

6 **NOBODY PUTS GRANDMA IN THE CORNER: PLACEMAKING AT EARLY CLASSIC CHAN CHICH, BELIZE**

Anna C. Novotny, Tomás Gallareta Cervera, and Brett A. Houk

Mortuary evidence of the Early Classic period (AD 250–600) at the Chan Chich acropolis suggests the consolidation of power by the local ruling elite. Located in the northeastern corner of the Upper Plaza, Burial CC-B20 contained the exceptionally well-preserved remains of an elderly adult female within a stone-lined crypt (Crypt 2; cal AD 257–387). The excellent skeletal preservation allowed a comprehensive osteobiography; cranial modification, stable isotopes, and pathological changes to the vertebrae and long bones tell a story of a long and active life. The Early Classic was a transformational era at the city. During the Preclassic period, the Chan Chich rulers consolidated power by manipulating the built environment to create a political place in the Upper Plaza. In the Early Classic, they constructed a vaulted crypt in the Upper Plaza, partially dismantling a Late Preclassic platform in the process. Crypt 1 contained multiple male individuals and markers of rulership, including spondylus shell earflares and a jade bib-helmet pendant. In contrast, the coeval Burial CCB-20 lacked artifacts, but the construction of the crypt was labor intensive. The interment of the woman in Burial CCB-20 marks a change in the location and body treatment of the ruling lineage interred in this exclusive location. Osteological data are interpreted in concert with contextual information to gain insight into local ideas concerning power and gender, as well as into elite life at Early Classic Chan Chich.

Introduction

Throughout the ancient Maya realm, the Early Classic saw the transition of political power from lords of the Late Preclassic to the divine kingships of the Classic period. During the Early Classic at Chan Chich, the southernmost city of the Belizean portion of the Three Rivers adaptive region (Figure 1), two elite graves at the site's central precinct, the Upper Plaza, contained the material insignia of divine kingship. These insignia indicate their attempts to tap into this newly consolidated political model of ideological power (Friedel and Schele 1988; Gallareta Cervera et al. 2017; Houk et al. 2010). A number of individuals were interred in the Upper Plaza over the course of the Early Classic period, including an elderly female, Burial CC-B20. Our main question here is, *how did this transitional era, the social context of the early part of the Early Classic, mold the body of the individual interred in Burial CC-B20?* To address this question, we present a detailed osteobiography of this elite female. We conclude by contextualizing the osteobiography of Burial CC-B20 within the broader scope of placemaking through mortuary activity in the Upper Plaza during the Early Classic.

An osteobiography takes a close look at the skeletal remains of one individual, tracking moments of life history from birth to death, and contextualizes the results within broader culture and historical context. The present study is positioned within embodiment theory, described

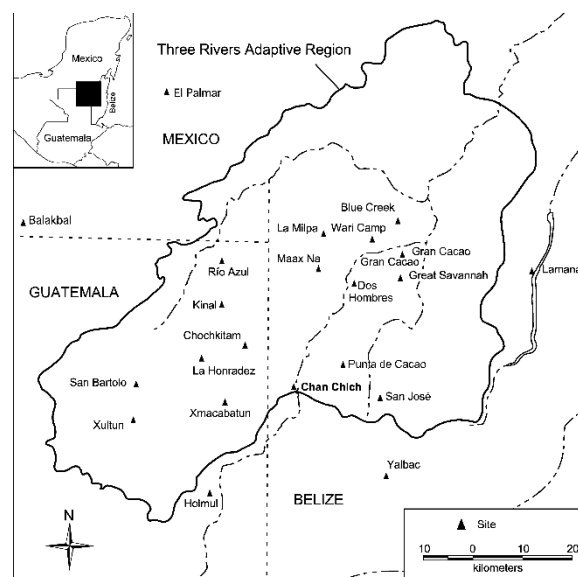


Figure 1. Map of the Three Rivers adaptive region.

by Schrader and Torres-Rouff (2020) as a conduit linking the human body with the social world. Historical approaches see a duality of body/culture in which the two are fundamentally opposed. Embodiment theory proposes that the body is not only an object to study but the subject of culture. There is plasticity and mutability inherent in the human body that culture molds and shapes. Bioarchaeological research is perfectly positioned to implement this theoretical perspective, as the discipline's prime goal is to answer questions about the past and past lives through the skeletonized body (Schrader and Torres-Rouff 2020).

