ceramics, saw changes in lithic technology, gave rise to inter-regional trade and exchange, and witnessed the introduction of a complex symbolic system expressed on portable objects. In this article, we synthesize data collected over the past several decades by various archaeological projects in western Belize to provide an overview of the cultural changes that unfolded during the Late Archaic to Late Early Formative period in the Upper Belize River Valley. We also provide evidence indicating that it was during this critical transitional period that we begin to see the establishment of several cultural traditions that became uniquely lowland Maya.

> The rapid expansion after 1800 B.C. of Early Formative villagers throughout a broad region of what later became Maya territory begs investigation of the process by which the highly successful adaptation of these early villagers evolved out of and supplanted the preceding Archaic period adaptations (Neff et al. 2006:288).
>
> At present, models of the Archaic to Formative period transition in Mesoamerica are based on a few sites in which conditions of preservation were unusually favorable. These sites may not be typical of what were probably highly varied routes toward greater sedentism and increased reliance on cultivation of a narrower range of plant foods. The role of fertile lowland riverine environments is especially difficult to investigate, due to the frequency with which sites have been reworked and buried by deposition (Joyce and Henderson 2001:21).

INTRODUCTION

The transition from the Late Archaic (3000 cal B.C.) to the Late Early Formative (1200/1000–900 cal B.C.) period witnessed some of the most profound changes in the prehistory of the Maya lowlands. Despite its cultural significance, however, this transitional phase remains the most poorly known period of Maya prehistory. As Joyce and Henderson (2001:21) lamented, most of what is known about the Archaic to Formative transition is "based on a few sites in which conditions of preservation were unusually favorable." The few known sites have two things in common. First, almost all are located outside of the Maya lowlands, and second, collectively they provide only limited information on the nature and processes of the changes that unfolded during this time. What little we do know is that it was during this period of transition that Archaic hunter-fisher-foragers gradually adopted more sedentary lifestyles, increased their reliance on agriculture, and eventually began producing pottery. We also know that these changes were neither synchronous nor homogeneous across the Mesoamerican landscape. Rather, and as Joyce and Henderson (2001) and Rosenswig (2015) have suggested, there was a "mosaic of adaptations," with considerable diversity and variation across Mesoamerican subregions. For example, archaeologists know considerably more about this transitional period for the valleys of Oaxaca (Flannery 1976; Flannery and Marcus 2005; Flannery et al. 1981) and Tehuacán (MacNeish 1972; MacNeish and Nelken-Terner 1983a), and for the Soconusco subregion of the Pacific coast (cf., Blake et al. 1995; Clark and Blake 1994; Clark and Cheetham 2002; Kennett 2012; Kennett and Voorhies 1996; Kennett et al. 2010; Rosenswig 2015; Rosenswig et al. 2014; Voorhies 2004). In contrast, few researchers have expended much effort investigating the preceramic to early ceramic phase of development in the Maya lowlands (Figure 1). The few exceptions have been short-term projects that were conducted in the 1980s and early 2000s in northern Belize (Hester et al. 1981, 1996; Iceland 1997, 2005; MacNeish and

E-mail correspondence to: Jaime.Awe@nau.edu

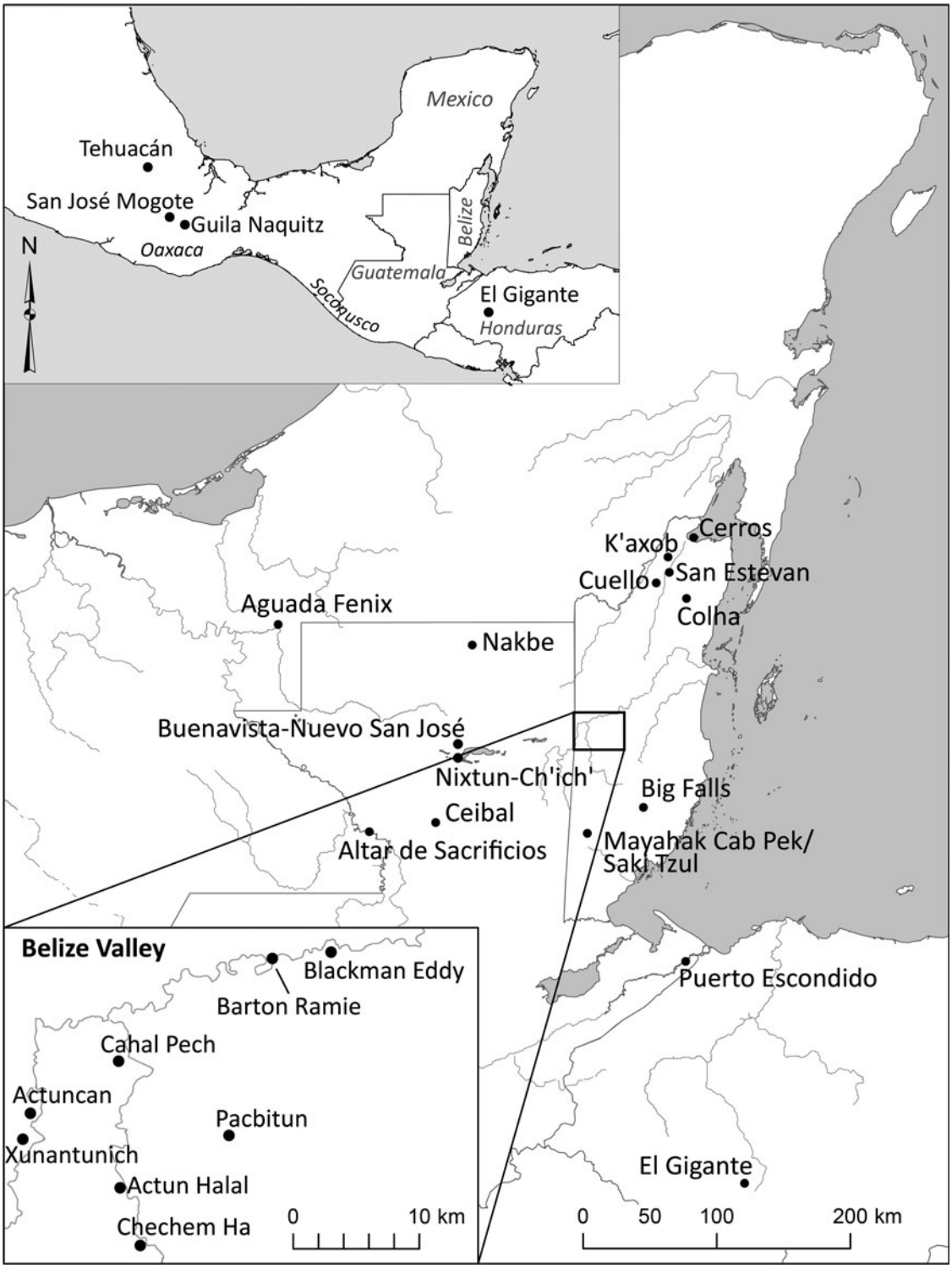

Figure 1. Map of the Maya lowlands with major Preclassic sites. Top inset: Mesoamerican Archaic sites; bottom inset: sites in the Belize Valley mentioned in text. Map by Ebert.

Nelken-Terner 1981, 1983b; MacNeish et al. 1980; Rosenswig 2004, 2006a, 2006b), and more recent, but sporadic, investigations in the Upper Belize Valley (Awe 1992; Brown et al. 2011; Lohse et al. 2006; Stemp and Awe 2013) and the Peten province of Guatemala (Inomata 2017a, 2017b; Inomata et al. 2015, 2019). Current research is also being conducted by Prufer and colleagues in southern Belize (Kennett et al. 2020, 2021; Prufer et al. 2019, 2021; Reich et al. 2020), and by Rosenswig (2021; Rosenswig et al. 2014) in the Freshwater Creek drainage in northern Belize.

https://doi.org/10.1017/S0956536121000420

In spite of the commendable efforts of the latter projects, most of which have focused on Belize, even a comprehensive search of the available literature reveals that data on the Archaic to Formative transition in the Maya lowlands remain exceedingly limited. As we hope to demonstrate in this article, however, absence of evidence does not necessarily mean evidence of absence. Indeed, we believe that through a careful and thorough examination of the extant data, it is possible to glean important information about the social and economic transformations that unfolded during this critical period of change in the Upper Belize River Valley, and about broader cultural developments in the Maya lowlands more generally. By examining data related to questions of origins, subsistence, settlement patterns, stone tools, pottery and other tool technologies, trade and exchange, and ideology, we define the nature of the Archaic to Formative transition in the Upper Belize Valley, and provide a foundation on which future research on this important topic can build. Significantly, we also believe that it was during this critical phase of transition in the Upper Belize Valley that several of the cultural traditions that became uniquely lowland Maya were being established.

DATING THE ARCHAIC TO FORMATIVE TRANSITION IN THE UPPER BELIZE VALLEY

In an article published in 2010 in the journal *Latin American Antiquity*, Jon Lohse provided an excellent review of the extant data on the Archaic to Formative transition in the central Maya lowlands. Lohse (2010:343) also noted that "the timing of the transition continues to vex research into Maya origins," particularly because of the paucity of data, as well as "the small sample of available ^{14}C dates." For this reason, it is of critical importance that we first establish at least a relative time frame within which this transition unfolded in the Upper Belize River Valley. Lohse (2010:314), for example, previously argued that "the transition from preceramic to early village life took place over a brief interval, between approximately 1100 and 900 or even 800 B.C. in the Central and Northern Lowlands." Lohse's use of 1100 B.C.to mark the start of the Archaic to Formative transition was based on his review of both radiometric and AMS ^{14}C dates that had been published for Belize up to 2010. The 800 B.C. terminal date for the end of the transitional period was based largely on research at Colha, where preceramic remains were discovered stratigraphically below Middle Preclassic Bolay complex pottery (Iceland 1997; Lohse 2010:340), and because evidence for "the earliest ceramics and sedentary village at [nearby] K'axob did not appear until ca. 800 B.C." (McAnany 2004; McAnany and Lopez 1999 in Lohse 2010:343). While acknowledging that Cunil complex ceramics, the earliest ceramic complex documented in the Upper Belize Valley, likely predated Swasey and Bolay complex pottery from northern Belize, Lohse also suggested that the end date for the Archaic in the Upper Belize Valley should be placed no earlier than 1000 B.C. In a more recent publication, Lohse reiterated his position that "the end of the Archaic dates from between 1800 to 800–900 B.C. in different parts of Mesoamerica" (Lohse 2010:342, 2021).

In the decade following the publication of Lohse's 2010 review, several research projects in the Upper Belize Valley and in Peten, Guatemala published new AMS ^{14}C dates (Table 1), which support the appearance of ceramic-producing sedentary communities in this part of the lowlands by or before 1000 B.C. These new data include recently published dates for Actuncan (LeCount et al. 2015, 2016), Cahal Pech (Ebert and Awe 2020; Ebert et al. 2019a), Xunantunich (Brown et al. 2011:211), Nixtun-Ch'ich' (Rice 2019b), and Ceibal (Inomata 2017a, 2017b; Inomata et al. 2019). Based on his evaluation of these new ^{14}C data, Lohse (2021) now accepts that "the most widespread appearance [of pottery in the Maya lowlands] seems to be sometime around 1000 B.C." Lohse further notes that "The exception is Inomata's (…) work in Tabasco that has yet to be fully published showing Xe pottery in bedrock middens as early as about 1200 B.C." (Lohse 2021; see also Inomata et al. 2020).

In regions bordering the Maya lowlands, early pottery production, which is generally identified as a diagnostic marker for the end of the Archaic period, has been dated mostly prior to 1200 B.C. This is the case for northwestern Costa Rica, where Hoopes (1994) dated the Tronadora complex to as early as 2000 B.C.; for the Soconusco region, where researchers place the introduction of Barra ceramics to around 1900–1500 cal B.C. (Rosenswig 2006b); and in Oaxaca, specifically at San José Mogote, where Flannery and Marcus (2015: 12–13) date the introduction of pottery between 2000 and 1500 B.C. during the Espiridión phase. For regions much closer to the Belize Valley, such as along the Caribbean coast of Honduras, Joyce and Henderson (2001) assigned early ceramic production at Puerto Escondido to the Early Formative Baharona phase (ca. 1600–900 B.C.). Significantly, the Baharona phase overlaps with both the Xe deposits reported by Inomata and colleagues (2020) at Aguada Fénix in Tabasco, and with the Cunil and Kanocha phases in the Upper Belize Valley (Awe 1992; Brown 2003; Ebert and Awe 2020; Ebert et al. 2017, 2019a, 2019b; Garber et al. 2004; Sullivan and Awe 2013, 2021; Sullivan et al. 2018).

Based on the dates acquired for the Baharona phase at Puerto Escondido, as well as those for the start of early ceramic traditions across Middle and Central America, Joyce and Henderson (2001:5) suggested that the transition to sedentary agricultural communities very likely occurred between 3000 and 1800 B.C. The upper and lower brackets of their suggested time frame expand the transitional period to well over a thousand years. This contrasts significantly with Lohse's (2010:314) suggestion that the transition occurred relatively rapidly over one to two hundred years. This leaves us with the questions of where we should place the start and end of the Archaic to Formative transitionary period in the Upper Belize Valley, and how long the duration of this transition should be. For the purposes of this article, and particularly given the growing body of chronological data for the Maya lowlands, we prefer to use the period between 2000 and 1200/1000 B.C. (Figure 2). We choose the latter range for several reasons. First, it acknowledges that the data currently available for western Belize (Figure 3) place the establishment of ceramic-producing sedentary communities somewhere around 1200/1000 B.C., a date that is also supported by recently published ^{14}C dates from Nixtun-Ch'ich' in neighboring Guatemala (Rice 2019b:473, Table 2). Second, it takes into serious consideration a perspective that has been echoed by several researchers that "[t]he transition out of the Archaic should be viewed as a process rather than an event" (Lohse 2021; see also Kennett et al. 2020; Prufer et al. 2019; Rosenswig 2015). Third, it reflects the point of view that this process was neither sudden nor abbreviated, but instead was gradual, complex, and as diverse in time as it was in space. Fourth, it takes into consideration that only very few Late Archaic and Late Early Formative sites have been documented in Belize, and that exploration of sites in the future, as well as additional AMS ^{14}C dates from previously collected materials, may extend the period of transition further into the past. Fifth, and finally, the 2000–1200/1000 B.C. window corresponds with research across Mesoamerica that suggests the Archaic to Formative transition lasted for at least several centuries.

https://doi.org/10.1017/S0956536121000420

Table 1. Late Archaic and late Early Formative radiocarbon dates for western Belize and adjacent areas. All dates were calibrated in OxCal v. 4.4 using the IntCal 20 calibration curve (Bronk Ramsey 2009; Reimer et al. 2020).

Site	Context	Material	Lab No.	Cal yr B.P.	Error	Cal Range B.C.(2-sigma)	Citation
Actun Halal	N97E119, 97.4 cmbd	Charcoal	Beta-221895	3080	50	1495–1210	Lohse 2010
Actun Halal	N97E119, 97.2–97.15 cmbd	Charcoal	PLD-28978	3425	20	1870–1630	Lohse 2020
Actun Halal	N97E119, 97.2 cmbd	Charcoal	Beta-221898	3580	50	2130–1765	Lohse 2010
Actun Halal	N97E119, 97.16 cmbd	Charcoal	Beta-221896	3800	50	2455–2045	Lohse 2010
Actun Halal	N97E119, 97.05–97.00 cmbd	Charcoal	PLD-28981	5265	25	4230–3985	Lohse 2020
Actun Halal	N97E119, 96.99 cmbd	Sediment	Beta-221897	5380	50	4340–4350	Lohse 2010
Actun Halal	N97.64E119.42, 97.33 cmbd	Charcoal	PLD-28976	3220	25	1530–1430	Lohse 2020
Actun Halal	N97.41E118.27, 97.13 cmbd	Charcoal	PLD-28980	3715	25	2200–2030	Lohse 2020
Actun Halal	N97.32E119.82, 97.41 cmbd	Charcoal	PLD-28975	2890	25	1200–985	Lohse 2020
Actun Halal	N97.25E119.2, 97.16 cmbd	Charcoal	PLD-28977	3380	20	1745–1615	Lohse 2020
Actun Halal	N97.1E118.2, 97.17 cmbd	Charcoal	PLD-28979	3695	20	2195–1985	Lohse 2020
Actuncan	Str. 41, Feature 6: dedication deposit	Charcoal	UCIAMS-116846	2835	15	1050–925	LeCount 2015
Actuncan	Str. 26, Feature 20: Jar rim with burned offering	Charcoal	PSUAMS-6700/ UCIAMS-166071	2895	15	1190–1010	LeCount et al. 2017:26
Barton Ramie	Mounds 123–124	Charcoal	Q-1575	3200	110	1750–1130	Hammond 1977:62
Barton Ramie	Mound BR-155, 1.30–1.50 m level of test cut	Charcoal	TBN-310-1	4016	118	2885–2205	Willey et al. 1965:29
Barton Ramie	Mound BR-123, Section 2, 0.22 m below datum, within fire basin	Charcoal	TBN-310-3	4155	153	3325–2285	Willey et al. 1965:29
Barton Ramie	Mound BR-123, between Floors D and E, clay fill	Charcoal	TBN-310-2	3414	131	2120–1425	Willey et al. 1965:29
Blackman Eddy	BR-F5b	Charcoal	Beta-162573	2800	40	1055–830	Garber et al. 2002:Table 2
Blackman Eddy	BR-F5a	Charcoal	Beta-159142	2750	40	995–810	Garber et al. 2002:Table 2
Blackman Eddy	BR-F3	Charcoal	Beta-122281	2990	60	1405–1045	Garber et al. 2002:Table 2
Blackman Eddy	Bedrock	Charcoal	Beta-122282	2730	50	995–800	Garber et al. 2002:Table 2
Cahal Pech	Structure B4EU5, Fl. 10A	Charcoal	Beta-77205	2800	50	1110–825	Healy and Awe 1995
Cahal Pech	Structure B4, EU9, Lvl 14, below Fl. 13	Charcoal	Beta-253771	2970	40	1380–1045	Sullivan and Awe 2013
Cahal Pech	Structure B4, EU8, Lvl 12/ 13. Fl. 13	Charcoal	UCIAMS-111158	2830	15	1050–920	Ebert et al. 2017
Cahal Pech	Structure B4, EU5, Fl. 11	Charcoal	Beta-77204	2710	120	1220–540	Healy and Awe 1995
Cahal Pech	Structure B4, EU5, Fl. 11	Charcoal	Beta-56765	2730	140	1285–490	Awe 1992
Cahal Pech	Structure B4, EU5, Fl. 10C	Charcoal	Beta-40865a	2740	70	1055–790	Awe 1992
Cahal Pech	Structure B4, EU5, below Fl. 13, on bedrock	Charcoal	Beta-77207	2930	50	1285–940	Healy and Awe 1995
Cahal Pech	Structure B4, EU10, Lvl 21. Fl. 13	Charcoal	UCIAMS-111162	2845	20	1110–920	Ebert et al. 2017
Cahal Pech	Structure B4, EU 8, Lvl 13, Fl 13	Charcoal	Beta-253772	2840	40	1125–895	Sullivan and Awe 2013
Cahal Pech	Plaza B/4th, Lot PL-B-169, below Fl. 17	Charcoal	UCIAMS-169816	2820	15	1015–915	Ebert et al. 2017
Cahal Pech	Plaza B/4th, Lot PL-B-168, below Fl. 17	Faunal bone	UCIAMS-172403	2835	20	1055–915	Ebert et al. 2017
Cahal Pech	Plaza B/3rd, Lot PL-B-184, Fill/Sascab	Charcoal	UCIAMS-169817	2800	20	1015–900	Ebert et al. 2017
Cahal Pech	Plaza B, Op. 1v Lvl 15	Charcoal	Beta-253773	2940	40	1265–1015	Sullivan and Awe 2013
Chechem Ha Cave	Chamber 2, Level 9	Charcoal	AA57302	2755	35	995–820	Moyes 2006
Chechem Ha Cave	Chamber 2, Level 9	Charcoal	AA57278	2755	35	2290–2035	Moyes et al. 2009
Chechem Ha Cave	Chamber 2, Level 8	Charcoal	AA57277	2826	34	1110–900	Moyes et al. 2009

https://doi.org/10.1017/S0956536121000420

Table 1. *Continued*

Site	Context	Material	Lab No.	Cal yr B.P.	Error	Cal Range B.C.(2-sigma)	Citation
Chechem Ha Cave	Chamber 2, Level 13	Charcoal	AA57282	2847	34	1120–915	Moyes et al. 2009
Chechem Ha Cave	Chamber 2, Level 12	Charcoal	AA57281	2931	62	1375–930	Moyes et al. 2009
Chechem Ha Cave	Chamber 2, Level 12	Charcoal	AA57304	2780	40	1020–830	Moyes 2006
Chechem Ha Cave	Chamber 2, Level 11	Charcoal	AA57280	2865	33	1190–920	Moyes et al. 2009
Chechem Ha Cave	Chamber 2, Level 10	Charcoal	AA57279	2760	34	995–925	Moyes et al. 2009
Chechem Ha Cave	Chamber 2, Level 10	Charcoal	AA57303	2760	34	1000–825	Moyes 2006
Nixtun-Ch'ich'	Level AA, bedrock	Charcoal	Beta-232953	2880	40	1205–930	Rice 2019b:Table 2
Nixtun-Ch'ich'	Level AA, bedrock	Charcoal	Beta-232952	2900	40	1220–935	Rice 2019b:Table 2
Pacbitun	No context reported	Charcoal	Beta-25372	2720	170	1370–410	Healy 1990:Table 1
Pacbitun	No context reported	Charcoal	Beta-25377	2750	100	1220–765	Healy 1990:Table 1
Xunantunich	Group E paleosol layer	Charcoal	Beta-275306	2890	49	1220–925	Brown et al. 2011:212
Xunantunich	Group E bedrock	Charcoal	Beta-275307	4410	40	3330–2910	Brown et al. 2011:212

This latter perspective is perhaps best expressed by Arnold (1999:157–158), who, in a critique of the Archaic to Formative transition noted that "one would think that Mesoamerican groups became sedentary, took up agriculture, and adopted pottery as soon as they crossed the threshold from one period to the next." A similar point of view can be deduced from Rosenswig's (2006a:347) summary of the cultural changes that gradually unfolded during the Archaic to Formative period in the Soconusco:

> horticulture is documented early in the Archaic period while sedentism increased through the Late Archaic (3000–1800 B.C.) and permanent villages were established by the Locona phase (1450–1350 B.C.) at the latest. Ceramics were adopted during the Barra phase (1600–1450 B.C.), followed by incipient political complexity during the Locona and Ocos phases. During the late Early Formative period (1250–900 B.C.), the degree of sedentism and plant use show no signs of changing but there was a political reorganization of the Mazatan zone. However, it was only in the following centuries that intensified plant production reorganized the economic base of the Soconusco during the Conchas phase (900–800 B.C.).