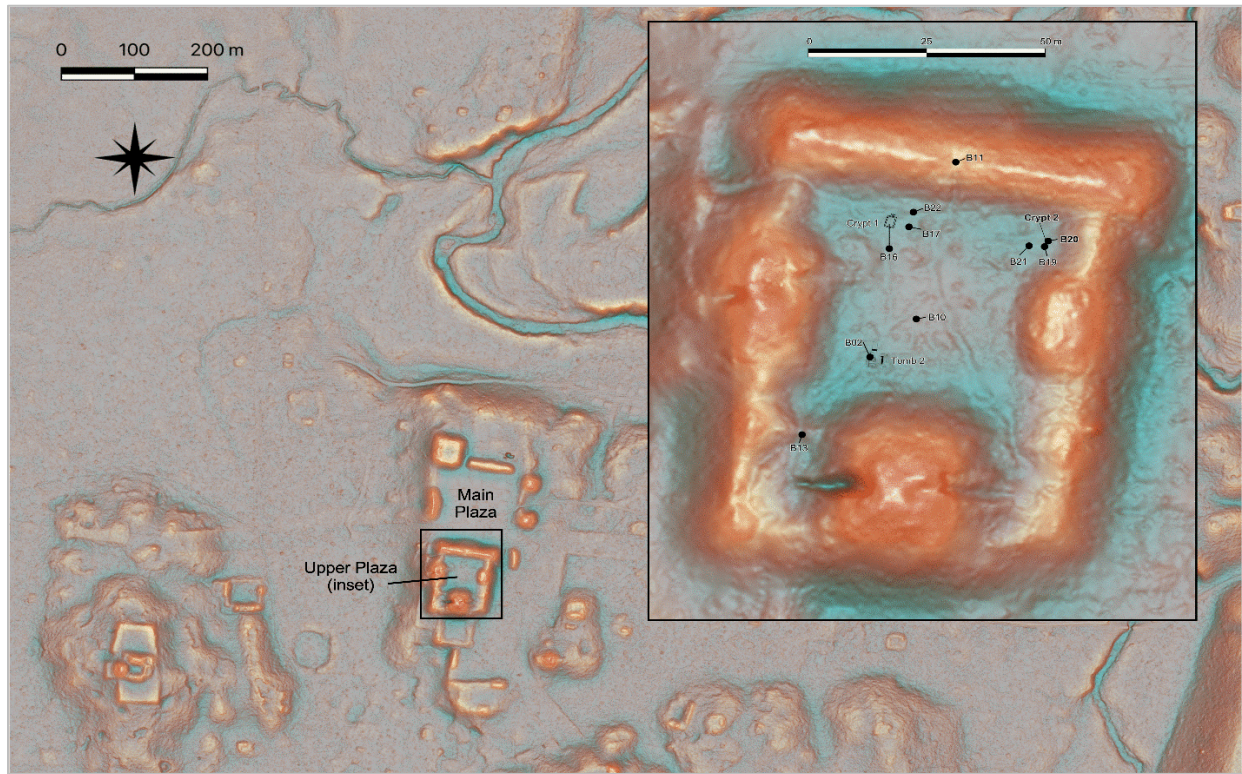


Figure 2. Red Relief Image Map of Chan Chich’s site core, with an inset of the Upper Plaza showing the locations of excavated burials.

Our theoretical approach aligns with current interpretations of ancient Maya worldview concerning the body and sociality. We draw on several key tenets from ethnographic, ethnohistoric, and linguistic sources from a range of Maya groups throughout Mexico, Guatemala, and Belize (see Scherer 2015 for summary). Movement/action/behavior of the body affects the stability of the animating life essences, our Western understanding of the “soul.” Infants, in particular, must be cared for in a manner that secures the newly attached animating essences, as they can lose vitality, “heat,” or detach. Among adults, proper behavior, such as participating in rituals, maintaining your household, and not giving in to drunkenness, all build the heat of the *ch’ulel* and anchor it firmly to the body. This is the link between anthropological theory and the body—the belief that shaping bodies also is proper treatment of the *ch’ulel*. We can see the process of social identity formation in the body.

The architectural context of this osteobiography is the monumental core of Chan

Chich, which is centered on a 350-m long, north-south line of contiguous plazas, multiple vaulted residences, two internal *sacbeob*, a ball court, and an acropolis group (Figure 2). Excavations from 2016–2018 focused on the Upper Plaza, an acropolis group elevated 7 m above the main plaza with two large temple-pyramids, attached lateral courtyards, and a formal entry through the central landing on Structure A-1 (Houk 2021). During the Middle Preclassic period, the first settlers of the site occupied the hilltop where the Upper Plaza would later be built.

Recent excavations into the Upper Plaza revealed several large buildings originally constructed around 400 BC that were dismantled and their foundations buried beneath the Upper Plaza in the later Late Preclassic (~400 BC–150 AD). Several Late Preclassic burials have been found in the Upper Plaza indicating its importance as a ritual locale. From then on, the Upper Plaza remained the heart of the community for several centuries. The architectural modifications and the mortuary activity, including Burial CC-B20, were part of the



Figure 3. Orthophoto of Burial CC-B20 created using Photoscan.

placemaking of the Upper Plaza—the creation of a socially meaningful locale, “... produced by ongoing human social practices and experiences with the material world” (Halperin 2014:111; see also Nieves Zedeño and Bowser 2009). There is ample archaeological evidence in the Maya lowlands that ancestor veneration and placemaking went hand in hand (McAnany 1998). We will return to the significance of Burial CC-B20’s interment for placemaking in the Upper Plaza. In the following section we describe the osteological data from Burial CC-B20.

Burial CC-B20

Burial CC-B20 was excavated in 2018 at the northeastern corner of the Upper Plaza (Gallareta Cervera et al. 2019). Burial CC-B20 consisted of a single individual, encapsulated by a capped cist placed directly on the Upper Plaza’s Middle Preclassic floor surface. Creating the grave required its builders to cut through approximately 2 m of Late Preclassic floors and fill to reach the Middle Preclassic floor. An AMS radiocarbon date from a bone fragment dates the

body to cal A.D. 257–387 (Gallareta Cervera et al. 2019: Table 2.2).

The bones of the individual interred in Burial CC-B20 were extremely well preserved (Figure 3). Overall, about 75% of the bones in the body and four teeth were available for study. The individual’s pelvis and cranium suggest a biological sex of female and indicate that she probably died in her early 70s (Novotny et al. 2019).

Skeletal indicators of immune response suggesting illness or poor nutrition include growth arrest lines called linear enamel hypoplasias on the teeth and inflammation on skeletal elements indicative of infection (Buikstra 2019). Burial CC-B20 was recovered with only four teeth, three of which were in occlusion. Recovered teeth include mandibular premolar, incisor, and canine, and one maxillary second molar. All were unmarked by hypoplasia and nearly free of dental calculus, or calcified plaque, which can lead to dental caries. She did suffer from extreme antemortem tooth loss, which is not unexpected for an ancient Maya individual, as their corn-based diet is highly cariogenic. The

mandibular bone was particularly well healed, which suggests that she lived without her dentition for years before her death. Several long bones showed minor periostitis, an inflammatory bone reaction possibly indicative of infection. Periostitis suggests a low-grade, possibly systemic, infection.

As a child, her caregivers had modified her cranial vault in the tabular erect form, resulting in a sloping forehead and flattening to the posterior aspect of the cranium (Tiesler 2014). This shape is created by applying a compression device on the frontal bone, creating a sloping forehead, and a device higher up on the occipital, at lambda. Although difficult to discern in photos, the impression of these two circular pads is visible on the frontal bone. A furrow is also discernible posterior to the coronal suture and the occipital bone bulges slightly inferior to lambda.

Two ways we can see the life experience of Burial CC-B20 is through the markings of muscle attachments on the bones and osteoarthritic changes to joints. In short, tendons and ligaments attach muscle to bone and repetitive, habitual use of a muscle will promote bone proliferation at the attachment site (Benjamin et al. 2006). Well-developed musculoskeletal stress markers, or MSMs, are not necessarily pathological, and their frequency increases with age (Godde et al. 2018).

The deltoid tuberosity, a bone feature on the right humerus, was noticeably large, while the left side did not have the same robust shape. The deltoid muscle engages in raising the arm away from the body and rotating it anteriorly and posteriorly. The stronger expression of the MSM suggests a specific task that required just the right arm. The attachment for the teres major was also robust. The teres major is a muscle that adducts the arm, bringing it towards the body from a raised position. The conoid ligament, which attaches to the clavicle, was robust as well. This ligament functions to maintain shoulder stability when the arm is raised. The proximal ulna was not very well preserved, but the attachments for the muscles that rotate the forearm medially were pronounced, and there was evidence of osteoarthritis in the proximal epiphysis (elbow joint). Osteoarthritis was present on other elements, as well.