Rosenswig (2006a:339) further emphasized the gradual nature of the transitionary period with his statement that "[t]echnological changes further demonstrate a gradual development from the Archaic to the Early Formative period adaptation rather than an adaptive revolution."

ORIGINS OF LATE ARCHAIC OCCUPANTS OF THE UPPER BELIZE VALLEY

Almost 30 years ago, Awe (1992:40) noted that "with the exception of MacNeish and colleagues (1980), most archaeologists [had] ignored the role that preceramic people may have played" in the establishment of the first permanent settlements in the Maya lowlands (also see MacNeish and Nelken-Terner 1981, 1983a, 1983b). Awe (1992:40–41) further remarked:

> Whether this sin of omission stems simply from a lack of evidence, or whether it reflects a traditional preference for less problematic explanatory paradigms (i.e. diffusion), is difficult to ascertain. Future studies should investigate this issue for if researchers continue to ignore the possible developmental role of preceramic cultures, future students may yet be confounded by our lack of insight and amazed by our ignorance.

Almost in response to Awe's lament, Clark and Cheetham (2002:297–299) eventually suggested that western and northern Belize may have been settled by "tribal units of similar language and culture," likely associated with proto-Maya people. Clark and Cheetham (2002:298) also argued that based on their reconstruction of neighboring ceramic assemblages, "a clear case cannot be made for late colonization of the Maya lowlands by ceramic-users from either the Guatemalan Highlands to the south or from Chiapas/Tabasco to the west, as speculated by many … because none of the known pottery types from likely donor areas show up in the hypothesized colonized zones."

Differences between Cunil and Swasey pottery subsequently led Ball and Taschek (2003:181–182) to suggest a different place of origin for the earliest settlers of central and northern Belize. They proposed that early Upper Belize Valley settlers were likely Mixe-Zoquean people who migrated into the area by way of Honduras. According to Ball and Taschek (2003:182–183), these migrants were responsible for introducing Cunil and Kanocha ceramics into the region. Ball and Taschek's hypothesis reminds us of James Gifford's (1970) previous suggestion that highland groups from El Salvador were responsible for introducing Middle Formative period ceramics into western Belize. Neither hypothesis, however, considered whether migrants displaced earlier preceramic populations, or whether they intermixed with them. Ball and

https://doi.org/10.1017/S0956536121000420

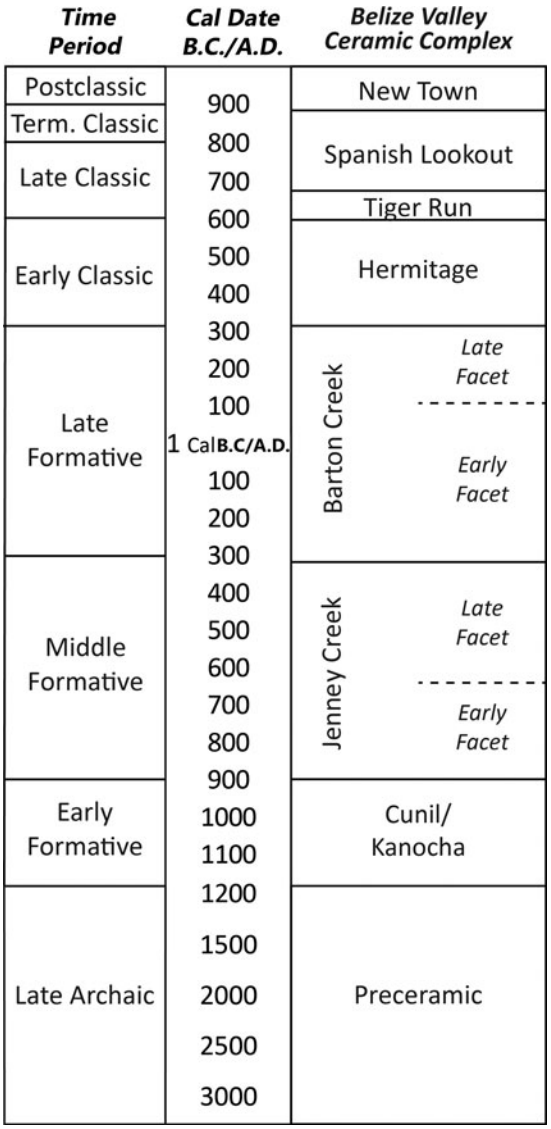

Figure 2. Timeline for the Belize Valley with calibrated date ranges for ceramic phases. Figure by Ebert and Awe.

Taschek (2003) further suggested that northern Belize was coevally occupied by a different group of people whose cultural and linguistic affiliation was likely Maya. Later, during the Middle Formative period (after 900 B.C.), the northern Belize "Maya," or their cultural equivalent from the Peten, moved into the Upper Belize Valley and were responsible for the introduction of Mamom-related pottery (Ball and Taschek 2003:210).

In an attempt to apply Ball and Taschek's (2003) hypothesis to their investigations at Blackman Eddy, Brown and Garber (2003: 91–92) suggested that the desecration of the principal Early Middle Formative public structure (Structure B1-4th) at Blackman Eddy may have been the result of possible ethnic conflict between local inhabitants and immigrant Maya groups from the north. This event was seen as contemporaneous with the appearance of "unequivocally Maya pottery" at Blackman Eddy as Mamom pottery first appears at this time (Brown and Garber 2003:102). Brown and Garber have subsequently reassessed this position, particularly after additional data collected during the past 20 years from western Belize now indicates that the transition from Pre-Mamom to Mamom pottery does not appear to be sudden and more likely represents a gradual *in situ* development (M. Kathryn Brown and James F. Garber, personal communication 2021). Ball and Taschek's interpretation was also recently challenged by Peniche May and colleagues (2021), who argue that the frequency of Mamom pottery is actually limited in the Upper Belize Valley, and that the limited presence of most early Mamom-related types in western Belize is best explained as the result of emulation and trade rather than by invasion or migration.

Clark and Cheetham's (2002) hypothesis, that central and northern Belize were originally occupied by two different proto-Maya groups, has also been called into question by Lohse (2010:342; see also Iceland 2005), who notes that the "central Belize Archaic component of that model was not based on actual data when it was published, and new finds continue to indicate just how widespread preceramic occupations were across a diversity of habitats," including the Belize River Valley (Stemp and Awe 2013; Stemp et al. 2018a).

While all these hypotheses represent initial efforts at addressing questions related to the origins of the first ceramic-producing agricultural settlements in the Upper Belize Valley, the one thing they all share in common is that none were based on direct evidence for genetic ancestry. This situation, however, has changed dramatically with the recent research of Prufer and colleagues in southern Belize, in particular their aDNA analysis of radiocarbon-dated human skeletal remains from rockshelters in the Toledo District (Kennett et al. 2020; Prufer et al. 2019, 2021; Reich et al. 2020). Results of these multidisciplinary studies now indicate that between approximately 5500 and 3600 cal B.C. (7300 and 5600 cal B.P.) there was a migration of proto-Chibchan speakers from the Isthmo-Colombian region northward into the Maya lowlands, and that these migrants intermixed with people who were already in Belize. Reich and colleagues (2020; see also Kennett et al. 2020) further note that these immigrants "contributed more than 50 percent of the ancestry of succeeding populations and coincided with the first intensive use of domesticated plants in the region (fully domesticated maize, manioc, chili peppers) by 6500–4700 cal B.P. [4500–2700 cal B.C.]. Much of the ancestry of present-day Maya people can be traced to this early dispersal, demonstrating its lasting effects."

Given the scientific results of the genetic studies conducted on Archaic period skeletal remains in southern Belize, we can now suggest more confidently that the earliest agricultural settlers in western Belize were likely descendants of mixed populations whose genetic line combined heritage from a proto-Maya group with that of proto-Chibchan speakers from Central America, rather than from Mixe-Zoquean groups moving in from the southeast and west. We now turn to issues concerning subsistence, settlement patterns, technology, trade, and ideology.

SUBSISTENCE ECONOMY

One of the most important events in Mesoamerican prehistory was the adoption of agriculture because of its key role in the origins of settled village life and the emergence of social and political hierarchies. Maize agriculture supported massive populations in the Maya lowlands during the Classic period (A.D. 300–900), yet relatively little is known about farming before the appearance of sedentary villages ~1200/1000 B.C. Nevertheless, researchers working in the Upper Belize Valley and beyond have explored Archaic and Formative period agriculture and subsistence practices for decades (e.g., Carr

https://doi.org/10.1017/S0956536121000420

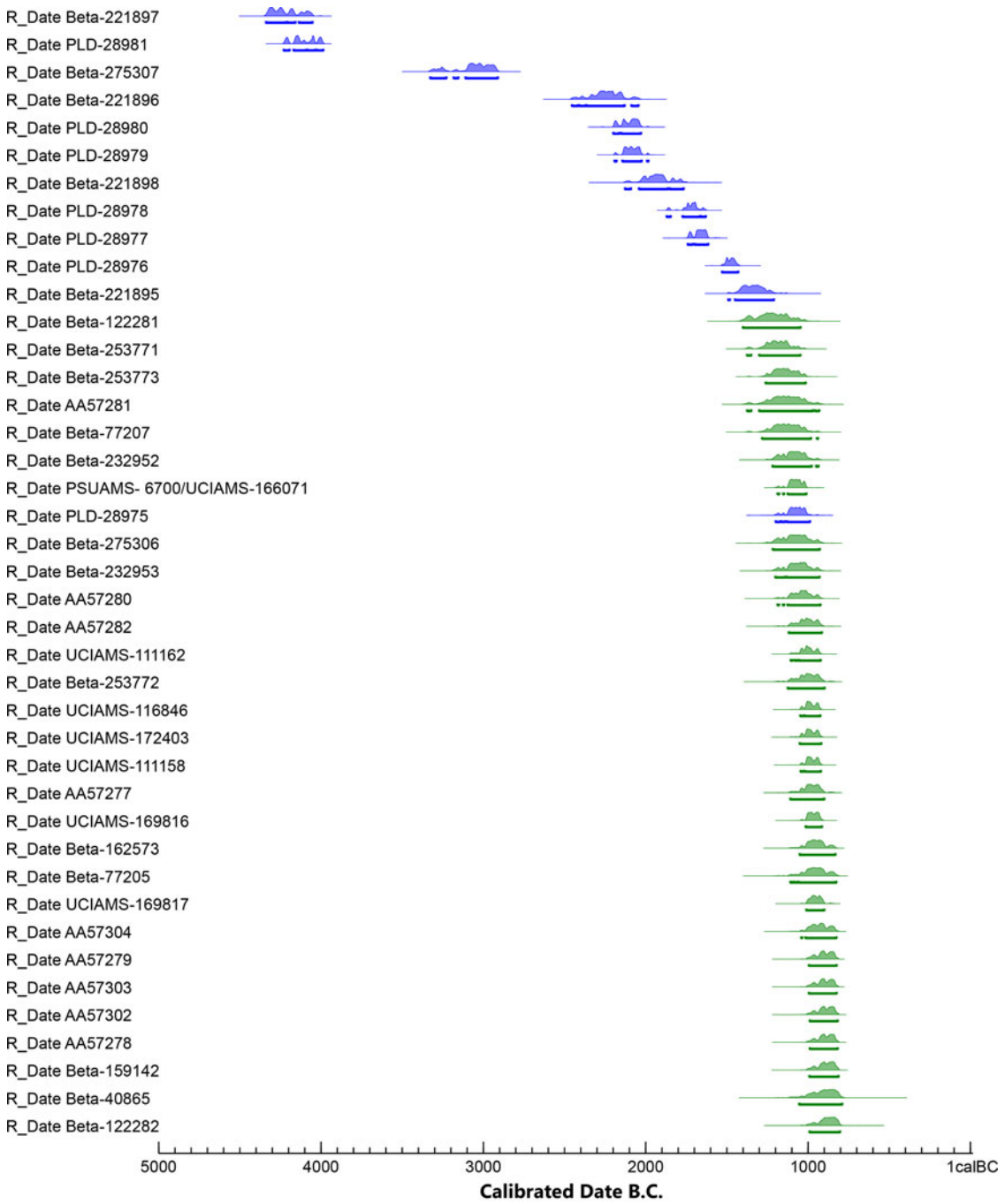

Figure 3. Calibrated ^{14}C dates from western Belize for Archaic (blue) and late Early Formative (green) contexts. Dates with error ranges >±100 years are removed, but reported in Table 1. All dates were calibrated in OxCal v. 4.4 using the IntCal 20 calibration curve (Bronk Ramsey 2009; Reimer et al. 2020). Figure by Ebert.

and Fradkin 2008; Castellanos and Foias 2017; Flannery 2009; Flannery et al. 1981; Kennett et al. 2017, 2020; Neff et al. 2006; Orsini 2016; Piperno 2011; Piperno and Pearsall 1998; Pohl 1976, 1983; Pohl et al. 1996; Rosenswig 2006a, 2006b, 2015; Rosenswig et al. 2014; Stanchly and Awe 2015; Stanchly and Burke 2018; Voorhies 2004; Wake 2004; Wing and Scudder 1991). Rather than repeating the rich datasets and insightful interpretations contained in these reports, we limit comments here to a few statements that identify potential changes and continuities in the subsistence patterns of Archaic to Formative populations in the Upper Belize Valley.

Archaeologists traditionally view Mesoamerica's Archaic period as the era when maize and other domesticates start to define subsistence economies. Flannery (2009; see also Rosenswig 2015; Zeder 2012) suggested that major environmental shifts at the end of the Archaic period correspond with a significant change in subsistence patterns in Mesoamerica. A decline in hunting of large game was followed by increased reliance on a wide diversity of smaller species of animals and plants, a transition that has been dubbed the "Broad Spectrum Revolution" (Flannery 1969). In Belize, rising sea levels and wetter climatic conditions during this time

https://doi.org/10.1017/S0956536121000420

led to the establishment of *bajos* (e.g., northern Belize and Peten), which held shallow lakes and perennial wetlands (Beach et al. 2009; Dunning et al. 2002). In these locations, aquatic foods, including freshwater mollusks, turtles, and water birds, would have been important components of the diet (Lohse et al. 2006: 210, 216; Rosenswig 2015:120–124; Zeder 2012:242–245). The reliance on this broad spectrum of small species, particularly those that proliferated around aquatic habitats, likely influenced reduced mobility and a preference for seasonal rounds, ultimately culminating in settlement along riverine and swampy environments. In western Belize, such areas would be along the river valleys where we have found Archaic period artifacts and campsites, as well as the earliest Cunil/Kanocha phase (1200/1100–900 B.C.) settlements (Awe 1992; Brown 2003; Brown et al. 2011; Ebert and Awe 2020).

Unquestionably, the most significant subsistence-related change during the Late Archaic to Formative transition was an increased reliance on maize. The presence of maize microfossils, including phytoliths and starch, indicate its dispersal across Mesoamerica by ~5000 cal B.C., along with other domesticates (e.g., *Cucurbita* sp.; Piperno 2011). In the Maya lowlands, evidence for maize cultivation in the form of microfossils first appears around ca. 4500 B.C. in northern Belize (Rosenswig et al. 2014), with more intensive agriculture associated with dramatic deforestation and erosion across the lowlands between 2500 and 1500 cal B.C. (Anselmetti et al. 2007; Pohl et al. 1996). Though direct evidence for maize consumption is limited, Kennett and colleagues' (2020) stable isotopic study of radiocarbon-dated human remains from southern Belize indicates that by 2000 cal B.C. maize was the staple crop in parts of the Maya lowlands. These lines of evidence for early farming coincide with the "2200 B.C. event" (i.e., the 4.2k event), when a three-century drought may have encouraged farming as an adaptive response to shifts in tropical biodiversity (Rosenswig 2015, 2019). Archaeological evidence also indicates that during the Late Early Formative, slash-and-burn agriculture was practiced in every part of the Maya lowlands by sedentary populations (Clark and Cheetham 2002; Ebert et al. 2017; Lohse 2010). It should be noted that isotopic values reflecting early maize consumption in southern Belize may likely differ for populations in other regions of Mesoamerica (see, e.g., Rosenswig 2006a). While no isotopic data are available for the Late Early Formative from other parts of Belize, Middle Preclassic data indicate that a range of domesticated plants, including maize, and wild plants and animals, were consumed in the Upper Belize Valley (Ebert et al. 2019a; Powis et al. 1999). In northern Belize, stable isotope data suggest less investment in maize, though it was still the major protein component in the diet (Henderson 2003; Tykot et al. 1996). These data highlight the fact that maize consumption consistently increases throughout the Archaic to Formative transition.

Zooarchaeological and paleoethnobotanical analyses of animal and plant remains at Actun Halal (Lohse 2010), the southern Belize rockshelters (Orsini 2016), and at Cahal Pech and Blackman Eddy (Stanchly and Awe 2015; Stanchly and Burke 2018) in the Upper Belize Valley confirm that Late Archaic and Late Early Formative settlers practiced what Flannery (1969) referred to as a broad-spectrum diet—that is, a diet that relied on the exploitation of a variety of plants, animals, the harvesting of aquatic resources, and low-level horticulture. At Mayahac Cab Pek rockshelter in southern Belize, Orsini (2016) noted less diversity in animal taxa utilization, and an emphasis on larger mammals during the Preceramic period (ca. 9120–3348 cal B.C.). By the onset of the Formative period, the bones of smaller animals, including dog, began to dominate the frequency distribution of animal remains. A similar observation was made by Scheffler (2008:139) at El Gigante, where the data reveal a decline of large game through the Archaic. Shells of the freshwater snail (*Pachychilus* spp.), locally known as *jute*, occurred in large quantities before, during, and after the transitional period in the southern Belize rockshelters (Orsini 2016), reflecting continuity in the exploitation of freshwater molluscs over time (Healy et al. 1990).