Osteoarthritis is a joint disease affecting the synovial, freely moving, joints of the body. The pathology begins in soft tissue, the joint's articular cartilage, which progressively degenerates. Skeletal involvement includes reactive bone formation on and within the joint surface, osteophyte formation at margins of the joint, and eventually eburnation, or polishing, of the joint surface due to bone-on-bone contact. Osteoarthritis is one of the most common diseases among living and past populations and is identified in two types—primary and secondary. Primary osteoarthritis is of unknown cause and is the result of biomechanical stress or trauma and tends to occur as age progresses. Secondary osteoarthritis occurs as the result of another condition and can happen at any point in life (Buikstra 2019). The osteoarthritis at the elbow joint, mentioned above, included porosity on the joint surface. In addition, lumbar vertebrae 4 and 5 showed signs of osteoarthritis in the form of porosity on the superior and inferior aspects of the bodies. There are osteophytes, curved spicules, on the anterior aspect of both bodies. Spicule formation suggests habitual anterior flexion of the spine.

Bone chemistry reflects the isotopic components of food and water consumed over the course of an individual's life (Price and Burton 2012). In particular, the isotopes of carbon and nitrogen reflect the nature of the plants and animals, respectively. In brief, more negative values suggest a diet of plants using the C₃ photosynthetic pathway, while less negative values indicated more reliance on C₄ plants, such as corn, and/or marine resources. Bone collagen values of $\delta^{15}\text{N}$ speak to the trophic level of the consumer; that is, they show the amount of terrestrial meat consumed. The carbon and nitrogen values speak to her diet for approximately 5–7 years prior to death.

Bone collagen was extracted from a fragment of humerus. The ratio of carbon to nitrogen isotope values is shown in Figure 4 for all Chan Chich Upper Plaza burials. The carbon value from bone collagen is -11.8 which suggests she consumed a fair amount of C₄ foods supplemented by foods with a C₃ photosynthetic pathway. Her nitrogen value was 8.6 indicating terrestrial meat was part of her diet. Her values are consistent with other ancient Maya

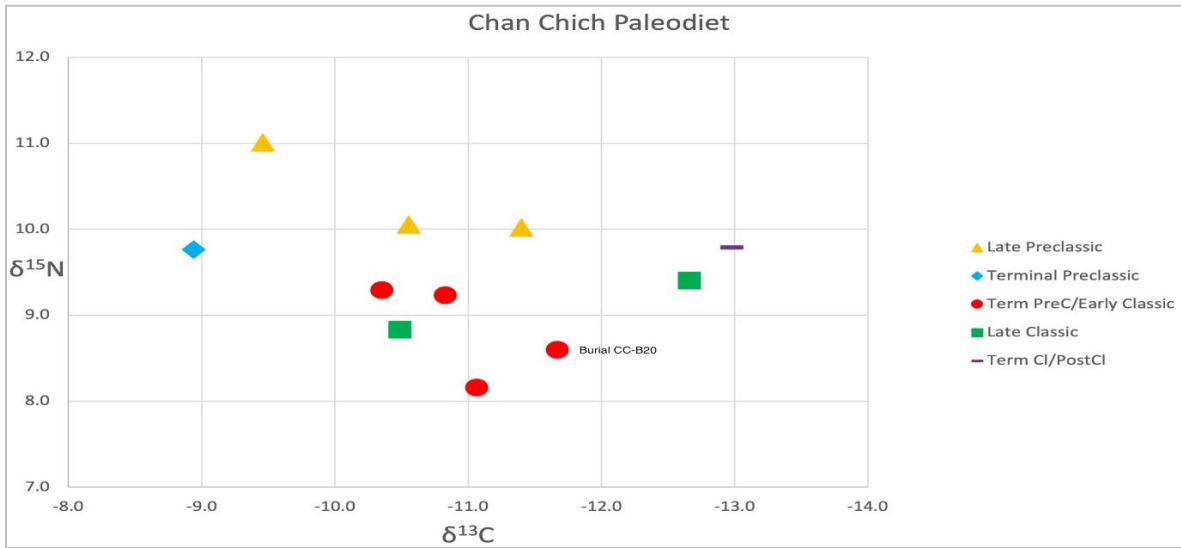


Figure 4. Carbon and Nitrogen isotope ratios from the Upper Plaza burials at Chan Chich.