Cunil phase (1200/1100–900 B.C.) contexts at Cahal Pech contained mostly small mammal remains and thousands of *jutes* (*Pachyhilus* spp.), along with smaller numbers of other freshwater molluscs, such as pearly mussel (*Nephronaias* sp.) and apple snail (*Pomacea flagellata*; Stanchly and Awe 2015; Stanchly and Burke 2018). The bones of domesticated dog are also present in almost all Late Early Formative to Late Formative middens in western Belize (Stanchly and Awe 2015:230). The common occurrence of dog remains in Formative period contexts in the Upper Belize Valley reflects a pattern seen across Mesoamerica (Flannery 2001). This is true in Oaxaca (Flannery 2001), as well as at Olmec San Lorenzo, where Wing (1978) noted that more than 50 percent of dog remains displayed evidence of being consumed. According to Flannery (2001:222), dogs became a significant source of food during the Formative period (ca. 1150–150 B.C.), "when human populations were growing rapidly and a new meat source was needed." Based on these data, we conclude that there was an increased reliance on dog consumption between the Late Archaic to Formative period, as well as continuity in the utilization of freshwater molluscs in western Belize. Concomitantly, there was also an increasing reliance on smaller mammals and maize in the diets of early settlers along the Belize River, which supplemented maize farming in early agricultural communities.

SETTLEMENT PATTERNS

Three of the most significant changes that unfolded during the Archaic to Formative transition were that people transitioned from mixed, low-level horticulture to agriculture as the primary subsistence focus, they became more sedentary, and they eventually began producing pottery. By the very nature of these changes, and by virtue of the requirements that these changes imposed on the humans who adopted them, people had to alter their relatively mobile way of living. One way to determine potential changes in land use during this period of transition is to examine where it is that we have found Archaic period campsites, and then compare their locations with those of the earliest settlements in the region. This, however, is easier said than done, because few Archaic sites have been documented in the Maya lowlands, and even fewer have been investigated by archaeologists. In western Belize, for example, only three preceramic sites with radiocarbon dates have been documented to date. At Xunantunich, Brown and colleagues (2011:212) uncovered a buried paleosol that provides evidence of preceramic occupation at the site. In the paleosol, which yielded dates between 3325 and 2910 cal B.C., Brown et al. (2011: 211–212) discovered "highly patinated lithic materials" and "an intact fire-cracked rock feature." Horowitz (2018) has also excavated early dated construction fill with lithics and ceramics in Structure 4 at Callar Creek; however, there were no reported dates associated with the aceramic paleosol exposed at this site. The most complete understanding of the Archaic comes from the Actun Halal rockshelter, first excavated by the Belize Valley

https://doi.org/10.1017/S0956536121000420

Archaeological Reconnaissance (BVAR) Project (Awe et al. 2020; Griffith and Helmke 2000), then by Lohse (Lohse et al. 2006). The partial excavation of this site produced important data, notably a constricted biface and other lithics, as well as some faunal and floral remains. Radiocarbon dates from the site also suggest overlap between Archaic populations and the first sedentary Maya communities of the Formative, and the site has the only continuous directly dated primary sequence linking Archaic and Preclassic contexts (Ebert and Awe 2020; Lohse 2021). In spite of this information, limited excavation at the site still leaves us with considerably more questions than answers.

As we noted earlier, however, absence of evidence does not equate to evidence of absence, for although few Archaic sites have been discovered or investigated in western Belize, or the Maya lowlands in general, there are at least two methods that we can use to glean information on the spatial distribution of Archaic sites in and around the Upper Belize Valley. The first method is to examine the locations of Archaic period sites in Belize and other regions of Mesoamerica, and then to extrapolate that information to western Belize. Second, by examining the spatial distribution of Archaic period artifacts in western Belize—that is, where we have found these artifacts in terms of landform characteristics—we can develop a list of spatial-landforms criteria for determining the probable locations of other Archaic sites, or at least identify those particular areas which they exploited. We now examine both approaches in turn.

Location of Archaic Period Sites

Three of the most comprehensive studies of non-coastal, Archaic period Mesoamerican sites are those of MacNeish (1972) in the Tehuacán Valley of southeastern Puebla, Flannery and Marcus's investigations in Oaxaca (Flannery 2009; Flannery et al. 1981), and, closer to Belize, the research conducted at El Gigante rockshelter in Honduras (Figure 1; Kennett et al. 2017; Scheffler 2008; Scheffler et al. 2012). At Tehuacán, MacNeish documented seasonally occupied Archaic (7000–1500 B.C.) campsites, several of which were in caves and rockshelters overlooking valleys with resource-rich habitats. Archaic period campsites in Oaxaca reflect similarities, but also differences, with those noted for Tehuacán. For example, while some sites are in caves and rockshelters (e.g., Guilá Naquitz), contemporaneous Gheo Shih was an open-air site located on a rise overlooking two arroyos near the Mitla River (Flannery 2009; Flannery et al. 1981; Marcus and Flannery 2005). El Gigante Rockshelter in southern Honduras is also located at an elevated location that provided a commanding view of the Estanzuela River. According to Scheffler (2008:2), "Potential benefits of this view include the ability to sight animal prey in the valley bottom and its defensive potential."

The few confirmed Archaic period sites in Belize include the Actun Halal rockshelter along the Macal River Valley (Griffith and Helmke 2000; Lohse et al. 2006); the buried paleosol layer at Early Xunantunich (Brown et al. 2011) along the Mopan River Valley; Mayahak Cab Pek, Saki Tzul, and Tzibte Yux rockshelters in southern Belize (Prufer et al. 2021; see also Kennett et al. 2020; Prufer et al. 2019); and several localities in northern Belize, including Colha, the Kelly site, Pulltrouser Swamp, Crawford Bank, Betz Landing, Caye Coco, the Fred Smith site, Laguna de On island, and other locations in the Freshwater Creek drainage (Iceland 1997, 2005; Lohse 2010; Rosenswig 2004, 2006b, 2021; Stemp and Harrison-Buck 2019). The Belize Valley sites of Actun Halal and early Xunantunich, and the southern Belize rockshelters are all in elevated locations overlooking resource-rich watersheds. The northern Belize sites are generally in open-air locations near small lakes and streams. While limited in number, the topographic locations of Belize sites reflect the pattern found in Oaxaca, Tehuacán, and Honduras, suggesting that Archaic groups preferred locating their temporary campsites in elevated locations with access to water and its associated resources. The fact that many Archaic campsites are also associated with caves and rockshelters suggests that these features were purposely sought out as temporary shelters because they provided ready-made protection from the elements, and perhaps because they might have been ritually significant.

Twenty years ago, Paleoindian and Archaic period artifacts in Belize had only been recovered in the northeastern part of the country (Iceland 1997; Hester et al. 1981, 1996; Lohse et al. 2006). The one exception was southern Belize, where a single fishtail point had been recovered by a farmer in Big Falls, Toledo District (Lohse et al. 2006; Weintraub 1994). This situation changed dramatically between 2000 and 2020, when more than 20 Lowe, Sawmill, and Allspice points, plus several constricted unifaces were recovered and recorded in western and central Belize (Stemp and Awe 2013; Stemp et al. 2018a). Three of the new western Belize preceramic points were recovered from caves and rockshelters within the Sibun/Caves Branch River watershed. All others, except one found in the construction fill of a Classic period mound at San Lorenzo, Cayo, were surface finds discovered along the valleys of the Belize River and its Macal and Mopan tributaries. In two caves, Actun Migdalia and Cebada, the remains of extinct animals were also documented (Helmke and Ishihara 2002:128–129; Miller and Alvarez 2000), but these sites have yet to be excavated to determine whether they contain associated Paleoindian and Archaic period artifacts.

Formative Period Settlements

The location of early agricultural settlements in western and northern Belize reflects both parallels and differences with the location of known Archaic period sites in the region. In the Upper Belize Valley, for example, the earliest known settlements include Cahal Pech, Blackman Eddy, Barton Ramie, Actuncan, and Xunantunich. All these sites are located either on hilltops overlooking their respective river valleys, or on elevated positions adjacent to rivers (e.g., Barton Ramie). Several of these sites have also produced early ^{14}C dates (pre-1200 cal B.C.) associated with aceramic levels possibly representing earlier occupation by Archaic groups. For example, at Xunantunich, one radiocarbon date (3325–2910 cal B.C.) associated with highly patinated lithic artifacts may indicate possible Late Archaic period components at the site (Brown et al. 2011:212). Other early contexts at Xunantunich include paleosols that contain only a very small number of sherds with higher concentrations of chert flakes, tools, and freshwater shells, with one other date (1220–1295 cal B.C.) possibly representing transitional Archaic to Preclassic contexts. Chechem Ha cave in the Macal River Valley has also produced early ^{14}C dates that span from Archaic times through the Late Early and Middle Formative periods (Moyes 2006; Moyes et al. 2009, 2017), though Archaic artifact associations have not been documented. Instead, Moyes and colleagues (2017) suggest that use of the site likely began during the Formative, related to ritual activity rather than use of the cave as a temporary campsite.

https://doi.org/10.1017/S0956536121000420

The location of early agricultural settlements in northern Belize, where the terrain is relatively flat, is similar to that of Barton Ramie in the Upper Belize Valley. Colha, Cuello, and San Estevan, for example, are all situated in relatively elevated areas near to waterways. At Colha, Iceland (2005:22) also noted that "there is evidence of close spatial congruence between Preceramic and early Middle Formative occupation and activity areas," reflected by the fact that some Formative house platforms were constructed directly on top of Preceramic activity areas. The location of Early Formative period settlements on hills overlooking resource-rich aquatic environments has also been noted in other parts of the Maya area, as well as in Honduras, Oaxaca, and the Gulf Coast region of Mexico. In the central Peten Lakes region, for example, the earliest sites recorded near Lakes Yaxha-Sacnab are located on high hills overlooking the lakes (Rice 1976:425–445). The same is true of Buenavista-Nuevo San José, which is situated at the summit of a hill overlooking Lake Peten Itza (Castellanos and Foias 2017:8). In Honduras, some of the earliest agricultural settlements, like Puerto Escondido, Yarumela, and Los Naranjos are located above river valleys and Lake Yojoa (Joyce and Henderson 2001, 2010). In the case of Oaxaca, the Early Formative site of San José Mogote is situated on a hill overlooking the Atoyac River (Flannery and Marcus 2005, 2015), while San Lorenzo in the Gulf Coast sits on a hill about 50 meters above the banks of the Coatzacoalcos River, Veracruz (Coe et al. 2015).

Comparing the Locations of Archaic Sites and Formative Period Settlements

When we compare the locations of the earliest ceramic-producing settlements with those of the Archaic period campsites, continuities and discontinuities in landscape use are apparent. Like their Archaic period predecessors, the first permanent settlers in Belize appear to have preferred locating their sites at the summit of hills overlooking rivers and lakes, or in areas that were elevated above adjacent bottomlands. Lohse (2010:342) notes: "[c]onsidering that forager-horticulturalists had previously maintained access to a wide range of subsistence resources through residential mobility, perhaps the greatest advantage gained by locating permanent settlements near navigable waterways was access to trade." We would add that elevated locations adjacent to rivers and lakes provided several other significant advantages for early agricultural communities. The soils along the valleys of the Belize River and its tributaries are among the most fertile in Belize, a condition that was sustained by annual flooding during the rainy season and which would allow continuous cropping with little if any fallow period. Rivers and lakes are also rich in aquatic resources that contributed significant amounts of protein to the diets of early settlers, and most riparian zones were also a good source of raw materials for the production of stone tools (e.g., chert cobbles, granite for *manos* and *metates*). Other pragmatic reasons for locating early settlements on hilltops are that these locations are much better drained, they are cooler during the summer months, they are safe from major floods, and they are a major source of limestone for construction purposes. The major discontinuity evident in the spatial use of the landscape by early settlers is reflected by their use of rockshelters and caves. Whereas Archaic groups appear to have gravitated toward the use of the latter features for temporary habitation, the early settlers of the Upper Belize Valley seem to have discontinued their use for this purpose and began to utilize them primarily as sacred landscapes for ritual purposes (Moyes et al. 2009, 2017). We address this topic in greater detail below, under the subsection ideology.

TECHNOLOGICAL CHANGES

The transition from the Archaic to the Formative in the Upper Belize Valley witnessed important technological changes in a variety of tool industries. Because the chipped stone industry in northern and western Belize has been the focus of several previous publications (Iceland 1997, 2005; Kelly 1993; Lohse 2010; Lohse et al. 2006; Stemp and Awe 2013; Stemp et al. 2016, 2018b), we provide just a brief discussion of changes in this industry, and refer readers to the more detailed publications cited above. In this section, we also focus more attention on the ground stone, polished stone, ceramic, shell, and weaving industries, which have not received as thorough treatment. Weaving is of particular interest, since Archaic period sites in Mesoamerica have yielded evidence for the production of cordage, sandals, baskets, nets and bags, as well as the use of gourds as receptacles for food and for carrying water (Flannery 2009; Flannery and Marcus 1983; MacNeish 1972). Today, the latter practice continues in traditional Maya villages, where bottle gourds, *leks*, are used as water bottles by farmers. The other objects, however, have yet to be reported in Belize, but this is likely the result of poor preservation in the more humid tropical environment in this part of the lowlands.

The Chipped Stone Industry

Until quite recently, and based primarily on data from northern Belize, conventional wisdom held that the chert stemmed and barbed Lowe, Sawmill, and Allspice points (Figures 4a and 4b)

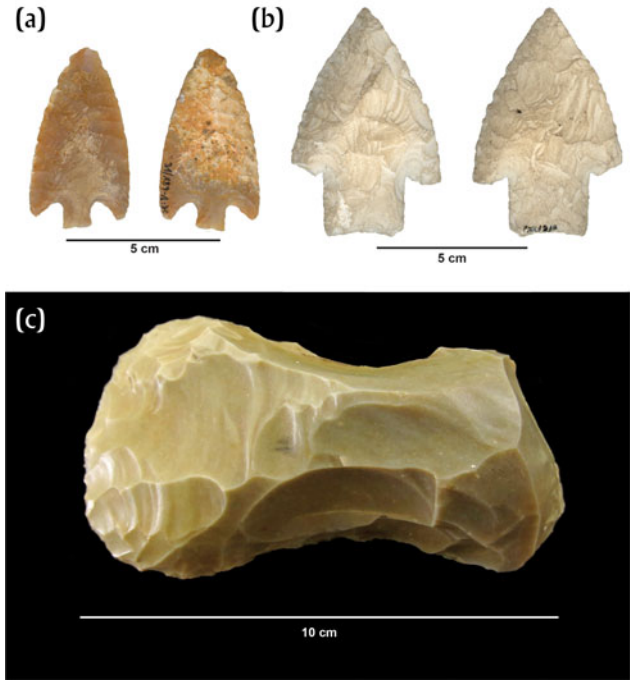

Figure 4. Examples of diagnostic Archaic period lithic artifacts: (a) Sawmill point; (b) Lowe point; and (c) unifacial constricted adze. Photographs by Awe.

https://doi.org/10.1017/S0956536121000420

dated to the Early Preceramic phase (2500–1900 B.C.) of the Late Archaic period (3400–900 B.C.) (Iceland 1997; Kelly 1993; Lohse 2010; Lohse et al. 2006; Stemp et al. 2016, 2021). With the increased investment in and reliance on domesticated crops during the latter half of the Late Archaic (i.e., the Late Preceramic, 1500–900 B.C.; see Kennett et al. 2020; Pohl et al. 1996; Rosenswig 2021), chert constricted unifaces, likely used for wood-working, land clearance, and horticultural activities (Gibson 1991; Iceland 1997), were added to the stone tool repertoire (Figure 4c). Because the date range established for constricted unifaces is 1500–900 B.C., based on associated radiocarbon dates in northern Belize (Iceland 1997; Lohse et al. 2006), it is possible this tool type was used into the Early Middle Preclassic period in western and central Belize. However, there is currently no stratigraphic or radiocarbon evidence supporting this. The only constricted tool with an associated radiocarbon date from western Belize is a constricted biface from Actun Halal dated to the Late Archaic (Lohse 2009, 2010, 2020). By the beginning of the Early Middle Formative (1000–900 B.C.), the stemmed and barbed Lowe, Sawmill, and Allspice points and constricted unifaces do not appear in the archaeological record in Western Belize. Present evidence indicates a shift in stone tool technology, with a focus on expedient chert and obsidian flakes produced by hard-hammer percussion during the transition to the Early Formative in western Belize (Awe and Healy 1994; Stemp et al. 2018b). The earliest evidence for obsidian blade technology in western Belize occurs in the Late Cunil phase (1000–900 B.C.) at Cahal Pech where a prismatic blade fragment was recovered from Structure B4 (Ebert 2017:135, Table 4.2; Ebert and Awe 2018:69).

In northern Belize, large chert macroblade bifaces, wedge-form adzes, and T-form adzes, as well as macroblades, blades, and burin spall drills were being produced in the Middle Formative period (Potter 1991), and stemmed chert macroblades, tranchet-bit bifaces, and large oval bifaces made from chert begin to appear in significant abundance by the Late Formative period (ca. 300–250 B.C.) (Hester and Shafer 1984; Shafer 1991; Shafer and Hester 1983). Many of these tool types would be traded to other sites throughout Belize or locally made, including those in western Belize (Stemp et al. 2018b).

The long-held sequence of preceramic and early ceramic period tool types originally established in northern Belize (Iceland 1997; Kelly 1993) was recently challenged by Prufer and colleagues' (2019, 2021) investigations in southern Belize, where, for the first time, Lowe points were found in discrete, *in situ*, stratified contexts. AMS ^{14}C analysis of the contexts where the Lowe points were discovered dated the points and their associated technology to approximately 8200–7300 cal B.C., indicating a Late Paleoindian/Early Archaic temporal assignment. Prufer and colleagues (2019:15) note that the shift of Lowe and other stemmed and barbed points from the Late Archaic to Late Paleoindian times "leaves a notable temporal gap with no bifacial technocomplex for CA [Central America] for the Early to Late Archaic (9000–3900 B.P. [~7000–1900 B.C.])."

The shift in chronology for Lowe (and, potentially, the related Sawmill and Allspice stemmed points)—that is, their placement in the Late Paleoindian to Early Archaic period—has important implications for the early stone tool sequence in western and central Belize. For example, all three types of preceramic stemmed points (Lowe, Sawmill, and Allspice) have been recovered in western and central Belize, as have constricted unifaces (Stemp and Awe 2013; Stemp et al. 2016, 2021). The dating of these artifacts to the Late Paleoindian to Early Archaic means that "[h]afted formal tools … and the complex array of manufacturing techniques that characterize preceramic lithic technology" are no longer evident in the Upper Belize River Valley during the transition from the Late Archaic to the Late Early Formative Cunil/Kanocha phase (1200/1100–900 B.C.; Stemp et al. 2018a:88). Instead, what we have at Cahal Pech and Blackman Eddy are Late Early Formative assemblages consisting of simple flake tools produced by hard-hammer and bipolar percussion and made primarily from local chert and imported obsidian (Table 2). Although hafted constricted unifaces extend from the Late Archaic into the Middle Formative, they are the product of hard-hammer reduction. They lack the more sophisticated soft-hammer, indirect, and pressure flaking observed on preceramic stemmed bifaces (Iceland 1997; Kelly 1993). Local production of obsidian blades appears to be absent in western Belize, and, as noted above, obsidian blade technology does not become evident until the end of the Early Formative period (1000–800 B.C.; Awe and Healy 1994; Ebert 2017:137; Ebert and Awe 2018). The absence of stemmed and barbed points, and the lack of macroblade and blade technology at Cahal Pech and Blackman Eddy lead us to conclude that it is difficult to argue for technological continuity between preceramic people in western Belize and the first Cunil and Kanocha ceramic-making Maya who appeared there around 1200/1100 B.C. This contrasts with the situation in northern Belize where the presence of blade and macroblade technology at Colha in both Late Archaic and the Early Middle Formative contexts led Iceland (1997, 2005) to suggest a technological connection between preceramic people and the early Maya.