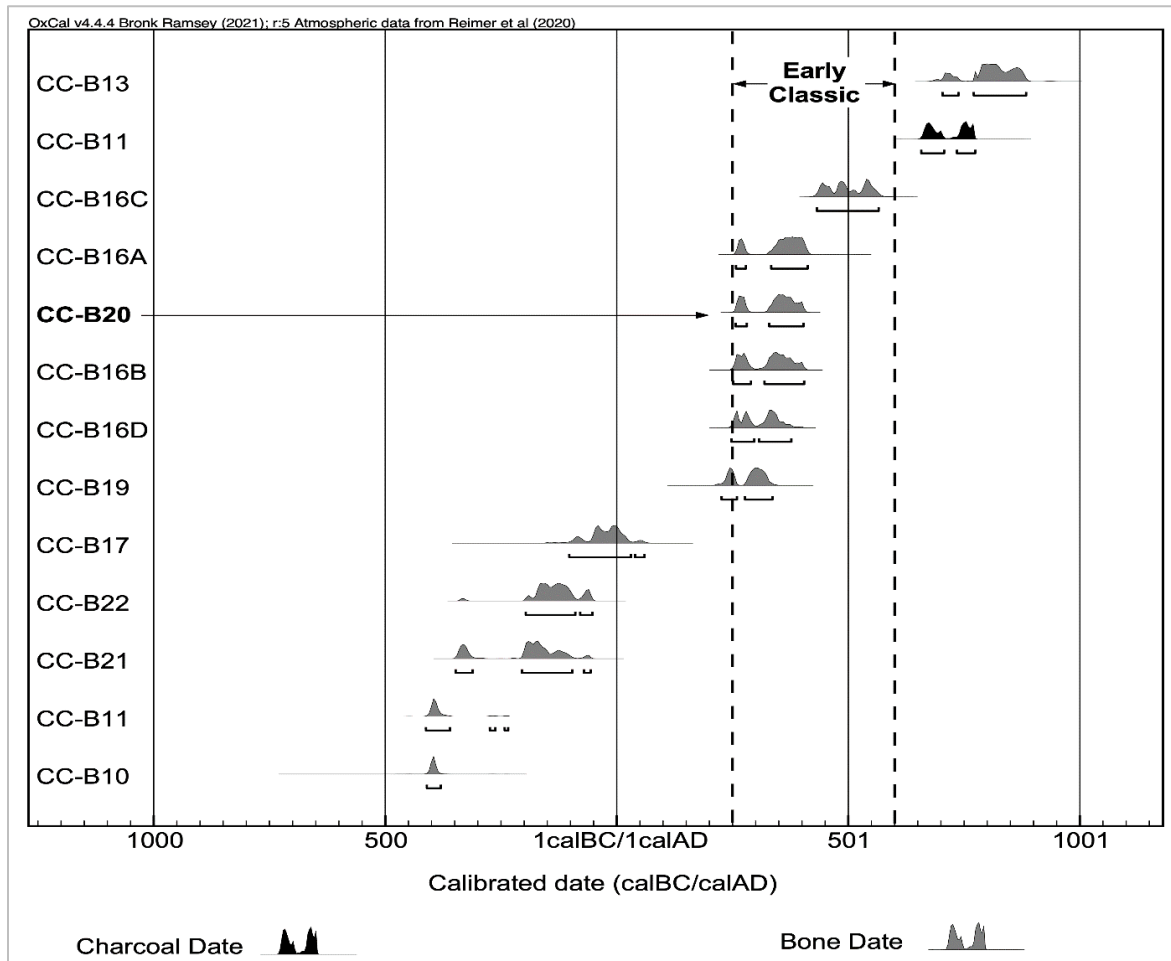


Figure 5. Sequence of radiocarbon dates from the Upper Plaza burials at Chan Chich.

individuals living in the Early Classic period (Sommerville et al. 2013).

Strontium isotope values reflect the ratio of ^{86}Sr to ^{87}Sr in bedrock. Humans consume plants and water that take on the strontium bedrock signature. Analysis of samples of human teeth and bone relate the strontium values of the location where the individual was consuming food and water while those tissues were formed—as a child when the teeth were forming or as an adult as bone remodeling occurred (Bentley 2006). Burial CC-B20's strontium ratio in dental enamel is $^{86}\text{Sr}/^{87}\text{Sr} = 0.70820$ and $^{86}\text{Sr}/^{87}\text{Sr} = 0.70834$ in bone. Local individuals are typically identified as those that fall within two standard deviations of the faunal mean for a strontium zone. There are no baseline faunal values for Chan Chich, but the range of baseline values from water, rock, and plants of the southern lowlands, $^{86}\text{Sr}/^{87}\text{Sr} = 0.7071\text{--}0.7082$ (Hodell et al. 2004), and the mean strontium value for the nearby site of Holmul, $^{86}\text{Sr}/^{87}\text{Sr} = 0.70825$ (Cormier 2018:206), suggest that Burial CC-B20 spent her childhood and adulthood in the vicinity of Chan Chich.

A radiocarbon date places Burial CC-B20 at cal A.D. 257–387, suggesting that her life began as early as A.D. 200 during the transition from the Late Preclassic to Early Classic (Figure 5). She was likely a member of an elite family at Chan Chich based on the location of her interment. In the following section, we interpret these biological data within the context of Early Classic Chan Chich and describe one possible trajectory for the life history of Burial CC-B20.

Osteobiography

The woman in Burial CC-B20 was likely born at Chan Chich. Within the first months of her life her caregivers, courtiers of the Chan Chich royal family, such as midwives, began the process of molding her cranium (Figure 6). The minor bulging at the occipital and the groove posterior to the coronal suture suggests the compression devices being extremely tight or being used longer than needed, after closure of the fontanelles, which typically occurs between 18–24 months (Tiesler 2014:43). As the modification is not particularly extreme, we suggest they were applied up to or beyond 18 months. Observations made by Fray Diego de



Figure 6. Orthophoto showing Burial CC-B20 cranial modification. Image courtesy of Gabriel Wrobel.

Landa (cited in Tiesler 2014) about infant head shaping suggest the practice lasted for several months to a few years, which is consistent with the marks seen on Burial CC-B20.

Tiesler's (2014) thorough study of head shaping throughout Mesoamerica suggests that, generally speaking, shaping the head emphasized the process instead of the resulting shape. Ethnographic and ethnohistoric data from multiple Mesoamerican cultures describe the top of the head and the occipital region as places where the newly attached life essence, *ch'ulel*, resides and that it can detach easily through the fontanelles. The caregiver's duty is to manage the body of the infant so that the soul remains attached and the newly born can accrue vitality, or heat, to secure the life essences. Growth and development, thus, is about caretakers' facilitating the accumulation of strength and vitality through the malleability of the body.

Although comparative sample sizes are small due to poor preservation, the type of cranial modification we see in Burial CC-B20 is also common for this region. Tabular erect makes up 80% of the modification in the Central Lowlands according to Tiesler's study, which is supported by Hannah Plummer's (2017) observations of crania from northwest Belize.

Childhood wellness is indicated by the lack of hypoplasias on the recovered teeth. The recovered teeth would have been completed formation by age 7 or 8. The absence of these

lesions does not mean that Burial CC-B20 did not experience any illness, trauma, or metabolic stress, but that she was buffered from the most extreme consequences.

We do not want to overinterpret these MSMs and evidence for osteoarthritis. We cautiously suggest that Burial CC-B20 was engaged in activities related to craft production, perhaps spinning or another aspect of cloth production, a craft typically carried out by women in Mesoamerica. In fact, her training may have begun not long after the head shaping devices were removed. An image from the Codex Mendoza shows that Aztec girls as young as 3 years were taught to spin and were competent weavers by age 8 (Nielsen 2017). She may have continued to spin and or weave throughout her adult life. The osteoarthritis in her lower back suggests flexion of the spine in a motion consistent with movement while sitting. Bioarchaeologists studying movements of modern-day weavers in Peru and India, who also use backstrap looms like the ones used by the Maya, suggest that the positioning of the loom and movements during weaving may contribute to osteoarthritis in the lower back (Becker 2016).

Scholars of Aztec weaving suggest that older weavers began to spin more than weave as they aged and their eyesight diminished (Nielsen 2017). It is possible that the unilateral robusticity of the attachments associated with raising one arm and stabilizing the shoulder could be indicative of time spent spinning. As she aged, she may have taught younger women to weave and spin, as represented in the Aztec images.

Her long life likely affected her dental health. The well-healed alveolar bone of the mandible and general lack of dental calculus on recovered dentition suggest some degree of dental care. We propose that a health practitioner may have extracted carious teeth. A recent study by Schnell and Scherer (2021) identified carious and broken human teeth associated with a marketplace at Piedras Negras, indicating that dental care may have been available to certain parts of the ancient Maya population. Our own excavations at Chan Chich in the proposed marketplace recovered one human tooth (Degnan et al. 2022).

The lack of teeth would certainly have affected which foods she was able to consume,

which would have influenced her bone collagen isotopic values. The isotopes are similar to other Early Classic elites in the Maya lowlands, but they are exactly on point with Early Classic non-elites from Sommerville and colleague's (2013) comparison of elite and non-elite diets. This might suggest that the Chan Chich elite were not consuming a diet on par with elites at other sites. A second interesting aspect of these isotope values is that the Early Classic burials, the red dots in Figure 4, indicate a slight shift in diet from the Late Preclassic period, shown in yellow. Further isotopic analysis should clarify her diet and those of the other Chan Chich residents, including what she ate as a child when her teeth were forming.