The sequence of stone tools in southern Belize, and at Puerto Escondido, El Gigante, and Copan in Honduras, as well as at Ceibal and Caobal in Guatemala, largely mirror that recorded in the Upper Belize Valley. At Puerto Escondido, Joyce and Henderson (2001:8) report the presence of "obsidian flakes, produced through percussion" in stratigraphic levels that bridge the Late Archaic to Late Early Formative period, followed by the limited production of obsidian blades. At El Gigante, Scheffler (2008:126) indicates that during the Late Archaic to Formative transition, flake tools greatly outnumber formal tools and that obsidian "prismatic blades produced from polyhedral cores do not occur" at the site. Similarly, the earliest stone tools in the Early Preclassic Rayo phase (1400–900 B.C.) at Copan appear in the form of expedient hard-hammer chert and obsidian core and flake technology (Aoyama 1999:53). At Ceibal and Caobal, Guatemala, in the Real-Xe phase (1000–700 B.C.), the chipped chert tool assemblage was overwhelmingly represented by hard-hammer percussion flakes, flake tools (e.g., denticulates and scrapers), and simple flake cores; however, chert biface and blade technology was present (Aoyama 2017a:283, Table 4, 2017b; Aoyama and Munson 2012:35). Hard-hammer reduction of obsidian nodules or macroflakes also occurred at Ceibal and Caobal. Beginning in the Early Middle Formative, evidence for prismatic blade technology is present at both Ceibal and Caobal in Guatemala (Aoyama 2017a, 2017b:283, Table 4; Aoyama and Munson 2012:35).

What can we surmise from the apparent differences in chipped stone tool technology during the Archaic to Formative transition? The sequence in the Upper Belize River Valley clearly reflects a discontinuity in the production of large chert bifaces (Lowe and Sawmill points) and a greater reliance on expedient chert and obsidian flake tools produced by hard-hammer percussion. This represents a significant change in lithic technology during the transitional period, specifically the disappearance of the

https://doi.org/10.1017/S0956536121000420

Table 2. Trends in raw material types, tool types, production techniques, and technological features on chipped stone tools from the Late Archaic to the Late Middle Formative in western Belize.

Phase	Tool Types	Raw Materials	Production/Technology
Late Archaic (Early and Late Preceramic)	– Stemmed, barbed bifaces (Lowe?,[1] Sawmill?) – Constricted unifaces[2] – Simple flakes	– Local chert – NBCZ chert	– Hard-hammer percussion – Soft-hammer percussion(?) – Indirect percussion (notching)(?) – Pressure flaking (alternate beveling)(?) – Basal thinning (fluting?)(?) – Hafting – Projectiles(?)
Late Early Formative (Cunil/Kanocha)	– Constricted unifaces – Simple flakes – Retouched flake tools – Bifaces? – Prismatic blades (few)	– Local chert – NBCZ chert – Obsidian	– Hard-hammer percussion – Bipolar percussion – Indirect percussion/punch (known locally)? – Hafting
Early Middle Formative (Early Kanluk/Jenney Creek)	– Simple flakes – Retouched flake tools – Bifaces – Prismatic blades – Fortuitous blades – Crude choppers/unifacial celts	– Local chert – Obsidian	– Hard-hammer percussion – Bipolar percussion – Bifacial thinning – Indirect percussion/punch (known locally)? – Hafting
Late Middle Formative (Late Kanluk/Jenney Creek)	– Simple flakes – Retouched flake tools – Bifaces – Prismatic blades – Burin spall drills – Fortuitous blades – Crude choppers/unifacial celts – Stemmed macroblades	– Local chert – NBCZ chert – Obsidian	– Hard-hammer percussion – Bipolar percussion – Bifacial thinning – Hafting – Burination – Indirect percussion/punch (known locally)?

Notes: [1]Lowe points are dated to the Late Paleoindian/Early Archaic (cal B.P. 10,223 and 9300) in southern Belize (Prufer et al. 2019).
[2]Constricted biface at Actun Halal (Lohse 2010, 2020).

sophisticated production techniques associated with stemmed bifaces. Almost 30 years ago, and in an effort to explain this very situation, Tom Kelly concluded that:

> This typology then begs the questions of what happened to the preceramic users of these [stemmed and barbed] points and what was their relationship to the earliest Maya. A comparison of these preceramic projectile points with Preclassic through Early Postclassic Maya points … clearly shows a sharp discontinuity between preceramic and Maya point types. There are no shared morphological attributes. One can postulate either that the preceramic people were gone before the ceramic-using Maya arrived with an already well-established lithic industry, or that the Maya assimilated and chose not to adopt any of the excellent preceramic lithics. The differences are just too great to believe that Maya lithics evolved from preceramic lithics (Kelly 1993:225).

Because of the results of recent aDNA studies by Reich and colleagues (2020; see also Kennett et al. 2021; Prufer et al. 2021), we now know that local populations in southern Belize did intermarry with maize farmers who migrated from the southeast. Why their descendants discontinued their use of earlier preceramic lithic technology is not clear, but we do believe that it likely reflects "a decline in the importance of sharp cutting edge tools, generally associated with the procurement and processing of meat, within the subsistence economy" (Scheffler 2008:125–126). This emphasis may reflect an increasing investment in horticulture and gathering of riverine resources such as freshwater mussels and *jute*. It is also likely that hunting implements, such as traps, for smaller game may have been fashioned from hardwood and thus are not preserved in the archaeological record.

One new tool type that does appear following the establishment of the earliest settlements in western Belize is the chert microdrill, primarily produced on retouched burin spalls. These small tools were produced in the hundreds and are generally found in association with marine shell debitage and broken perforated shell disks. The latter association indicates that the drills were most likely used in the production of shell beads (Brown 2003; Garber et al. 2004; Hohmann 2002; Hohmann et al. 2018; Stemp et al. 2018b). Similar production of chert microdrills on burin spalls and shell beads is noted in northern Belize in the Middle Formative (Potter 1991:24).

The Ground Stone Industry

One of the major changes we see in the toolkit of the earliest Formative period residents of the Upper Belize Valley is an increase in the frequency of ground stone artifacts, particularly oval-shaped *manos* plus turtle-back and *tecomate*-shaped *metates* (Figure 5; Awe 1992; Brown 2003:103). Rosenswig (2006a:339, 2015:148) observed a similar trajectory in both the Soconusco and the Gulf Coast, where he notes that as "the reliance on cultivated food increased … after 1000 cal B.C. … these subsistence changes were accompanied by an increased use of manos and metates." El

https://doi.org/10.1017/S0956536121000420

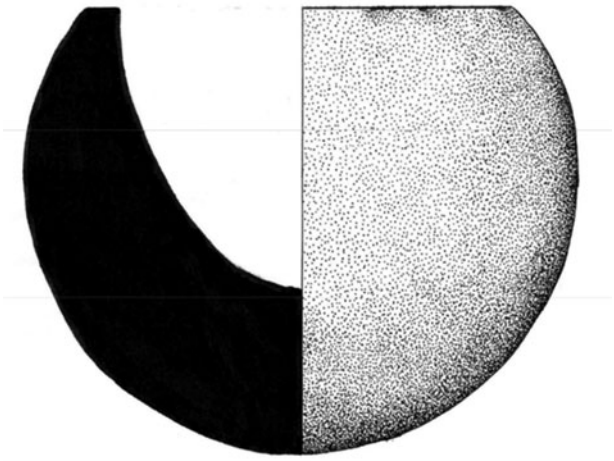

Figure 5. *Tecomate*-style *metate* from Kanocha phase context at Blackman Eddy. Image courtesy of Brown and Garber.

Gigante is one site where this sequence seems to differ from most others in Mesoamerica. Scheffler (2008:135) reports that, while one would expect "that with the onset of agricultural practices, ground stone artifacts such as [manos and metates] would become more common in the archaeological record," the opposite appears to be true, despite the presence of fully domesticated maize cobs in the El Gigante assemblage by ~2300 cal B.C. (Kennett et al. 2017). Scheffler does note, however, that this anomaly may likely be the result of "post-depositional mixing," or because the occupants of the rockshelter moved to the valley below after adopting agriculture. Another possible reason is that, given the durability of grinding stones, these portable tools would likely have been taken by their owners when they discontinued use of the rockshelter and moved to permanent settlements closer to the Estanzuela River.

An interesting observation by Scheffler is that in the American Southwest, "[p]remaize ground stone is usually found in the form of one-handed manos used with small simple slab metates." Following the adoption of maize, there is a change "toward the more common implementation of two-handed manos that are used with larger (in surface area) flat metates" (Scheffler 2008:136). Interestingly, the smaller, rounded (*tecomate*-shaped) *metates* that were likely used with one-hand *manos* are among the earliest mortars and pestles recorded in northern and western Belize (cf., Brown 2003:103, Figure 5.2; Garber et al. 2004:18; MacNeish 1981: Figure 27).

The Polished Stone Industry

One industry that does not demonstrate an Archaic period precedent is polished stone. Indeed, and to our knowledge, no polished stone objects like jadeite beads have been reported in Archaic period contexts in Belize or elsewhere in the Maya area. Polished stone objects therefore seem to be introduced during the Formative period, and they continued to be produced through the rest of Maya prehistory.

The earliest polished stone objects recovered in western Belize include jadeite *adornos* that were found in Cunil (1200/1100–900 B.C.) contexts at Cahal Pech (Awe 1992:305–307). Perforated discoidal jadeite beads appear in the subsequent early Jenney Creek phase (900–750 B.C.). The Cunil phase *adornos* at Cahal Pech are highly polished on one side, but just ground and smoothed on the opposite side. One of the *adornos* is in the shape of a fang, while the other is "reminiscent of a stylized flaming brow," suggesting that they were fragments of a mosaic mask with a wooden backing (Awe 1992:307). By the start of the Middle Formative (900–800 B.C.), greenstone triangulates are common across western Belize, and much of the rest of the Maya lowlands (Powis et al. 2016).

The Ceramic Industry

Like almost everywhere in Mesoamerica, the early ceramic industry in the Upper Belize Valley is associated with the first agricultural settlements in the region, and it represents one of the most diagnostic differences with the preceding Late Archaic period. When exactly pottery first appeared in the Upper Belize Valley, however, remains elusive. Current evidence from the sites of Cahal Pech, Blackman Eddy, Actuncan, and Xunantunich indicate that pottery technology was widespread in the region by the Terminal Early Formative Cunil/Kanocha phases, sometime between 1200–1000 B.C. (Awe 1992; Brown 2003; Ebert and Awe 2020; Garber et al. 2004; LeCount and Yaeger 2008; LeCount et al. 2016; Strelow and LeCount 2001; Sullivan and Awe 2013; Sullivan et al. 2018). This temporal span overlaps with the introduction of pottery at Puerto Escondido, Honduras during the Baharona phase (ca. 1600–900 B.C.; Joyce and Henderson 2001:8), but is several centuries later than the established dates for early pottery in other regions of Mesoamerica (cf., Clark and Blake 1994; Flannery and Marcus 2015; Love 1991; Rosenswig 2015).

Cunil and Kanocha pottery (Figure 6) from the Upper Belize Valley differs in quality from the first pottery documented in places such as the valleys of Oaxaca and Tehuacán. In Oaxaca, for example, the earliest ceramics of the Espiridión complex are primarily gourd-shaped vessels, and some are very finely made, extremely thin-walled bowls, but all are undecorated (Flannery and Marcus 2015). Purrón complex pottery from Tehuacán is relatively crude and undecorated; not until subsequent phases are Espiridión and Purrón pottery replaced by more finely made and decorated ceramics (MacNeish 1972). In contrast, and from its very first appearance, Cunil/Kanocha pottery reflects limited evidence of experimentation, and includes several ceramic types categorized as Belize Valley Dull Wares, which are well-made and decorated with post-slip incised designs and symbols (Awe 1992; Sullivan and Awe 2013, 2021; Sullivan et al. 2018). Many of the post-slip incised designs bear resemblance to pan-Mesoamerican iconographic motifs (Awe 1992; Garber and Awe 2009), suggesting at least that the movement of these ideas between diverse regions of Mesoamerica was likely before the Late Early Formative of the Upper Belize River Valley.

While it is likely that this sophisticated early pottery technology in the Upper Belize Valley was an import, gained through interaction with other early sedentary communities, Cunil/Kanocha ceramic vessels themselves were not. Evidence for the local production of early pottery in the Upper Belize Valley comes from geochemical analyses that document a sophisticated understanding of the technological aspects of pottery production by the beginning of the Late Early Formative. Instrumental neutron activation analysis (INAA) of Cunil pottery from Cahal Pech ($n = 47$ samples) revealed distinct paste recipes for both utilitarian (coarse wares) and decorated vessels (dull wares) that, when compared to a large

https://doi.org/10.1017/S0956536121000420

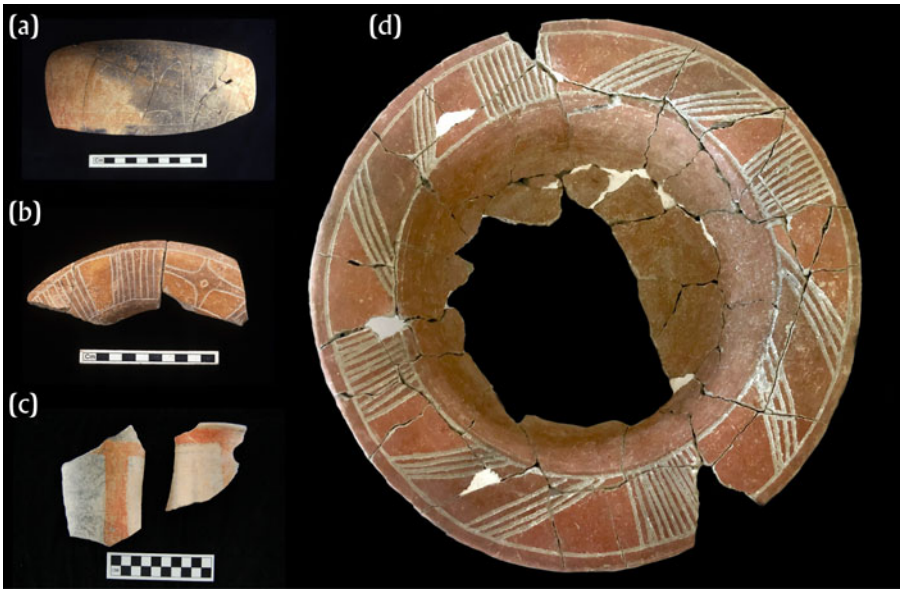

Figure 6. Examples of Cunil ceramics from Cahal Pech: (a) Kitam Incised; (b) Zotz Zone Incised; (c) Uck Red; and (d) Zotz Zoned Incised. Photographs by Awe and Ebert.

database of sherds from Mesoamerica previously analyzed by INAA (>15,000, Archaeometry Lab at the University of Missouri Research Reactor), suggests production and consumption of Cunil/Kanocha pottery within the greater Upper Belize Valley region (Ebert et al. 2019b; Ronald Bishop and Dorie Reents-Budet, personal communication 2021). Notably, several Cunil specimens with ash-temper were included in the study, indicating that an ash-paste tradition for the Late Early Formative and subsequent periods probably originated in western Belize (Ebert et al. 2019b; Sunahara et al. 2018).

The Upper Belize Valley is not the only subregion of Mesoamerica where the earliest pottery does not appear to be experimental. This was also the case at the coeval dated site of Nixtun-Ch'ich' in the central Peten Lakes region (Rice 2019b: 471–475), and at Puerto Escondido, Honduras, where the earliest pottery from the Baharona phase "consists of finely made, thin-walled vessels in the shape of small open bowls and closed-mouth bowls (*tecomates*), with elaborate decoration, including incision, dentate-stamping, and painting in red and black" (Joyce and Henderson 2001:8). The earliest Barra phase (1900 cal B.C.) pottery in the Soconusco is equally "very finely made and all are decorated or slipped" (Rosenswig 2006b:62). Clark and Blake (1994) explain the high quality of Barra phase pottery by suggesting that these early ceramics initially functioned as feasting vessels and prestige goods. The same case has been made for early Cunil and Kanocha phase ceramics in western Belize (Brown et al. 2018).

Other Tool Industries and Production Technologies

Several other artifact classes recovered in Cunil/Kanocha contexts provide evidence for production techniques and technologies that were introduced during the Archaic to Formative period transition in the Upper Belize Valley. These artifacts include marine shell beads, ceramic colanders, ceramic spindle whorls, and bone implements.

Marine Shell Beads. With regard to marine shell beads, we previously noted (see Chipped Stone Industry above) that small chert drills often occur in association with marine shell debitage, and with broken perforated marine shell discs. Both drills and shells are also found adjacent to house platforms, suggesting that the production of imported marine shell beads was likely a household industry (Awe 1992:324–325; Brown 2003; Garber et al. 2004; Hohmann 2002; Stemp et al. 2018b). The absence of marine shell debitage associated with shell disc production, as well as the drills, in the few Archaic sites that have been excavated in central, northern, and southern Belize suggests that this industry only emerged in Formative period times.

Ceramic Colanders. Ceramic colanders are unquestionably a product of the ceramic-producing Formative period settlers of the Upper Belize Valley (Figure 7). A complete specimen of this artifact type was recovered in a Kanocha phase chultun at Blackman Eddy (Brown 2003:Figure 5.3), and fragments of similar vessels have been found in Cunil contexts at Cahal Pech and Xunantunich

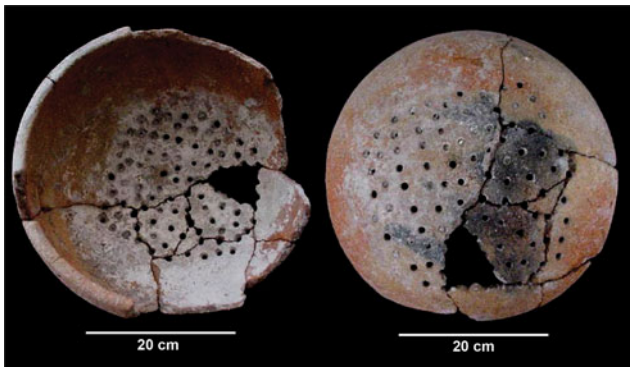

Figure 7. Ceramic colander from the Kanocha phase at Blackman Eddy. Photograph by Brown.

https://doi.org/10.1017/S0956536121000420

(e.g., Cheetham 2010:Figure 6; Strelow and LeCount 2001). Ceramic colanders were used to make *nixtamal* (lime-treated maize), though it is unclear whether the nixtamalization process was introduced during Late Archaic times, or whether it was a Formative development.

In the nixtamalization process, dried kernels of corn are boiled in a solution of water and lime (Green 2010), then left soaking overnight. The procedure removes the hard pericarp that covers maize kernels. Colanders are used to drain the softened corn from lime water prior to grinding with *manos* and *metates*. Recovered Cunil/Kanocha colanders possess traces of lime at the base and lower walls of the vessels, providing strong evidence that they were essential for the nixtamalization process (Brown 2003; Cheetham 2010).

Few colander specimens, or evidence for the early practice of nixtamalization, have been reported in other regions of Mesoamerica (Cagnato 2021; Cheetham 2010; Green 2010). Three exceptions are the south coast of Guatemala, where "culinary equipment for the nixtamalization process was found archaeologically … [dating] between 1500 and 1200 B.C." (Green 2010:315; see also Coe 1994); the central Peten subregion of the Maya lowlands (Cheetham 2010); and the Valley of Mexico, where Niederberger (1976:41, Plate 41) discovered a colander in contexts dating between 1000 and 800 B.C.

The presence of ceramic colanders in Late Early Formative contexts in the Upper Belize Valley led Cheetham (2010:362) to suggest the possibility that the nixtamalization process "began sometime during the preceding Preceramic period. If so, ceramic colanders may have replaced or supplemented perforated wooden or gourd prototypes." In Oaxaca, Flannery and Marcus (2015) note that ceramic vessels likely replaced gourds following the introduction of pottery; thus, it is possible that gourds with perforations may have preceded the introduction of ceramic colanders in the Upper Belize Valley. This situation may also have existed in the Soconusco region, where Clark and Gosser (1995) and Rosenswig (2006a:331) suggest that ceramic-producing Early Formative communities "did not employ subsistence technology that differed markedly from their non-ceramic using predecessors." No evidence for the nixtamalization process, however, has been documented in the Soconusco, perhaps suggesting that this method for processing corn may have developed earlier in the Maya area (Cheetham 2010) or elsewhere. Rosenswig's (2006a) observation that the adoption of full-fledged maize agriculture is not evident until the Conchas phase (900–800 B.C.) in the Soconusco lends support to this possibility.

The late adoption of maize agriculture in the Soconusco stands in stark contrast to recent data from southern Belize, where stable isotopic analyses of human remains indicate that maize formed a significant dietary contribution (>25 percent of total dietary protein) between 2700 and 2000 cal B.C. (Kennett et al. 2020). After 2000 cal B.C., maize became the staple grain of the Maya lowlands, typically contributing over 70 percent of the total dietary protein for most individuals, a pattern which persisted through the Classic period (Kennett et al. 2020). Given the increased reliance on maize in the diets of transitional groups in southern Belize, it is therefore quite possible that the nixtamalization process developed during the Late Archaic (~2000 B.C.), and that the Cunil/Kanocha phase presence of ceramic colanders in western Belize reflects an equally early reliance on maize consumption.