The woman in Burial CC-B20 spent her life at, or in the vicinity of Chan Chich and passed at an advanced age, likely living into her 70s. Her mourners decided that the Upper Plaza, a private and long used ritual locale at the site, was the best place for her interment. She was among at least four other people already interred there at or near the time of her interment, including two individuals likely of royal status. Two secondary burials dating to the Preclassic period were found in close association with the grave of Burial CC-B20, suggesting a gathering of remains in this corner of the plaza (Gallareta Cervera et al. 2019).

Her grave showed particular investment in construction, beginning with the excavation of a 2 m deep shaft. Her body was laid in a semi-flexed position on a Middle Preclassic floor. Seven large roughly shaped limestone slabs held back the construction fill, and three enormous chert boulders capped her crypt. The grave was not filled with sediment, as others in the Upper Plaza were, but was left open. Her body position and orientation are consistent with the rest of the Three Rivers adaptive region. Around 65% of primary burials are flexed and 58% are oriented with head to the south (Novotny 2022).

Even though Burial CC-B20 was placed in the corner of the Upper Plaza, well below the plaza floor, she was included in a centuries' old tradition of interment in this exclusive architectural group. The tradition of interment there was a critical source of social memory that the Chan Chich nobility relied on for consolidating power in the Early Classic. They

were claiming divine kingship evidenced by the jade bib helmet diadems in Tomb 2 and Crypt 1 (Friedel and Schele 1988; Gallareta Cervera et al. 2017; Houk et al. 2010). The institution of divine kingship drew on the traditions of ancestor veneration to legitimate power during the Classic period, including interment of the dead in special locations to facilitate care and communication. Placemaking at the Upper Plaza created the appropriate stage for the theatre of divine kingship, including all those who were no longer visible. Long after her death, Burial CC-B20 remained integral to the placemaking of the Upper Plaza.

Conclusion

We began by asking *how did the social context of the early part of the Early Classic mold the body of the individual interred in Burial CC-B20?* The individual in Burial CC-B20 embodies the biocultural traditions of cranial modification, eating, and crafting. She was cared for and guided towards becoming a vital and contributing member of her group. She likely passed on these skills and traditions, important social knowledge, as she aged. Her cranial modification and body treatment at death were all in line with the general population of Early Classic Maya in the Three Rivers adaptive region.

After her death, the living chose her to include in a cohort of dead who were gathered together as part of the placemaking of the Upper Plaza. Some had material status markers, while she did not have any that survived the millennia since her burial. Her placement and the construction effort put forward to inter her speak to the purposeful inclusion of her body. Early Classic period placemaking marked the Upper Plaza as an important locale to be through the Classic period.

Acknowledgements We would like to thank Dr. John Morris and the Institute of Archaeology for permitting the excavations at Chan Chich and to the Bowen Family for allowing access to Chan Chich. The work discussed here was funded by the Alphawood Foundation, Texas Tech University, and Kenyon College. We also extended our thanks to the staff, students, and workers who assisted in the excavation and documentation of the data presented here.

References Cited

- Becker, Sara K.
2016 Skeletal Evidence of Craft Production from the Ch'iji Jawira site in Tiwanaku, Bolivia. *Journal of Archaeological Science: Reports* 9:405–415.
- Benjamin, Michael, Hechmi Toumi, Jim R. Ralphs, Graeme Bydder, Thomas M. Best, and Stefan Milz
2006 Where Tendons and Ligaments Meet Bone: Attachment Sites ('entheses') in Relation to Exercise and/or Mechanical Load. *Journal of Anatomy* 208:471–490.
- Bentley, R. Alexander
2006 Strontium Isotopes from the Earth to the Archaeological Skeleton: A Review. *Journal of Archaeological Method and Theory* 13(3):135–187.
- Buikstra, Jane E. (editor)
2019 *Ortner's Identification of Pathological Conditions of Human Skeletal Remains*. Academic Press, New York.
- Cormier, Aviva Ann
2018 Maya Osteobiographies of the Holmul Region, Guatemala: Curating Life Histories Through Bioarchaeology and Stable Isotope Analysis. Unpublished PhD dissertation, Department of Anthropology, Boston University, Boston.
- Degnan, Bridgette, Alexandra Cox, Anna DesHotels, Gabrielle Blowers, and Brett A. Houk
2022 Chan Chich North Plaza Marketplace Study. In *The 2022 Season of the Belize Estates Archaeological Survey Team*, edited by Brett A. Houk, pp. 39–64. Papers of the Chan Chich Archaeological Project, Number 15. Department of Sociology, Anthropology, and Social Work, Texas Tech University, Lubbock.
- Friedel, David A. and Linda Schele
1988 Kingship in the Late Preclassic Maya Lowlands: The Instruments and Places of Ritual Power. *American Anthropologist* 90(3):547–5678.
- Gallareta Cervera, Tomás, Brett A. Houk, and Paisley Palmer
2017 The 2017 Investigations in the Upper Plaza at Chan Chich, Belize. In *The 2017 Season of the Chan Chich Archaeological Project*, edited by Brett A. Houk and Claire Novotny, pp. 33–68. Papers of the Chan Chich Archaeological Project, Number 12. Department of Sociology, Anthropology and Social Work, Texas Tech University, Lubbock.