Cotton Textiles. The production of cotton textiles may be another achievement of early settlers during the second to first millennium B.C. Four lines of evidence indicate this possibility in the Upper Belize Valley: cotton pollen, ceramic spindle whorls, bone needles, and evidence for the presence of textiles. Early remains of cotton, and pollen in particular, have been reported in both western (Lohse 2010:321; Wiesen and Lentz 1997) and northern Belize (Jones 1994; Piperno and Pearsall 1998:300–303; Pohl et al. 1996:363). In western Belize, cotton pollen is present in Late Archaic period deposits at Actun Halal (~2200–1380 cal B.C.; Jones and Hallock 2008; Lohse 2010:321), and cotton pollen and a cotton seed were found in Late Early Formative contexts at Cahal Pech and Pacbitun (~1200–1000 cal B.C.; Healy 2006:22; Wiesen and Lentz 1997). A fragment of plaster with a textile impression from a Cunil phase context at Cahal Pech was also recovered, which, under high magnification, indicated that "the fabric was constructed of single-ply yarns with a Z-twist" (Lawlor et al. 1995:157).

Bone needles were found within a Cunil/Kanocha phase chultun at Blackman Eddy, indicating cloth production of some nature (Brown 2003; Garber et al. 2004). Ceramic spindle whorls in Cunil/early Jenney Creek phase contexts at Cahal Pech also provide indirect evidence for early textile production in the Upper Belize Valley. At Cahal Pech, stone spindle whorls first appear in Late Formative times, but ceramic whorls precede them by several centuries (Awe 1992:299). The temporal precedence of ceramic whorls was also noted by Willey (1978:43) at the sites of Ceibal and Altar de Sacrificios, where they were dated to the Middle and Late Formative periods, respectively.

The discovery of a fragment of cotton textile at El Gigante in Honduras provides even stronger evidence for the regional production of textiles during the Formative period (Scheffler 2008:149, Photo 38). The widespread presence of cotton pollen at sites across Mesoamerica and South America, however, likely suggests that textile production began earlier during the Archaic period (Piperno 2011), and that it continued into Late Early Formative times in places like the Upper Belize River Valley.

TRADE AND EXCHANGE

Lohse (2010:326) previously noted that "the apparent absence of exotic goods in preceramic deposits is among the most striking differences between the Archaic and Preclassic," though evidence exists for the exchange of some goods or materials during preceramic times in Belize and other regions of Mesoamerica. The Archaic Chantuto people of the Pacific Coast of southern Mexico, for example, acquired obsidian from both nearby and distant sources (Voorhies 2004). By 1800–1400 B.C., major obsidian trade networks were established throughout Mesoamerica (Ebert et al. 2014; Golitko and Feinman 2015; Stark et al. 2016). Voorhies (2012:343) also reports that in the Tehuacán Valley of Puebla, burials of adults accompanied by the remains of children contained several grave goods, including marine shells. The presence of the marine shells in Archaic deposits at Tehuacán represents one of the earliest examples of incipient trade in Mesoamerica.

In the case of western Belize, evidence for preceramic exchange is very limited, represented by a few stemmed bifaces and constricted unifaces that were produced from chert originating in the northern Belize chert-bearing zone (Lohse 2010:325–326; Stemp and Awe 2013). Given that northern Belize is relatively close to the Belize River Valley, it is possible that these points could have been brought into the area by mobile preceramic groups. The

https://doi.org/10.1017/S0956536121000420

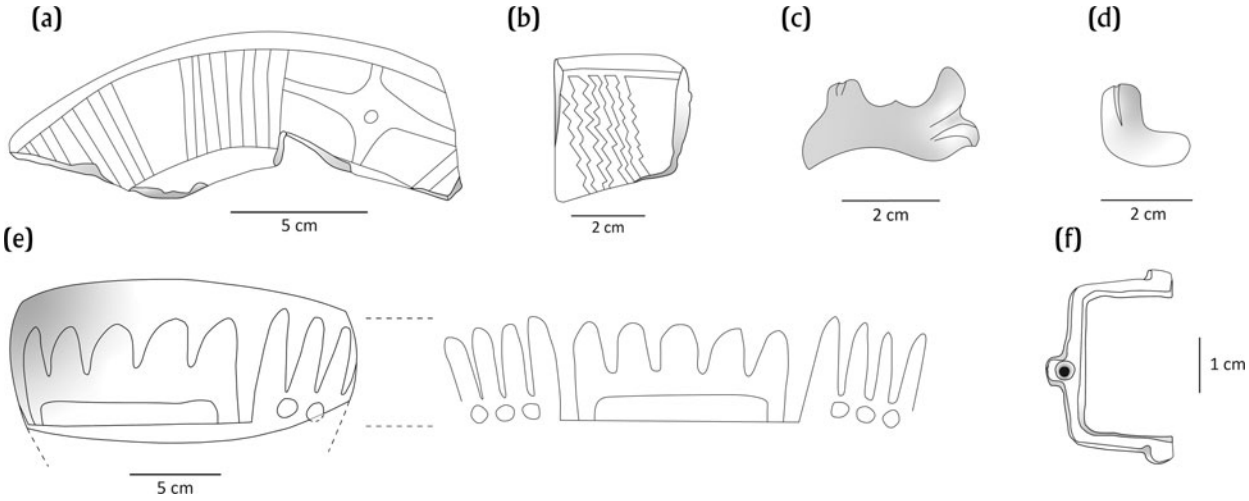

Figure 8. Early symbols depicted on Cunil/Kanocha phase artifacts: (a) Kan Cross; (b) lightning; (c) flame eyebrow; (d) fang; (e) Avian Serpent; (f) half quatrefoil (Cave Monster maw). Illustrations by Ebert.

other alternative is that the bifaces arrived in the Upper Belize Valley by way of down-the-line trade. The exchange of projectile points during the Late Archaic has been suggested for the Oaxaca area by Marcus and Flannery (1996:62). They also note that this practice was typical among hunter-gatherers such as the !Kung of Botswana, where Lee (1979) recorded the exchange of arrows among hunters.

In contrast to their late preceramic precursors, Awe (1992:348) previously reported that "[f]rom the establishment of their initial settlement, the [Late Early Formative] Cunil community at Cahal Pech was involved with long distance exchange and trade." Evidence for long-distance trade is also present for contemporaneous Kanocha phase occupation downriver at Blackman Eddy (Brown 2003; Garber et al. 2004). Exotics imported by Cunil communities included obsidian from highland Guatemala, jadeite from the Motagua Valley in southeastern Guatemala, and marine shell, particularly conch (*Strombus* sp.), from the Caribbean. At Cahal Pech, obsidian nodules and percussion flakes ($n = 15$) were created from materials imported from the El Chayal source (Awe and Healy 1994; Ebert 2017). Geochemical sourcing data of five artifacts from Blackman Eddy, on the other hand, shows a reliance on obsidian from the San Martín Jilotepeque source during the Late Early Formative/Early Middle Formative (Kersey 2006).

Greenstone objects in Cunil levels at Cahal Pech represent one of the earliest recorded uses of jadeite in the Maya lowlands. Cunil Phase greenstone objects at this site include irregular-shaped and perforated beads, and the small *adornos* carved in the shape of a curved fang and "flaming" eyebrow that we previously described in the section Polished Stone Industry. The small jadeite beads were likely used for simple bracelets or necklaces, while the *adornos* (Figures 8c and 8d) likely served as components for mosaic masks with wooden backing (Awe 1992:308). At Nixtun-Ch'ich', Peten, Rice (2019a:20) notes that "[w]ood and pottery masks were likely worn in Formative-period dances, processions and dramas, as they are cross-culturally today."

In addition to using jadeite beads, the early settlers of the Upper Belize Valley also produced simple jewelry out of marine shells. These shells were cut into discs and perforated at the center. The large quantities of shell discs, and the association of shell debitage with chert microdrills at Cahal Pech, Blackman Eddy, and Pacbitun suggest that these sites likely were producing shell discs for export to other early inland settlements (Awe 1992; Hohmann 2002; Hohmann et al. 2018; Peniche May 2016). At Nakbe, for example, Hansen and colleagues noted that there is little marine shell debitage in the earliest components at the site (early Ox phase, ca. 1000–800 B.C.), and that marine shell discs in completed form were likely "imported possibly via the Belize River Valley" (Hansen et al. 2018:153).

Pumice (or other forms of volcanic ash), which was used as temper for Cunil/early Jenney Creek phase pottery, may also have been imported from the Caribbean coast or from other sources in the Maya area. Recent INAA and petrographic analyses of Cunil, and Spanish Lookout phase pottery from western Belize confirm that much of this pottery was tempered with volcanic ash (Ebert and Awe 2020; Ebert et al. 2019b; Sunahara et al. 2018), and Callaghan et al. (2018) report that Formative period ash-tempered pottery was traded from the Upper Belize Valley into the eastern Peten. Pumice has been found in Preclassic contexts at Cuello (Hammond 1991:197) and is available along beaches of the Caribbean coast of Belize. Potential sources of volcanic ash, however, have yet to be determined. Based on this evidence, Lohse's (2010:342) assertion that "long-distance trade poses one of the most dramatic contrasts between preceramic and early Middle Preclassic [i.e., Late Early Formative] deposits," continues to remain a valid assessment of the Late Archaic to Late Early Formative period.

IDEOLOGY

More than 30 years ago, Marcus (1989:148) noted that the nature of Formative period religion is one of the most challenging topics facing students of early Mesoamerican societies. For the lowland Maya area, this problem has remained with us because "there is absolutely no agreed-upon theoretical or methodological framework for dealing with prehistoric religion" (Marcus 1978:172), and for the simple fact that only a few Formative period sites in the region have been intensively investigated (Awe 1992:13–16). This situation is even more difficult for the Archaic because there are even fewer sites known for this period, and fewer still that have been excavated and have good preservation. Despite similar limitations in other subregions of Mesoamerica, some scholars (e.g., Flannery 1976; Marcus 1978, 1989, 1993:11–12) have

https://doi.org/10.1017/S0956536121000420

demonstrated that temporal changes in rituals and religion can be deduced through a careful study of the contextual distribution and morphology of cultural remains. Marcus also notes that, although Formative rituals cannot be observed, "we can recover the places where rituals were performed and observe the patterning of the ritual artifacts involved" (Marcus 1993:2). Applying this approach, we examine and compare evidence for early symbols and rituals during the Late Archaic to Formative period in western Belize.

Actun Halal in the Upper Belize Valley (Griffith and Helmke 2000; Lohse 2009; Lohse et al. 2006), and the rockshelters investigated by Prufer and colleagues (2019, 2021) in southern Belize are presently the only two sites where we can examine Late Archaic ritual behavior in Belize due to good preservation in excavated cave deposits. For Actun Halal, Lohse (2007:26–27) suggests that, given its hallucinogenic properties and consequent ritual associations in Mesoamerica, the presence of morning glory (*Convolvulaceae* spp.) at the site may be associated with early ritual activity. In the southern Belize rockshelters, at least two pieces of evidence can be connected to ritual activity: the long continuous sequence of burials, and the secondary use of the freshwater snail *jute*. Dating of human remains recovered from the rockshelters indicates their use as burial grounds by at least Late Paleoindian times, and that this practice continued well into the Formative period and beyond (Prufer et al. 2019; Reich et al. 2020). Thousands of the *jute* shells were brought up to the rockshelters where they were used to cover remains of the dead, to line the floors of the burials, or to "pave" sections of the rockshelter's floor (Prufer et al. 2019). Investigations of both caves and surface sites in western Belize indicate that the ritual use of *jute* began in Formative period times, and that it continued unabated into the Terminal Classic period (Awe 1992; Halperin 2005; Healy et al. 1990). Halperin and colleagues (2003:216) further note that *jute* in burials served as food for the dead as they traveled through the underworld.

Moyes' investigations in Chechem Ha cave, located less than 10 km south of Cahal Pech, revealed that ritual use of caves in the Upper Belize Valley began by at least the end of the Early Formative (Moyes 2006:583–584; Moyes et al. 2017). She also notes that increasing concentrations of charcoal and the presence of corn in Middle Formative contexts at Chechem Ha were associated with the "development of agricultural rites" and that "[t]he types of rituals occurring at such early dates provide evidence that the cave was used by the earliest settlers as a water and/or agricultural fertility shrine" (Moyes 2006:564; Moyes et al. 2009).

Beyond the Upper Belize River Valley, the early use of caves, both for burials and rituals, has been documented at Gordon cave #3 in Honduras (Brady 1995), in Guerrero, Mexico (Coe et al. 2015), and in the Tehuacán Valley (MacNeish 1967). At Coxcatlán cave in Tehuacán, MacNeish found the remains of several adults as well as two children. One child had been cremated, while "[t]he head of the other child had been severed and roasted, the brains had been removed, and the head had been placed in a basket on the child's chest" (Evans 2008:84). Next to the children were several baskets "containing the desiccated remains of plants," which "suggest that this act of sacrifice occurred at the time of a successful harvest, and may have been part of a ritual thanksgiving" (Flannery and Marcus 2015:11). What is particularly significant about the Coxcatlán cave remains is that they strongly suggest that the "belief in ritual reciprocity was already present during the era of hunting, gathering, and incipient agriculture" (Flannery and Marcus 2015:11).

Investigations at Cahal Pech indicate that caves were also ritually significant to the earliest settlers of the Upper Belize Valley. For example, a Cunil phase cache contained two small, spherical stones that were subsequently identified as "cave pearls" (Awe 1992). Several "cave pearls" were also found in early contexts at Blackman Eddy (Brown 2003). These small, spherical stones form in subterranean travertine pools, suggesting that they had to have been removed from a nearby cave and brought to Cahal Pech where they were included in the Cunil phase cache. Another offering in Cunil phase levels included a small shell pendant (Figure 8f) carved in the form of a half quatrefoil motif that may represent an opening to the underworld, or what Garber and Awe (2009:153–155, Figure 4c) refer to as a "Cave Monster" maw. The Cahal Pech pendant is the earliest representation of the quatrefoil motif in the Maya lowlands, and predates the use of this motif on Monuments 1 and 9 at Chalcatzingo (Grove 2000) "by at least two or three centuries" (Garber and Awe 2009:155). More significantly, the Cunil phase quatrefoil motif and the cave pearls at Cahal Pech, along with the coeval use of nearby Chechem Ha, provide compelling evidence that caves were already perceived as sacred landscapes during the period of transition from the Late Archaic to the Late Early Formative in the Upper Belize Valley.

Crocodilian remains and imagery, and the use of various motifs carved on Cunil phase pottery and greenstone (Figure 8) provide additional evidence for the formalization of sacred and cosmological symbols and concepts during the early years of settlement in the Upper Belize Valley. The placement of a crocodile mandible beneath the floor and along the north/south axis of a Cunil phase platform at Cahal Pech (Awe 1992) indicates that the association of crocodilians with earth may already have been conceived at this early time (Awe 2021; see also Rice 2019a, 2021). Once formally established, this concept continued to play a significant role in ritual activity at Cahal Pech, reflected by the discovery of additional crocodilian imagery in the form of a Middle Formative slate crocodile figurine, and a shell crocodile effigy, both deposited in caches in Structure B4 at the site (Awe 2021; Brown et al. 2018). Like the quatrefoil motif, crocodilian imagery is present in the iconography of early sites across Mesoamerica (Rice 2018, 2020). Remains of a crocodile, for example, were recovered in an early platform at Fábrica San José in Oaxaca (Flannery 1976:Figure 11.6). Stocker and Armsey (1980) also report that crocodilian imagery is pervasive in early Olmec art, and Garber and Awe (2009) note that representations of crocodilians continued to be depicted throughout the Classic and Postclassic periods in the Maya lowlands.

Cunil/Kanocha phase contexts at Cahal Pech and Blackman Eddy contain some of the earliest evidence for the production of hand-modeled figurines, and female effigies are among the earliest forms represented in the early Cahal Pech assemblage (Awe 2021). The number of figurines increased exponentially during the ensuing Middle Formative period, then gradually going out of production towards the end of the Late Middle Formative. Studies of Formative period figurines unanimously agree that these small effigies were associated with fertility rites or other ritual purposes (cf., Awe 1992; DeLance 2016; DeLance and Awe 2021; Grove and Gillespie 1984; Halperin 2014; Hammond 1989, 1991; Marcus 1998, 2009; Peniche May et al. 2018; Rice 2018, 2020). For Oaxaca, Marcus (1993:4) proposes that prior to the emergence of rank, figurines were simple in form, and predominantly used by women for "invoking the spirits of their ancestors." Using ethnohistoric and ethnographic analogy, she suggests that women

https://doi.org/10.1017/S0956536121000420

occasionally petitioned ancestors "for guidance," and that figurines "provided a medium which the spirits of specific ancestors could return to and inhabit during this petitioning" (Marcus 1993:2–6). In Oaxaca, Marcus (1993) notes that figurines arranged in scenes were a way for ancestors to witness and participate in the ongoing rituals of the household. The discovery of Cunil and early Jenney Creek phase (1200/1100–700 B.C.) figurines, predominantly in household contexts and caches, at Cahal Pech suggests that early settlers in the Upper Belize Valley may have shared these concepts with their Mesoamerican cousins, and that like in Oaxaca, the Soconusco, and elsewhere, these concepts began to be manifested during the initial stages of the Formative period.

One of the diagnostic attributes of "dull ware" Cunil/Kanocha pottery is that several specimens are decorated with post slip carved and incised symbols (Awe 1992; Brown 2003; Ebert and Awe 2020; LeCount and Yaeger 2008; Rice 2019b; Sullivan and Awe 2013; Sullivan et al. 2018). The most significant motifs (Figures 8a, 8b, and 8e) on Cunil/Kanocha pottery are representations of the Kan Cross, lightning, and the so-called "Avian Serpent" (Garber and Awe 2009). Garber and Awe (2009: 155–157) note that "[t]he Kan Cross is the most basic symbol representing the concept of a quadripartite universe," and it is "associated with concepts of creation, cyclical completion, cardinal direction, lineages, gods, and colors" (see also Matthews and Garber 2004). The Avian Serpent, which is synonymous with Joralemon's (1971) "Olmec Dragon," is a composite creature that combines elements of the harpy eagle and crocodilians. Motifs representing the Avian Serpent generally depict only a part of the creature, adhering to the concept of *pars pro toto*. At Cahal Pech, Blackman Eddy and Xunantunich, the Cunil/Kanocha phase Avian Serpent motifs differ from their Olmec counterpart in that they are predominantly curvilinear and primarily avian in character (Garber and Awe 2009:152). Their Late Early Formative presence in the Upper Belize Valley is also among the earliest expressions of this motif in Mesoamerica, but in a format that appears to be uniquely lowland Maya.

What is perhaps the most significant aspect of the various motifs, symbols, and evidence of rituals in Late Archaic and Cunil/Kanocha phase contexts in western and southern Belize is that they reflect both cultural continuities and innovations. The use and perception of caves as sacred landscapes in Mesoamerica seem to have their origins in Archaic times. In contrast, the representation of symbolically laden motifs on pottery is unquestionably a product of the earliest settlers in the region. Despite these differences, it is hard to imagine that the concepts represented by these motifs appeared, *in prima forma*, during the Formative period. While speculative, we would argue that most of these concepts likely had their origins in preceramic times, and it was only after Mesoamericans began to live in permanent settlements that they began to be symbolically and formally represented on ceramics and other tangible objects. This perspective concurs with Rice's (2019a:34) observation that "it is not unlikely that certain [concepts] had begun in storytelling before the Preclassic period—perhaps in the late Archaic or the Early Preclassic, or the long Archaic-to-Preclassic transition."

DISCUSSION AND CONCLUSIONS

In the introduction to this article, we highlighted the fact that few Archaic period sites and Late Early Formative sedentary village sites are presently known in Belize, or the Maya lowlands in general. We further noted that even fewer of these sites have been intensively excavated by archaeologists, thus limiting the data available for examining the changes that unfolded during the Archaic to Formative transition. Despite the paucity of data, we suggest that much can be gleaned about this transitional phase through careful examination of available datasets. By applying a comparative methodology to our study of the Archaic to Formative transition in the Belize River Valley, we are able to identify several significant continuities, discontinuities, and innovations during one of the most dynamic periods of cultural development in western Belize.

In regard to the temporal span of the Archaic to Formative transition, we concur with Arnold's (1999:157–158) observation that Mesoamerican people did not become sedentary, take up agriculture, and adopt pottery "as soon as they crossed the threshold from one period to the next." In essence, we disagree with any suggestion that perceives this time as an abbreviated event rather than as a gradual process. This view is shared by colleagues who have investigated this very question in the valleys of Oaxaca (Flannery and Marcus 2015) and Tehuacán, (MacNeish 1967, 1972), in the Soconusco (Rosenswig 2015, 2019), and at sites in Honduras (Joyce and Henderson 2001; Scheffler 2008). We also agree with Rosenswig's (2015) assessment that the Archaic to Formative transition is best described as a "mosaic of adaptations." This perspective acknowledges that while there were some processes that were shared by early settlers across the Mesoamerican landscape, there was also considerable diversity in their adaptive responses across time and space. In northern Belize, for example, it has been argued that the Late Archaic period continued until approximately 1000–900 B.C., after which we see the establishment of sedentary, ceramic-producing, communities in the Middle Formative period (Lohse 2010; Rosenswig et al. 2014). In southern Belize, Prufer and colleagues (2021; see also Kennett et al. 2020) argue that local populations there adopted maize as a staple crop much earlier, by at least 2050 cal B.C., and that they were using rockshelters as mortuary sites between 7600 and 2000 cal B.C. In the Upper Belize River Valley, present evidence suggests that the first ceramic-producing settlements were established along river valleys between 1200/1100 and 1000 B.C., and that they may have relied on a subsistence strategy that combined horticulture, the consumption of dog and deer, and the exploitation of aquatic resources. In the Peten, archaeologists (Estrada-Belli 2011; Inomata et al. 2015) have also identified early ceramic-producing communities at around 1000 B.C., but Inomata and colleagues (2015:4268) suggest that some of these sites, such as Ceibal, may have been used by relatively mobile groups "who maintained the traditional lifestyle of the preceramic period." The transition from the Late Archaic to the Formative period was therefore anything but even across the lowland Maya landscape, and present data indicate that it is perhaps best characterized by spatial and temporal diversity rather than uniformity.

The question concerning the origins of the first farmers in the Maya lowlands has bothered archaeologists for more than half a century. Fifty years ago, Gifford (1970; see also Sharer and Gifford 1970) hypothesized that Middle Formative settlements at the Upper Belize Valley site of Barton Ramie were established by immigrants who originated from the area around Chalchuapa in El Salvador. Following the discovery of Late Early Formative Cunil and Kanocha settlements at Cahal Pech, Blackman Eddy, Actuncan, and Xunantunich, Clark and Cheetham (2002), and, later, Ball and Taschek (2003), argued for a proto-Maya or Mixe-Zoquean origin for the ancestors of the Cunil/Kanocha

https://doi.org/10.1017/S0956536121000420

phase Maya. What these hypotheses had in common was that they were both based on comparative studies of cultural remains, rather than on direct evidence for genetic ancestry or geochemical analysis of ceramics.

Fortunately, the ongoing work of Prufer and colleagues (2019, 2021; Kennett et al. 2020, 2021; Reich et al. 2020) in southern Belize is finally shedding new and more accurate light on the question of origins. What we now know from this new and exciting research is that migrants from the southeast did move into southern Belize sometime between 5300 and 3600 cal B.C., and that they intermarried with local, Archaic period populations in the region. The modern Maya of Belize still "harbor the largest part of their ancestry (~50 percent) from this northward expansion of early farmers" (Reich et al. 2020; see also Kennett et al. 2021). Based on the analysis of lake sediments and pollen cores across the Maya lowlands (e.g., Cowgill and Hutchinson 1956; Wahl et al. 2006), it is apparent that this migration coincided with environmental disturbance, likely associated with the introduction of a "package of cultigens" that included productive varieties of maize, as well as manioc and chili peppers (Kennett et al. 2020; Prufer et al. 2019; Reich et al. 2020). In spite of the increasing reliance on maize, paleoethnobotanical and zooarchaeological analyses of remains from sites in the Upper Belize Valley suggest that local populations continued to follow a broad spectrum diet that relied significantly on the exploitation of resources along riverine and lacustrine environments until at least the Middle Formative period (Lawlor et al. 1995; Powis et al. 1999; Stanchly and Awe 2015; Stanchly and Burke 2018; Wiesen and Lentz 1997).

Shifts in the subsistence patterns of Late Archaic people had several major consequences. Three important and archaeologically visible developments followed. The first was the transition to sedentism. Current evidence in the Upper Belize Valley indicates that the first settlements were established by at least 1200–1000 B.C. on the summits of hills overlooking river valleys. These locations allowed easy access to the rich resources in riverine bottomlands, while at the same time providing settlers with well-drained, cooler, and defensible locations for their communities, and with good building materials for their houses. Proximity to navigable rivers also facilitated opportunities for trade and regional interaction. Once established, Cunil/Kanocha phase settlements appear to have been permanent, for there is clear evidence of sequential construction above the earliest building platforms. This type of early settlement contrasts with that proposed for Ceibal, where Inomata and colleagues (2015: 4268) suggest that even after the construction of "a formal ceremonial complex … built around 900 B.C. … [m]any residents of Ceibal appear to have remained relatively mobile during the [Early Middle Formative period], living in ephemeral post-in-ground structures and frequently changing their residential localities," adding that in "other parts of the Pasion region, there may have existed more mobile populations who maintained the traditional lifestyle of the preceramic period." While this perspective harkens, to some degree, to Thompson's (1954) early views of empty ceremonial centers, there is presently no solid evidence for this type of settlement pattern at early Cahal Pech, Blackman Eddy, or Xunantunich. In spite of the absence of this evidence, however, it is quite conceivable that mobile horticultural groups existed in the Upper Belize Valley during early transitional times, and that following the establishment of settlements in the Cahal Pech, Blackman Eddy, and Xunantunich site cores, these settlements became permanent, as suggested by sequential construction over the earliest house platforms at Cahal Pech and Blackman Eddy. At the same time, other horticulturalists in the valley may have continued a more semi-sedentary lifestyle akin to that proposed by Inomata and colleagues (2015).

The second development in the Upper Belize River Valley consisted of changes in the tool kits of incipient Cunil phase (1200/1100–900 B.C.) agriculturalists, characterized by the disappearance of stemmed bifaces, followed by the appearance of constricted adzes and an increased reliance on expedient flake tools produced by hard-hammer percussion. There are, for example, no stemmed bifaces (Lowe and Sawmill points) found in Cunil/Kanocha (1200/1100–900 B.C.) contexts, and constricted unifaces, which consist of surface finds, are assigned to the Late Preceramic period (1500–900 B.C.) based on radiocarbon dates associated with similar tools recovered from northern Belize (Iceland 1997; Lohse et al. 2006; Pohl et al. 1996; see Lohse 2020 for a constricted biface dated to 2200 B.C. from Actun Halal). Hard-hammer bifaces appear during the transition to the early facet Jenney Creek/Kanluk phase (900–650 B.C.). Concurrent with these changes, the Cunil/Kanocha phase witnesses an increase in grinding stones, especially *manos* and *metates*, along with increased use of expedient flake tools. Eventually, toward the end of the Early Formative (1000–900 B.C.), obsidian prismatic blades show up in the tool repertoire.

A third major change is the introduction of exotic materials, particularly obsidian, jadeite, and marine shell. The presence of these exotics in Cunil/Kanocha levels at Cahal Pech and Blackman Eddy provide solid evidence for the establishment of inter-regional trade and exchange networks by the end of the Early Formative period. Pumice and/or volcanic ash, for use as temper in Cunil pottery, as well as some chert, also were likely imports into the Upper Belize Valley at this time. In return, the Upper Belize Valley settlements exported finished conch shell beads, pottery, and possibly granite *manos* and *metates* to neighboring settlements in the central Peten of Guatemala (Callaghan et al. 2018; Hansen et al. 2018). Other technological innovations, such as the development of pottery technology, led to the production of ceramic vessels that likely began to replace the use of gourds for a variety of purposes, including their use as colanders for processing corn, and as molds for pottery vessels (Flannery and Marcus 1983). Ceramic spindle whorls, bone needles, and evidence for the use of cotton at Actun Halal and Cahal Pech indicate that the production of textiles likely expanded at this time.

The manifestation of ideological concepts and the formalization of religious practices and symbols represent equally substantial changes between 3000 and 1000 B.C. In southern Belize, for example, the sequential burial of deceased members of the community in sacred landscapes becomes quite evident by Late Archaic times (Prufer et al. 2019). Also evident is the caching of freshwater snails, and their likely use for representing the watery underworld (Orsini 2016). In western Belize, the use of caves as the loci for agricultural and related rituals also started by the end of the Late Archaic (Moyes 2006; Moyes et al. 2017). Subsequently, with the introduction of pottery at the end of the Early Formative, symbols that represent early manifestations of the quadripartite division of the universe (Kan Cross), the quatrefoil motif (cave Monster maw), lightning, and the principal bird deity (manifested by the Avian Serpent motif), began to be depicted on ceramic vessels and other portable objects (Awe 1992; Brown et al. 2018; Garber and Awe 2009).

When we consider all these characteristics in tandem, they demonstrate that the Late Archaic to Late Early Formative period was one of the most dynamic phases of cultural development in the

https://doi.org/10.1017/S0956536121000420

Upper Belize River Valley. It was a period that witnessed truly profound changes to the lifestyles of the early inhabitants of the region. Once adopted, these changes also led to significant consequences, the most consequential of which was the subsequent rise of cultural complexity and the establishment of one of Mesoamerica's most lasting and accomplished societies. The Late Archaic to Late Early Formative period truly encompasses the genesis of lowland Maya civilization.

RESUMEN

La transición del Arcaico tardío al período Formativo temprano tardío fue testigo de profundos cambios en las tierras bajas mayas. Además del establecimiento de los primeros asentamientos y comunidades agrarias, esta fase crítica del desarrollo cultural anunció la introducción de la cerámica, vio cambios en la tecnología lítica, dio lugar al comercio e intercambio interregional y fue testigo de la introducción de un complejo sistema de símbolos expresado en objetos portátiles. En este artículo, sintetizamos los datos recopilados durante las últimas décadas por varios proyectos arqueológicos en el oeste de Belice para proporcionar una descripción general de los cambios culturales que se desarrollaron durante la transición entre los períodos arcaico tardío y formativo temprano tardío en el Valle del Río Belice. También proporcionamos evidencia que sugiere que fue durante esta fase incipiente de evolución cultural que vemos el establecimiento de varias tradiciones culturales que se convirtieron en únicas de las tierras bajas mayas.

ACKNOWLEDGMENTS

Permission to conduct research at Actun Halal, Blackman Eddy, Cahal Pech, Chechem Ha cave, and Xunantunich was graciously granted by the Belize Institute of Archaeology under the direction of Drs. Allan Moore, John Morris, Jaime Awe, and the late Harriot Topsey. Funding for our various research projects was generously provided by the Canadian Commission to UNESCO, the Gordon Childe Fund of the University of London, the Social Sciences and Humanities Research Council of Canada, the Tilden Family Foundation, the National Science Foundation, the Rust Family Foundation, the Belize Ministry of Tourism and Culture, Northern Arizona University, Keene State College, the Pennsylvania State University, the University of Texas at San Antonio, and the BVAR, BVAP, and XAC Projects. We extend our sincere gratitude to all these institutions and foundations, to the many members of our projects, and to the many colleagues who have assisted us during 32 years of investigations in western Belize. Lastly, but certainly not least, we thank Joyce Marcus and Norman Hammond for their very constructive suggestions and comments that served to improve the quality of this article.

REFERENCES

Anselmetti, Flavio S., David A. Hodell, Daniel Ariztegui, Mark Brenner, and Michael F. Rosenmeier
2007 Quantification of Soil Erosion Rates Related to Ancient Maya Deforestation. *Geology* 35:915–918.

Aoyama, Kazuo
1999 *Ancient Maya State, Urbanism, Exchange and Craft Specialization: Chipped Stone Evidence from the Copan Valley and the La Entrada Region, Honduras*. University of Pittsburgh Memoirs in Latin American Archaeology 12. University of Pittsburgh, Pittsburgh.
2017a Ancient Maya Economy: Lithic Production and Exchange Around Ceibal, Guatemala. *Ancient Mesoamerica* 28:279–303.
2017b Preclassic and Classic Maya Interregional and Long-Distance Exchange: A Diachronic Analysis of Obsidian Artifacts from Ceibal, Guatemala. *Latin American Antiquity* 28:213–231.

Aoyama, Kazuo, and Jessica Munson
2012 Ancient Maya Obsidian Exchange and Chipped Stone Production at Caobal, Guatemala. *Mexicon* 34:34–42.

Arnold, Phillip J., III
1999 Tecomates, Residential Mobility, and Early Formative Occupation in Coastal Lowland Mesoamerica. In *Pottery and People: A Dynamic Interaction*, edited by James M. Skibo and Gary M. Feinman, pp. 159–170. University of Utah Press, Salt Lake City.

Awe, Jaime J.
1992 *Dawn in the Land Between the Rivers: Formative Occupation at Cahal Pech, Belize and Its Implications for Preclassic Development in the Maya Lowlands*. Unpublished Ph.D. dissertation. Institute of Archaeology, University of London, London.
2020 The Evolution of Anthropomorphic Imagery at Cahal Pech, Belize and Its Implications for the Rise of Kingship in the Middle Preclassic Maya Lowlands. Manuscript in author's possession.
2021 Archaeological Evidence for the Preclassic Origins of the Maya Creation Story and the Resurrection of the Maize God at Cahal Pech, Belize. In *The Myths of the Popol Vuh in Cosmology Art and Ritual*, edited by Holley Moyes, Allen Christenson, and Frauke Sachse, pp. 93–116. University Press of Colorado, Louisville.

Awe, Jaime J., and Paul F. Healy
1994 Flakes to Blades? Middle Formative Development of Obsidian Artifacts in the Upper Belize River Valley. *Latin American Antiquity* 54:1–15.

Awe, Jaime J., Christophe Helmke, and Shawn G. Morton
2020 Beyond the Twilight Zone: Cave Exploration in the Macal River Valley, Belize. In *The Realm Below: Speleoarchaeological Investigations in the Macal River Valley, Belize*, edited by Christophe Helmke, pp. 20–73. Precolumbian Mesoweb Press, San Francisco.

Ball, Joseph, and Jennifer Taschek
2003 Reconsidering the Belize Valley Preclassic: A Case for Multiethnic Interactions in the Development of a Regional Culture Tradition. *Ancient Mesoamerica* 14:179–217.

Beach, Timothy, Sheryl Luzzadder-Beach, Nicholas Dunning, John Jones, Jon C. Lohse, Thomas Guderjan, Steve Bozarth, Sarah Millspaugh, and Tripti Bhattacharya
2009 A Review of Human and Natural Changes in Maya Lowlands Wetlands over the Holocene. *Quaternary Science Reviews* 28:1710–1724.

Blake, Michael M., John E. Clark, Barbara Voorhies, George Michaels, Michael Love, Mary E. Pye, Arthur A. Demarest, and Barbara Arroyo
1995 Radiocarbon Chronology for the Late Archaic and Formative Periods on the Pacific Coast of Southeastern Mesoamerica. *Ancient Mesoamerica* 6:161–183.

Brady, James E.
1995 A Reassessment of the Chronology and Function of Gordon's Cave #3, Copan, Honduras. *Ancient Mesoamerica* 6:29–38.

Bronk Ramsey, Christopher
2009 Bayesian Analysis of Radiocarbon Dates. *Radiocarbon* 51: 337–360.

Brown, M. Kathryn
2003 *Emerging Complexity in the Maya Lowlands: A View from Blackman Eddy, Belize*. Unpublished Ph.D. dissertation. Department of Anthropology, Southern Methodist University, Dallas.

Brown, M. Kathryn, and James F. Garber
2003 Evidence of Conflict During the Middle Formative in the Maya

https://doi.org/10.1017/S0956536121000420

Lowlands: A View from Blackman Eddy, Belize. In *Ancient Maya Warfare*, edited by M. Kathryn Brown and Travis W. Stanton, pp. 91–108. Altamira Press, Walnut Creek/Lahman, New York and Oxford.

Brown, M. Kathryn, Jennifer Cochran, Leah McCurdy, and David Mixter
2011 Preceramic to Postclassic: A Brief Synthesis of the Occupation History of Group E, Xunantunich. *Research Reports in Belizean Archaeology* 8:209–220.

Brown, M. Kathryn, Jaime J. Awe, and James F. Garber
2018 The Role of Ideology, Religion, and Ritual in the Foundation of Social Complexity in the Belize River Valley. In *Pathways to Complexity: A View from the Maya Lowlands*, edited by M. Kathryn Brown and George Bey, pp. 87–116. University of Florida Press, Orlando.

Cagnato, Clarissa
2021 Gathering and Sowing Across the Central Maya Lowlands: A Review of Plant Use by Preceramic Peoples and the Early to Middle Preclassic Maya. *Ancient Mesoamerica* 32:486–501.

Callaghan, Michael G., Daniel E. Pierce, and William D. Gilstrap
2018 The First Maya Trade Ware? New Data on Middle Preclassic-Period Mars Orange Ware from Holtun, Guatemala. *Latin American Antiquity* 12:821–827.

Carr, Helen S., and Arlene Fradkin
2008 Animal Resource Use in Ecological and Economic Context at Formative Period Cuello, Belize. *Quaternary International* 191: 144–153.

Castellanos, Jeanette E., and Antonia E. Foias
2017 The Earliest Maya Farmers of Peten: New Evidence from Buenavista-Nuevo San José, Central Peten Lakes Region, Guatemala. *Journal of Anthropology* 2017:8109137.

Cheetham, David
2010 Corn, Colanders, and Cooking: Early Maize Processing in the Maya Lowlands and Its Implications. In *Pre-Columbian Foodways: Interdisciplinary Approaches to Food, Culture, and Markets in Ancient Mesoamerica*, edited by John E. Staller and Michael Carrasco, pp. 345–368. Springer, New York.

Clark, John E., and Michael Blake
1994 The Power of Prestige: Competitive Generosity and the Emergence of Rank Societies in Lowland Mesoamerica. In *Factional Competition and Political Development in the New World*, edited by Elizabeth M. Brumfiel and John W. Fox, pp. 17–30. Cambridge University Press, Cambridge.

Clark, John, and David Cheetham
2002 Mesoamerica's Tribal Foundations. In *The Archaeology of Tribal Societies*, edited by William Parkinson, pp. 278–339. Archaeological Series 15. International Monographs in Prehistory, Ann Arbor.

Clark, John E., and David Gosser
1995 Reinventing Mesoamerica's First Pottery. In *The Emergence of Pottery: Technology and Innovation in Ancient Societies*, edited by William K. Barnett and John W. Hoopes, pp. 209–221. Smithsonian Institution Press, Washington, DC.

Coe, Michael D., Javier Urcid, and Rex Koontz
2015 *Mexico: From the Olmecs to the Aztecs*, 8th ed. Thames and Hudson, London.

Coe, Sophie D.
1994 *America's First Cuisines*. University of Texas Press, Austin.

Cowgill, Ursula M., and George E. Hutchinson
1956 The Chemical History of Laguna de Petenxil. *Memoirs of the Connecticut Academy of Arts and Sciences* 17:121–126.

DeLance, Lisa L.
2016 *Enhancing Kinship: Figurines and State Formation at Cahal Pech, Cayo, Belize*. Unpublished Ph.D. dissertation. Department of Anthropology, University of California, Riverside.

DeLance, Lisa L., and Jaime J. Awe
2021 The Complexity of Figurines: Ancestor Veneration at Cahal Pech, Cayo, Belize. In *Framing Complexity: Vantages from Formative Mesoamerica*, edited by Lisa L. DeLance and Garry M. Feinman, pp. 291–323. University of Colorado Press, Louisville, and Utah State University Press, Salt Lake City.

Dunning, Nicholas, Sheryl Luzzadder-Beach, Timothy Beach, John Jones, Vernon Scarborough, and Patrick Culbert
2002 Arising from the Bajos: The Evolution of a Neotropical Landscape and the Rise of Maya Civilization. *Annals of the Association of American Geographers* 92:267–283.

Ebert, Claire
2017 *Preclassic Social Complexity and Origins of Inequality at Cahal Pech, Belize*. Unpublished Ph.D. dissertation. Department of Anthropology, The Pennsylvania State University, University Park.

Ebert, Claire E., and Jaime J. Awe
2018 Reconstructing Preclassic Maya Household Economies in the Belize River Valley. *Research Reports in Belizean Archaeology* 15: 65–78.
2020 Who Were the Early Preclassic Maya? Reassessing Key Questions About the Origins of Village Life in the Belize River Valley. *Research Reports in Belizean Archaeology* 17:273–286.

Ebert, Claire E., Mark Dennison, Kenneth G. Hirth, Sarah B. McClure, and Douglas J. Kennett
2014 Formative Period Obsidian Exchange along the Pacific Coast of Mesoamerica. *Archaeometry* 57(S1):54–73.

Ebert, Claire E., Nancy Peniche May, Brendan J. Culleton, Jaime J. Awe, and Douglas J. Kennett
2017 Regional Response to Drought During the Formation and Decline of Preclassic Maya Societies. *Quaternary Science Reviews* 173: 211–235.

Ebert, Claire E., Julie A. Hoggarth, Jaime J. Awe, Brendan J. Culleton, and Douglas J. Kennett
2019a The Role of Diet in Resilience and Vulnerability to Climate Change Among Early Agricultural Communities in the Maya Lowlands. *Current Anthropology* 60:589–601.

Ebert, Claire E., Daniel E. Pierce, and Jaime J. Awe
2019b Preclassic Ceramic Economy in Belize: Neutron Activation Analysis at Cahal Pech. *Antiquity* 93:1266–1283.

Estrada-Belli, Francisco
2011 *The First Maya Civilization: Ritual and Power Before the Classic Period*. Routledge, London.

Evans, Susan T.
2008 *Ancient Mexico and Central America: Archaeology and Culture History*, 2nd ed. Thames and Hudson, London.

Flannery, Kent V.
1969 Origins and Ecological Effects of Early Domestication in Iran and the Near East. In *The Domestication and Exploitation of Plants and Animals*, edited by Peter J. Ucko and Geoffrey W. Dimbleby, pp. 73–100. Duckworth, London.
1976 Contextual Analysis of Ritual Paraphernalia from Formative Oaxaca. In *The Early Mesoamerican Village*, edited by Kent V. Flannery, pp. 333–345. Academic Press, New York.
2001 Dog. In *Archaeology of Ancient Mexico and Central America: An Encyclopedia*, edited by Susan Toby Evans and David L. Webster, pp. 221–222. Garland Publishing, New York.

Flannery, Kent V. (editor)
2009 *Guilá Naquitz: Archaic Foraging and Early Agriculture in Oaxaca, Mexico*. Updated ed. Left Coast Press, Walnut Creek.

Flannery, Kent V., and Joyce Marcus (editors)
1983 *The Cloud People: Divergent Evolution of the Zapotec and Mixtec Civilizations*. Academic Press, New York.
2005 *Excavations at San José Mogote 1: The Household Archaeology*. Prehistory and Human Ecology of the Valley of Oaxaca 13/Memoirs of the Museum of Anthropology 40. University of Michigan, Ann Arbor.
2015 *Excavations at San José Mogote 2: The Cognitive Archaeology*. Prehistory and Human Ecology of the Valley of Oaxaca 16/Memoirs of the Museum of Anthropology 58. University of Michigan, Ann Arbor.

Flannery, Kent V., Joyce Marcus, and Stephen A. Kowalewski
1981 The Preceramic and Formative of the Valley of Oaxaca. In *Supplement to the Handbook of Middle American Indians Volume 1: Archaeology*, edited by Victoria Bricker, pp. 48–93. University of Texas Press, Austin.

Garber, James F., and Jaime J. Awe
2009 A Terminal Early Formative Symbol System in the Maya Lowlands: The Iconography of the Cunil Phase (1100–900 B.C.) at Cahal Pech. *Research Reports in Belizean Archaeology* 6: 151–160.

Garber, James F., M. Kathryn Brown, and Christopher J. Hartman
2002 The Early/Middle Formative Kanocha Phase (1200–850 B.C.) at Blackman Eddy, Belize. Report on file with the Foundation for the Advancement of Mesoamerican Studies, Inc., Los Angeles County Museum of Art, Los Angeles.

Garber, James F., M. Kathryn Brown, Jaime J. Awe, and Christopher J. Hartman
2004 The Terminal Early Formative Kanocha Phase (1100–900 b.c.) at Blackman Eddy. *Research Reports in Belizean Archaeology* 1:13–26.
Gibson, Eric C.
1991 A Preliminary Functional and Contextual Study of Constricted Adzes from Northern Belize. In *Maya Stone Tools: Selected Papers from the Second Maya Lithic Conference*, edited by Thomas R. Hester and Harry J. Shafer, pp. 229–237. Monographs in World Archaeology 1. Prehistory Press, Madison.
Gifford, James C.
1970 The Earliest and Other Intrusive Population Elements at Barton Ramie. *Cerámica de Cultura Maya* 6:1–10.
Golitko, Mark, and Gary M. Feinman
2015 Procurement and Distribution of Pre-Hispanic Mesoamerican Obsidian 900 B.C.–A.D. 1520: A Social Network Analysis. *Journal of Archaeological Method and Theory* 22:206–247.
Green, Judith S.
2010 Feasting with Foam: Ceremonial Drinks of Cacao, Maize, and Pataxte Cacao. In *Pre-Columbian Foodways: Interdisciplinary Approaches to Food, Culture, and Markets in Ancient Mesoamerica*, edited by John E. Staller and Michael Carrasco, pp. 315–344. Springer, New York.
Griffith, Cameron S., and Christophe G. Helmke
2000 Preliminary Investigations and GIS Spatial Analysis in Actun Halal, Belize. In *The Western Belize Regional Cave Project: A Report of the 2000 Field Season*, edited by Jaime J. Awe, pp. 98–113. Department of Anthropology Occasional Paper 3. University of New Hampshire, Durham.
Grove, David
2000 Faces of the Earth at Chalcatzingo, Mexico: Serpents, Caves, and Monuments in Middle Formative Period Iconography. In *Olmec Art and Archaeology in Mesoamerica*, edited by John E. Clark and Mary E. Pye, pp. 277–295. National Gallery of Art, Washington, DC.
Grove, David C., and Susan D. Gillespie
1984 Chalcatzingo's Portrait Figurines and the Cult of the Ruler. *Archaeology* July/August:27–33.
Halperin, Christina T.
2005 Social Power and Sacred Space at Actun Nak Beh, Belize. In *Stone Houses and Earth Lords: Maya Religion in the Cave Context*, edited by Keith M. Prufer and James E. Brady, pp. 71–90. University Press of Colorado, Boulder.
2014 *Maya Figurines: Intersections between State and Household*. University of Texas Press, Austin.
Halperin, Christina T., Sergio Garza, Keith M. Prufer, and James E. Brady
2003 Caves and Ancient Maya Ritual Use of *Jute*. *Latin American Antiquity* 14:207–219.
Hammond, Norman
1977 British Archaeology in Belize, 1976. *Antiquity* 51:61–65.
1989 The Function of Maya Middle Preclassic Figurines. *Mexicon* 11:11–14.
1991 *Cuello: An Early Maya Community in Belize*. Cambridge University Press, Cambridge.
Hansen, Richard D., Donald W. Forsyth, James C. Woods, Thomas P. Schreiner, and Gene L. Titmus
2018 Developmental Dynamics, Energetics, and Complex Economic Interactions of the Early Maya of the Mirador-Calakmul Basin, Guatemala and Campeche, Mexico. In *Pathways to Complexity: A View from the Maya Lowlands*, edited by M. Kathryn Brown and George Bey, pp. 147–194. University of Florida Press, Orlando.
Healy, Paul F.
1990 Excavations at Pacbitun, Belize: Preliminary Report on the 1986 and 1987 Investigations. *Journal of Field Archaeology* 17: 247–262.
2006 The Preclassic Maya of the Belize Valley: Key Issues and Questions. *Research Reports in Belizean Archaeology* 3:17–38.
Healy, Paul F., and Jaime J. Awe
1995 Radiocarbon Dates from Cahal Pech, Belize: Results from the 1994 Field Season. In *Belize Valley Preclassic Maya Project: Report on the 1994 Field Season*, edited by Paul F. Healy and Jaime J. Awe, pp. 198–215. Occasional Papers in Anthropology 10. Trent University, Peterborough.
Healy, Paul F., Kitty Emery, and Lori Wright
1990 Ancient and Modern Maya Exploitation of the Jute Snail (*Pachychilus*). *Latin American Antiquity* 1:170–183.
Helmke, Christophe, and Reiko Ishihara
2002 Archaeological Reconnaissance of Cueva Migdalia, Barton Creek Valley, Cayo District, Belize. In *The Belize Valley Archaeological Reconnaissance Project: A Report of the 2001 Field Season*, Volume 1, edited by Jaime J. Awe and Cameron S. Griffith, pp. 111–152. Institute of Archaeology, Belmopan.
Henderson, Hope
2003 The Organization of Staple Crop Production at K'axob, Belize. *Latin American Antiquity* 14:469–496.
Hester, Thomas R., and Harry J. Shafer
1984 Exploitation of Chert Resources by the Ancient Maya of Northern Belize, Central America. *World Archaeology* 16:157–173.
Hester, Thomas R., Thomas C. Kelly, and Giancarlo Ligabue
1981 *A Fluted Paleo-Indian Projectile Point from Belize, Central America*. Working Papers in Archaeology 1. Center for Archaeological Research, University of Texas at San Antonio, San Antonio.
Hester, Thomas R., Harry B. Iceland, Dale B. Hudler, and Harry J. Shafer
1996 The Colha Preceramic Project: Preliminary Results from the 1993–1995 Field Seasons. *Mexicon* 18:45–50.
Hohmann, Bobbi M.
2002 *Preclassic Maya Shell Ornament Production in the Belize Valley, Belize*. Unpublished Ph.D. dissertation. Department of Anthropology, University of New Mexico, Albuquerque.
Hohmann, Bobbi, Terry G. Powis, and Paul F. Healy
2018 Middle Preclassic Maya Shell Ornament Production: Implications for the Development of Complexity at Pacbitun, Belize. In *Pathways to Complexity: A View from the Maya Lowlands*, edited by M. Kathryn Brown and George J. Bey III, pp. 117–146. University Press of Florida, Gainesville.
Hoopes, John W.
1994 The Isthmian Alternative: Reconstructing Patterns of Social Organization in Formative Costa Rica. In *The Formation of Complex Society in Southeastern Mesoamerica*, edited by William R. Fowler Jr., pp. 171–192. BRC Press, Boca Raton.
Horowitz, Rachel A.
2018 Uneven Lithic Landscapes: Raw Material Procurement and Economic Organization Among the Late/Terminal Classic Maya of Western Belize. *Journal of Archaeological Science: Reports* 19:949–957.
Iceland, Harry
1997 *The Preceramic Origins of the Maya: The Results of the Colha Preceramic Project in Northern Belize*. Unpublished Ph.D. dissertation, Department of Anthropology, University of Texas at Austin, Austin.
2005 The Preceramic to Early Middle Formative Transition in Northern Belize: Evidence for the Ethnic Identity of the Preceramic Inhabitants. In *New Perspectives on Formative Mesoamerican Cultures*, edited by Terry G. Powis, pp. 15–26. BAR International Series 1377. Hadrian Books, Oxford.
Inomata, Takeshi
2017a The Emergence of Standardized Spatial Plans in Southern Mesoamerica: Chronology and Interregional Interactions Viewed from Ceibal, Guatemala. *Ancient Mesoamerica* 28:329–355.
2017b The Isthmian Origins of the E Group and Its Adoption in the Maya Lowlands. In *Early Maya E Groups, Solar Calendars, and the Role of Astronomy in the Rise of Lowland Urbanism*, edited by David A. Freidel, Arlen F. Chase, Anne Dowd, and Jerry F. Murdock, pp. 215–252. University Press of Florida, Gainesville.
Inomata, Takeshi, Jessica MacLellan, Daniela Triadan, Jessica Munson, Melissa Burham, Kazuo Aoyama, Hiroo Nasu, Flory Pinzón, and Hitoshi Yonenobu
2015 Development of Sedentary Communities in the Maya Lowlands: Coexisting Mobile Groups and Public Ceremonies at Ceibal, Guatemala. *PNAS* 112:4268–4273.
Inomata, Takeshi, Daniela Triadan, Flory Pinzón, and Kazuo Aoyama
2019 Artificial Plateau Construction During the Preclassic Period at the Maya Site of Ceibal, Guatemala. *PLoS ONE* 14(8):e0221943. DOI: 10.1371/journal.pone.0221943.
Inomata, Takeshi, Daniela Triadan, Verónica A. Vázquez López, Juan Carlos Fernández-Díaz, Takayuki Omori, María Belén Méndez Bauer, Melina García Hernández, Timothy Beach, Clarissa Cagnato, Kazuo Aoyama, and Hiroo Nasu
2020 Monumental Architecture at Aguada Fénix and the Rise of Maya Civilization. *Nature* 528:530–533.
Jones, John
1994 Pollen Evidence for Early Settlement and Agriculture in Northern Belize. *Palynology* 18:205–211.

Jones, John G., and Ashley Hallock
2008 Analysis of Fossil Pollen from Actun Halal, Belize. In *Search of the Preceramic: 2006 Season Investigations at Actun Halal, Belize*, edited by Jon C. Lohse, pp. 47–54. Institute of Archaeology, National Institute of Culture and History, Belmopan.
Joralemon, Peter David
1971 *A Study of Olmec Iconography*. Studies in Pre-Columbian Art and Archaeology 7. Dumbarton Oaks, Washington, DC.
Joyce, A. Rosemary, and John S. Henderson
2001 Beginnings of Village Life in Eastern Mesoamerica. *Latin American Antiquity* 12:5–24.
2010 Being "Olmec" in Early Formative Period Honduras. *Ancient Mesoamerica* 21:187–200.
Kelly, Thomas C.
1993 Preceramic Projectile-Point Typology in Belize. *Ancient Mesoamerica* 4:205–227.
Kennett, Douglas J.
2012 Archaic-Period Foragers and Farmers in Mesoamerica. In *The Oxford Handbook of Mesoamerican Archaeology*, edited by Deborah L. Nichols and Christopher A. Pool, pp. 141–150. Oxford University Press, New York.
Kennett, Douglass J., and Barbara Voorhies
1996 Oxygen Isotopic Analysis of Archaeological Shells to Detect Seasonal Use of Wetlands on the Southern Pacific Coast of Mexico. *Journal of Archaeological Science* 23:689–704.
Kennett, Douglas J., Dolores R. Piperno, John G. Jones, Hector Neff, Barbara Voorhies, Megan K. Walsh, and Brendan J. Culleton
2010 Pre-pottery Farmers on the Pacific Coast of Southern Mexico. *Journal of Archaeological Science* 37:3401–3411.
Kennett, Douglas J., Heather B. Thakar, Amber M. VanDerwarker, David L. Webster, Brendan J. Culleton, Thomas K. Harper, L. Kistler, Timothy E. Scheffler, and Kenneth Hirth
2017 High-Precision Chronology for Central American Maize Diversification from El Gigante Rockshelter, Honduras. *PNAS* 114: 9026–9031.
Kennett, Douglas J., Keith M. Prufer, Brendan J. Culleton, Richard J. George, Mark Robinson, Willa R. Trask, Gina Buckley, Emily Moses, Emily J. Kate, Thomas K. Harper, Lexi O'Donnell, Erin Ray, Ethan C. Hill, Asia Alsgaard, Christopher Merriman, Clayton Meredith, Heather J. Edgar, Jaime J. Awe, and Said M. Gutiérrez
2020 Early Isotopic Evidence for Maize as a Staple Grain in the Americas. *Science Advances* 6:1–11.
Kennett, Douglas J., Mark Lipson, Keith M. Prufer, David Mora-Marín, Richard J. George, Nadin Rohland, Mark Robinson, Willa R. Trask, Heather H.J. Edgar, Ethan C. Hill, Erin E. Ray, Paige Lynch, Emily Moes, Lexi O'Donnell, Thomas K. Harper, Emily J. Kate, Josue Ramos, John Morris, Said Gutierrez, Timothy M. Ryan, Brendan J. Culleton, Jaime J. Awe, and David Reich
2021 South-to-North Migration Preceded the Advent of Intensive Farming in the Maya Region. Manuscript in senior author's possession.
Kersey, Kelsey M.
2006 Emerging Elite Economies: Formative Period Obsidian Distribution in the Belize River Valley. In *The Belize Valley Archaeology Project: Results of the 2005 Field Season*, edited by James F. Garber, pp. 31–62. Texas State University, San Marcos.
Lawlor, Elizabeth J., Amy J. Graham, and Scott L. Fedick
1995 Preclassic Floral Remains from Cahal Pech, Belize. In *Belize Valley Preclassic Maya Project: Report on the 1994 Field Season*, edited by Paul F. Healy and Jaime J. Awe, pp. 150–165. Occasional Papers in Anthropology 10. Trent University, Peterborough.
LeCount, Lisa J.
2015 Chapter 1: Notes on Terminal Preclassic Ceramic Chronology. In *The Actuncan Archaeological Project Report of the 2014 Field Season*, edited by Lisa LeCount, pp. 1–32. Report submitted to the Belize Institute of Archaeology, Belmopan.
LeCount, Lisa J., and Jason Yaeger
2008 Tunnel Vision: What We Know About Cunil-Phase Materials and Contexts at Xunantunich, Belize. Paper presented at the 73rd Annual Meeting of the Society for American Archaeology, March 26–30, Vancouver.
LeCount, Lisa, David W. Mixter, and Borislava S. Simova
2016 Preliminary Thoughts on Radiocarbon Data from Actuncan's 2015 E-Group Excavations. In *The Actuncan Archaeological Project Report of the 2016 Field Season*, edited by Lisa LeCount and David W. Mixter, pp. 21–42. Report submitted to the Belize Institute of Archaeology, Belmopan.
LeCount, Lisa J., David W. Mixter, and Borislava S. Simova
2017 Preliminary Thoughts on Ceramic and Radiocarbon Data from Actuncan's E-Group Excavations. In *The Actuncan Archaeological Project: Report of the 2016 Field Season*, edited by Lisa J. LeCount and David W. Mixter, pp. 21–42. Report on file with the Belize Institute of Archaeology, Belmopan.
Lee, Richard B.
1979 *The !Kung San: Men, Women, and Work in a Foraging Society*. Cambridge University Press, Cambridge.
Lohse, Jon C.
2009 The Archaic-to-Preclassic Transition in Belize: What We Know and Why We Don't Know More. *Research Reports in Belizean Archaeology* 6:141–150.
2010 Archaic Origins of the Lowland Maya. *Latin American Antiquity* 21:312–352.
2020 Archaic Maya Matters. In *The Maya World*, edited by Scott R. Hutson and Traci Ardren, pp. 11–28. Routledge, New York.
2021 The End of An Era: Closing out the Archaic in the Maya Lowlands. In *Exploring the Unnamed Era: Pre-Mamom Pottery in the Maya Lowlands of Yucatan, Petén and Belize*, edited by Debra Walker. University of Florida Press, Gainesville. In press.
Lohse, Jon C., with contributions by Lisa LeCount, John G. Jones, Timothy Beach, and Ashley Hallock
2007 *In Search of the Preceramic: 2006 Season Investigations at Actun Halal, Belize*. FAMSI report. Electronic document, www.famsi.org/reports/06019/06019Lohse01.pdf, accessed October 14, 2021.
Lohse, Jon C., Jaime Awe, Cameron Griffith, Robert M. Rosenswig, and Fred Valdez Jr.
2006 Preceramic Occupations in Belize: Updating the Paleoindian and Archaic Record. *Latin American Antiquity* 17:209–226.
Love, Michael W.
1991 Style and Social Complexity in Formative Mesoamerica. In *The Formation of Complex Society in Southeastern Mesoamerica*, edited by William R. Fowler, pp. 47–76. CRC Press, Boca Raton.
MacNeish, Richard S.
1967 *The Prehistory of the Tehuacán Valley*. University of Texas Press, Austin.
1972 The Evolution of Community Patterns in the Tehuacán Valley of Mexico and Speculations about the Cultural Processes. In *Man, Settlement, and Urbanism*, edited by Peter J. Ucko, Ruth Tringham, and George W. Dimbleby, pp. 67–93. Duckworth, London.
MacNeish, Richard S., and Antoinette Nelken-Terner
1981 *Second Annual Report of the Belize Archaic Archaeological Reconnaissance*. Robert S. Peabody Foundation, Andover.
1983a The Preceramic of Mesoamerica. *Journal of Field Archaeology* 10:71–84.
1983b *Final Annual Report of the Belize Archaic Archaeological Reconnaissance*. Center for Archaeological Studies, Boston University, Boston.
MacNeish, Richard S., S. Jeffery K. Wilkerson, and Antoinette Nelken-Terner
1980 *First Annual Report of the Belize Archaic Archaeological Reconnaissance*. Robert S. Peabody Foundation, Andover.
Marcus, Joyce
1978 Archaeology and Religion: A Comparison of the Zapotec and Maya. *World Archaeology* 10:172–191.
1989 Zapotec Chiefdoms and the Nature of Formative Religions. In *Regional Perspectives on the Olmecs*, edited by Robert J. Sharer and David C. Grove, pp. 148–197. Cambridge University Press, New York.
1993 Men's and Women's Ritual in Formative Oaxaca. In *Ritual Behaviour, Social Identity, and Cosmology in Pre-Classic Mesoamerica*, edited by David C. Grove and Rosemary Joyce, pp. 67–96. Dumbarton Oaks, Washington, DC.
1998 *Women's Ritual in Formative Oaxaca: Figurine-Making, Divination, Death and the Ancestors*. Memoirs of the Museum of Anthropology 33. University of Michigan, Ann Arbor.
2009 Rethinking Figurines. In *Mesoamerican Figurines: Small-Scale Indices of Large-Scale Social Phenomena*, edited by Christina T. Halperin, Katherine A. Faust, Rhonda Taube, and Aurore Giguet, pp. 25–50. University Press of Florida, Gainesville.

Marcus, Joyce, and Kent V. Flannery
1996 *Zapotec Civilization: How Urban Society Evolved in Mexico's Oaxaca Valley*. Thames and Hudson, London.
2005 *The Radiocarbon Dating of Public Buildings and Ritual Features in the Ancient Valley of Oaxaca*. Report submitted to FAMSI, Coral Gables.
Matthews, Jennifer P., and James F. Garber
2004 Models of Cosmic Order: The Physical Expression of Sacred Space Among the Ancient Maya. *Ancient Mesoamerica* 15:49–59.
McAnany, Patricia A.
2004 Situating K'axob Within Formative Period Lowland Maya Archaeology. In *K'axob: Ritual, Work, and Family in an Ancient Maya Village*, edited by Patricia A. McAnany, pp. 1–9. Monumenta Archaeologica 22. Cotsen Institute of Archaeology, University of California, Los Angeles.
McAnany, Patricia A., and Sandra L. López Varela
1999 Re-Creating the Formative Maya Village of K'axob: Chronology, Ceramic Complexes, and Ancestors in Architectural Context. *Ancient Mesoamerica* 10:147–168.
Miller, Thomas, and Steven Alvarez
2000 Inside Chiquibul: Exploring Central America's Longest Cave. *National Geographic* 3:55–66.
Moyes, Holley
2006 *The Sacred Landscape as a Political Resource: A Case Study of Ancient Maya Cave Use at Chechem Ha Cave, Belize, Central America*. Unpublished Ph.D. dissertation. Department of Anthropology, State University of New York, Buffalo.
Moyes, Holley, Jaime J. Awe, George Brook, and James Webster
2009 The Ancient Maya Drought Cult: Late Classic Cave Use in Belize. *Latin American Antiquity* 20:175–206.
Moyes, Holley, Laura Kosakowsky, Erin E. Ray, and Jaime J. Awe
2017 The Chronology of Ancient Maya Cave Use in Belize. *Research Reports in Belizean Archaeology* 14:327–338.
Neff, Hector, Deborah M. Pearsall, John G. Jones, Barbara Arroyo, Shawn K. Collins, and Dorothy E. Freidel
2006 Early Maya Adaptive Patterns: Mid- to Late Holocene Paleoenvironmental Evidence from Pacific Guatemala. *Latin American Antiquity* 17:287–315.
Niederberger, Christine B.
1976 *Zohapilco: Cinco Milenios de Ocupación Humana en un Sitio Lacustre de la Cuenca de México*. Colección Científica 30. Instituto Nacional de Antropología e Historia, Mexico City.
Orsini, Stephanie R.
2016 *From Turkeys to Tamales: Paleoindian to Preclassic Period Faunal Use at Maya Hak Cab Pek Rockshelter in Southern Belize*. Unpublished Master's thesis. Department of Sociology and Anthropology, University of Mississippi, Oxford.
Peniche May, Nancy, Lisa DeLance, and Jaime J. Awe
2018 The Middle Preclassic Figurines from Cahal Pech, Belize Valley. *Ancient Mesoamerica* 30:221–234.
Peniche May, Nancy
2016 *Building Power: Political Dynamics in Cahal Pech, Belize During the Middle Preclassic*. Unpublished Ph.D. dissertation. Department of Anthropology, University of California, San Diego.
Peniche May, Nancy, Jaime J. Awe, and Claire E. Ebert
2021 Migration and Conflict, or Emulation and Interaction? The Belize Valley During the Middle Preclassic. In *Power, Politics, Violence, and Identity: 3,000 Years of War and Peace in Central America*, edited by Geoffrey E. Braswell. Routledge Archaeology of the Ancient Americas Series, Abingdon.
Piperno, Dolores R.
2011 The Origins of Plant Cultivation and Domestication in the New World Tropics: Patterns, Process, and New Developments. *Current Anthropology* 52:453–470.
Piperno, Dolores R., and Deborah M. Pearsall
1998 *The Origins of Agriculture in the Lowland Neotropics*. Academic Press, San Diego.
Pohl, Mary D.
1976 *Ethnozoology of the Maya: An Analysis of Fauna from Five Sites in Peten, Guatemala*. Unpublished Ph.D. dissertation, Department of Anthropology, Harvard University, Cambridge.
1983 Maya Ritual Faunas: Vertebrate Remains from Burials, Caches, Caves, and Cenotes in the Maya Lowlands. In *Civilization in the Ancient Americas*, edited by Richard Leventhal and Allan Kolata, pp. 55–103. University of New Mexico Press, Albuquerque.
Pohl, Mary D. Kevin O. Pope, John G. Jones, John S. Jacob, Dolores R. Piperno, Susan D. deFrance, David L. Lentz, John A. Gifford, Marie E. Danforth, and J. Kathryn Josserand
1996 Early Agriculture in the Maya Lowlands. *Latin American Antiquity* 7:355–372.
Potter, Daniel R.
1991 A Descriptive Taxonomy of Middle Preclassic Chert Tools at Colha, Belize. In *Maya Stone Tools: Selected Papers from the Second Maya Lithic Conference*, edited by Thomas R. Hester and Harry J. Shafer, pp. 21–29. Monographs in World Archaeology 1. Prehistory Press, Madison.
Powis, Terry G., Norbert Stanchly, Christine D. White, Paul F. Healy, Jaime J. Awe, and Fred Longstaffe
1999 A Reconstruction of Middle Preclassic Maya Subsistence Economy at Cahal Pech, Belize. *Antiquity* 73:364–376.
Powis, Terry G., Sherman Horn III, Gyles Iannone, Paul F. Healy, James F. Garber, Jaime J. Awe, Sheldon Skaggs, and Linda A. Howie
2016 Middle Preclassic Period Maya Greenstone "Triangulates": Forms, Contexts, and Geology of a Unique Mesoamerican Groundstone Artifact Type. *Journal of Archaeological Science: Reports* 10:59–73.
Prufer, Keith M., Asia V. Alsgaard, Mark Robinson, Clayton R. Meredith, Brendan J. Culleton, Timothy Dennehy, Shelby Magee, Bruce B. Huckell, W. James Stemp, Jaime J. Awe, José M. Capriles, and Douglas J. Kennett
2019 Linking Late Paleoindian Stone Tool Technologies and Populations in North, Central and South America. *PloS One* 14(7): e0219812.
Prufer, Keith M., Mark Robinson, and Douglas J. Kennett
2021 Terminal Pleistocene through Middle Holocene Occupations in Southeastern Mesoamerica: Linking Ecology and Culture in the Context of Neotropical Foragers and Early Farmers. *Ancient Mesoamerica* 32:439–460.
Reich, David, Douglas J. Kennett, Mark Lipson, Keith M. Prufer, David Mora-Marin, Richard J. George, Nadine Rohland, Mark Robinson, Willa R. Trask, Heather H.J. Edgar, Ethan K. Hill, Erin Ray, Paige Lynch, Emily Moes, Alexis O'Donnell, Thomas K. Harper, Emily Kate, Josue Ramos, John Morris, Said Gutiérrez, Brendan J. Culleton, and Jaime J. Awe
2020 Convergent Genetic, Linguistic, and Archaeological Evidence for an Ancient Migration of Farmers into the Maya Region. Unpublished manuscript in senior author's possession.
Reimer, Paula J., William E.N. Austin, Edouard Bard, Alex Bayliss, Paul G. Blackwell, Christopher Bronk Ramsey, Martin Butzin, Hai Cheng, R. Lawrence Edwards, Michael Friedrich, Pieter M. Grootes, Thomas P. Guilderson, Irka Hajdas, Timothy J. Heaton, Alan G. Hogg, Konrad A. Hughen, Bernd Kromer, Sturt W. Manning, Raimund Muscheler, Jonathan G. Palmer, Charlotte Pearson, Johannes van der Plicht, Ron W. Reimer, David A. Richards, E. Marian Scott, John R. Southon, Christian S.M. Turney, Lukas Wacker, Florian Adolphi, Ulf Büntgen, Manuela Capano, Simon M. Fahrni, Alexandra Fogtmann-Schulz, Ronny Friedrich, Peter Köhler, Sabrina Kudsk, Fusa Miyake, Jesper Olsen, Frederick Reinig, Minoru Sakamoto, Adam Sookdeo, and Sahra Talamo
2020 The IntCal20 Northern Hemisphere Radiocarbon Age Calibration Curve (0–55 cal kBP). *Radiocarbon* 62:725–757.
Rice, Don S.
1976 Middle Preclassic Maya Settlement in the Central Maya Lowlands. *Journal of Field Archaeology* 3:425–445.
Rice, Prudence M.
2018 Maya Crocodilians: Intersections of Myth and the Natural World at Early Nixtun-Ch'ich', Petén, Guatemala. *Journal of Archaeological Method and Theory* 25:705–738.
2019a *Anthropomorphizing the Cosmos: Middle Preclassic Lowland Maya Figurines, Ritual, and Time*. University Press of Colorado, Boulder.
2019b Early Pottery and Construction at Nixtun-Ch'ich', Petén, Guatemala: Preliminary Observations. *Latin American Antiquity* 30: 471–489.
2020 Crocodiles, Sharks, and Some Speculations on Central Peten Preclassic History. *Ancient Mesoamerica* 31:230–247.
2021 In Search of Middle Preclassic Lowland Maya Ideologies. *Journal of Archaeological Research* 29:1–46.
Rosenswig, Robert M.
2004 New Archaeological Excavation Data from the Late Archaic

Occupation of Northern Belize. *Research Reports in Belizean Archaeology* 1:267–277.
2006a Sedentism and Food Production in Early Complex Societies of the Soconusco, Mexico. *World Archaeology* 38:329–354.
2006b Northern Belize and the Soconusco: A Comparison of the Late Archaic to Formative Transition. *Research Reports in Belizean Archaeology* 3:59–71.
2015 A Mosaic of Adaptation: The Archaeological Record for Mesoamerica's Archaic Period. *Journal of Archaeological Research* 23:115–162.
2019 Mesoamerica's Archaic Period. In *Encyclopaedia of Global Archaeology*, edited by Claire Smith, pp. 1–16. Springer, Cham. doi:10.1007/978-3-319-51726-1.
2021 Opinions on the Lowland Maya Late Archaic Period with Some Evidence from Northern Belize. *Ancient Mesoamerica* 32:461–474.

Rosenswig, Robert M., Deborah M. Pearsall, Marilyn A. Masson, Brendan J. Culleton, and Douglas J. Kennett
2014 Archaic Period Settlement and Subsistence in the Maya Lowlands: New Starch Grain and Lithic Data from Freshwater Creek, Belize. *Journal of Archaeological Science* 41:308–321.

Scheffler, Timothy E.
2008 *The El Gigante Rock Shelter, Honduras*. Unpublished Ph.D. dissertation, Department of Anthropology, The Pennsylvania State University, University Park.

Scheffler, Timothy E., Kenneth G. Hirth, and George Hasemann
2012 The El Gigante Rockshelter: Preliminary Observation on an Early to Late Holocene Occupation in Southern Honduras. *Latin American Antiquity* 23:597–610.

Shafer, Harry J.
1991 Late Preclassic Formal Stone Tool Production at Colha, Belize. In *Maya Stone Tools: Selected Papers from the Second Maya Lithic Conference*, edited by Thomas R. Hester and Harry J. Shafer, pp. 31–44. Monographs in World Archaeology 1. Prehistory Press, Madison.

Shafer, Harry J., and Thomas R. Hester
1983 Ancient Maya Chert Workshops in Northern Belize, Central America. *American Antiquity* 48:519–543.

Sharer, Robert J., and James C. Gifford
1970 Preclassic Ceramics from Chalchuapa, El Salvador, and Their Relationships with the Maya Lowlands. *American Antiquity* 35: 441–462.

Stanchly, Norbert, and Chrissina Burke
2018 Preclassic Animal Resource Use and the Origins of Ancient Maya Lifeways and Society: Contributions from Belize Zooarchaeology. *Research Reports in Belizean Archaeology* 15:93–104.

Stanchly, Norbert, and Jaime J. Awe
2015 Ancient Maya Use of Dog (*Canis lupus familiaris*): Evidence from the Upper Belize River Valley. *Research Reports in Belizean Archaeology* 12:227–237.

Stark, Barbara L., Matthew A. Boxt, Janine Gasco, Rebecca B. González Lauck, Jessica D. Hedgepeth Balkin, Arthur A. Joyce, Stacie M. King, Charles L.F. Knight, Robert Kruger, Marc N. Levine, Richard G. Lesure, Rebecca Mendelsohn, Marx Navarro-Castillo, Hector Neff, Michael Ohnersorgen, Christopher A. Pool, L. Mark Raab, Robert M. Rosenswig, Marcie Venter, Barbara Voorhies, David T. Williams, and Andrew Workinger
2016 Economic Growth in Mesoamerica: Obsidian Consumption in the Coastal Lowlands. *Journal of Anthropological Archaeology* 41: 263–282.

Stemp, W. James, and Jaime J. Awe
2013 Possible Variation in the Late Archaic Period Bifaces in Belize: New Finds from the Cayo District of Western Belize. *Lithic Technology* 38:17–31.

Stemp, W. James, and E. Harrison-Buck
2019 Pre-Maya Lithic Technology in the Wetlands of Belize: The Chipped Stone from Crawford Bank. *Lithic Technology* 44:183–198.

Stemp, W. James, Jaime J. Awe, Keith M. Prufer, and Christophe G.B. Helmke
2016 Design and Function of Lowe and Sawmill Points from the Preceramic Period of Belize. *Latin American Antiquity* 27:279–299.

Stemp, W. James, Jaime J. Awe, M. Kathryn Brown, Eleanor Harrison-Buck, Christophe G. B. Helmke, Gabriel D. Wrobel, and Jason Yaeger
2018a Four Preceramic Points Newly Discovered in Belize: A Comment on Stemp et al. (2016: 279–299). *Latin American Antiquity* 29: 394–397.

Stemp, W. James, Jaime J. Awe, M. Kathryn Brown, and James F. Garber
2018b Rock Bottom: Maya Lithic Technology in the Early Terminal to Late Middle Preclassic Periods at Cahal Pech and Blackman Eddy, Cayo District, Belize. *Research Reports in Belizean Archaeology* 15: 79–92.

Stemp, W. James, Jaime J. Awe, and Gabriel D. Wrobel
2021 Better Late Than Never: Current Understanding of the Preceramic in Western and Central Belize. Paper presented at the 87th Annual Meeting of the Society for American Archaeology, March 30–April 3, Chicago.

Stocker, Terry, Sarah Meltzoff, and Steve Armsey
1980 Crocodilians and Olmecs: Further Interpretations in Formative Period Iconography. *American Antiquity* 45:740–758.

Strelow, Duane, and Lisa J. LeCount
2001 Regional Interaction in the Formative Southern Maya Lowlands: Evidence of Olmecoid Stylistic Motifs in a Cunil Ceramic Assemblage from Xunantunich, Belize. Poster presented at the 66th Annual Meeting of the Society for American Archaeology, April 18–22, New Orleans.

Sullivan, Lauren, and Jaime J. Awe
2013 Establishing the Cunil Ceramic Complex at Cahal Pech, Belize. In *Ancient Maya Pottery: Classification, Analysis, and Interpretation*, edited by James John Aimers, pp. 107–120. University of Florida Press, Gainesville.
2021 Cunil through Kanluk Pottery at Cahal Pech. In *Exploring the Unnamed Era: Pre-Mamom Pottery in the Maya Lowlands of Yucatan, Petén and Belize*, edited by Debra Walker. University of Florida Press, Gainesville. In press.

Sullivan, Lauren A., Jaime J. Awe, and M. Kathryn Brown
2018 The Cunil Complex: Early Villages in the Maya Lowlands. In *Pathways to Complexity: A View from the Maya Lowlands*, edited by M. Kathryn Brown and George Bey, pp. 35–48. University of Florida Press, Orlando.

Sunahara, Kay S., Joelle M. Chartrand, Paul F. Healy, and Jaime J. Awe
2018 Petrographic Analysis of Cunil Phase (1100–900 B.C.E.) and Spanish Lookout Phase (C.E. 700–900) Maya Pottery from Western Belize. Poster presented at the International Symposium on Archaeometry, May 20–26, Merida, Yucatan.

Thompson, J. Eric S.
1954 *The Rise and Fall of Maya Civilization*. University of Oklahoma Press, Norman.

Tykot, Robert H., Nikolaas J. van der Merwe, and Norman Hammond
1996 Stable Isotope Analysis of Bone Collagen, Bone Apatite, and Tooth Enamel in the Reconstruction of Human Diet: A Case Study from Cuello, Belize. In *Archaeological Chemistry: Organic, Inorganic, and Biochemical Analyses*, edited by Mary Virginia Orna, pp. 355–365. American Chemical Society, Washington, DC.

Voorhies, Barbara
2004 *Coastal Collectors in the Holocene: The Chantuto People of Southwest Mexico*. University of Florida Press, Gainesville.
2012 Archaic Period in Mesoamerica. In *The Oxford Companion to Archaeology*, Volume 2, edited by Neil A. Silberman, pp. 342–346. Oxford University Press, Oxford.

Wahl, David B., Roger Byrne, Thomas Schreiner, and Richard Hansen
2006 Holocene Vegetation Change in the Northern Peten and Its Implications for Maya Prehistory. *Quaternary Research* 65:380–389.

Wake, Timothy A.
2004 A Vertebrate Archaeofauna from the Early Formative Period Site of Paso de la Amada, Chiapas, Mexico. In *Maya Zooarchaeology: New Directions in Method and Theory*, edited by Kitty F. Emery, pp. 209–222. Cotsen Institute of Archaeology Monograph 51. University of California, Los Angeles.

Weintraub, Boris
1994 Geographica. *National Geographic* 185(4), April.

Wiesen, Alan, and David Lentz
1997 Floral Remains at Cahal Pech and Surrounding Sites. Research report, New York Botanical Garden, New York.

Willey, Gordon R.
1978 Artifacts. In *Excavations at Seibal Department of Peten, Guatemala*, edited by Gordon R. Willey, pp. 1–189. Memoirs of the

Peabody Museum of Archaeology and Ethnology 14(1). Harvard University, Cambridge.

Willey, Gordon R., William R. Bollard Jr., John B. Glass, and James C. Gifford

1965 *Prehistoric Maya Settlements in the Belize Valley*. Papers of the Peabody Museum of Archaeology and Ethnology, Harvard University, Cambridge.

Wing, Elizabeth S.

1978 Use of Dogs for Food: An Adaptation to the Coastal Environment. In *Prehistoric Coastal Adaptations: The Economy and Ecology of Maritime Middle America*, edited by L. Barbara Stark and Barbara Voorhies, pp. 29–41. Academic Press, New York.

Wing, Elizabeth S., and Sylvia J. Scudder

1991 The Exploitation of Animals. In *Cuello: An Early Maya Community in Belize*, edited by Norman Hammond, pp. 84–97. Cambridge University Press, Cambridge.

Zeder, Melinda A.

2012 The Broad Spectrum Revolution at 40: Resource Diversity, Intensification, and an Alternative to Optimal Foraging Explanations. *Journal of Anthropological Archaeology* 31:241–264.