- Gallareta Cervera, Tomás, and Brett A. Houk
 2019 The 2019 Investigations in the Upper Plaza at Chan Chich, Belize. In *The 2019 Season of the Belize Estates Archaeological Survey Team*, edited by Brett A. Houk, pp. 13–48. Papers of the Chan Chich Archaeological Project, Number 14. Department of Sociology, Anthropology, and Social Work, Texas Tech University, Lubbock.
- Godde, Kanya, Rebecca J. Wilson Taylor, Crystal Gutierrez
 2018 Enteseal Changes and Demographic/Health Indicators in the Upper Extremity of Modern Americans: Associations with Age and Physical Activity. *International Journal of Osteoarchaeology* 28:285–293.
- Halperin, Christina T.
 2014 Circulation as Placemaking: Late Classic Maya Politics and Portable Objects. *American Anthropologist* 116(1):110–129.
- Hodell, David A., Rhonda L. Quizz, Mark Brenner, and George Kamenov
 2004 Spatial Variation of Strontium Isotopes (87Sr/86Sr) in the Maya Region: A Tool for Tracking Ancient Human Migration. *Journal of Archaeological Science* 31(5):585–601.
- Houk, Brett A., Hubert R. Robichaux, and Fred Valdez, Jr.
 2010 An Early Royal Maya Tomb from Chan Chich, Belize. *Ancient Mesoamerica* 21:229–248
- McAnany, Patricia A.
 1998 Ancestors and the Classic Maya Built Environment. In *Function and Meaning in Classic Maya Architecture: A Symposium at Dumbarton Oaks*, edited by Stephen D. Houston, pp 271–298. Dumbarton Oaks Research Library and Collection, Washington D.C.
- Nielsen, Jesper
 2017 The World on a Whorl: Considerations on Aztec Spindle Whorl Iconography. In *PreColumbian Textile Conference VII/Jornadas de Textiles PreColombinos VII*, edited by Lena Bjerregaard and Ann Peters, pp. 132–140. Zea Books, Lincoln.
- Nieves Zedeño, Maria, and Brenda J. Bowser
 2009 The Archaeology of Meaningful Places. In *The Archaeology of Meaningful Places*. Edited by Brenda J. Bowser and Maria Nieves Zedeño, pp. 1–14. University of Utah Press, Salt Lake City.
- Novotny, Anna, Tomás Gallareta Cervera, Briana Smith, and Gertrude Kilgore
 2017 Bioarchaeological Analysis of Human Skeletons from Chan Chich, Belize: The 2017 Field Season. In *The 2017 Season of the Chan Chich Archaeological Project*, edited by Brett A. Houk and Claire Novotny, pp. 143–156. Papers of the Chan Chich Archaeological Project, Number 12. Department of Sociology, Anthropology, and Social Work, Texas Tech University, Lubbock.
- Novotny, Anna, Hannah Hughes, and Tomás Gallareta Cervera
 2019 Bioarchaeological Analysis of Human Skeletal Remains from Chan Chich, Belize: The 2018 Field Season. In *The 2018 Season of the Chan Chich Archaeological Project*, edited by Brett A. Houk, pp. 93–102. Papers of the Chan Chich Archaeological Project, Number 13. Department of Sociology, Anthropology, and Social Work, Texas Tech University, Lubbock.
- Novotny, Anna
 2022 Body Position and Territoriality in the Eastern Maya Lowlands During the Late Classic Period. Manuscript on file, Department of Sociology, Anthropology, and Social Work, Texas Tech University, Lubbock, Texas.
- Plumer, Hannah
 2017 Health Among the Maya: Comparisons Across Sites in the Northern Three Rivers Region, Belize. Unpublished PhD Dissertation, Department of Archaeology, University of Sheffield.
- Price, T. Douglas, and James H. Burton
 2012 *An Introduction to Archaeological Chemistry*. Springer, New York.
- 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(4):725–757.
- Scherer, Andrew K.
 2015 *Mortuary Landscapes of the Classic Maya: Rituals of Body and Soul*. University of Texas Press, Austin.
- Schnell, Joshua T., and Andrew K. Scherer
 2021 Classic Maya Dental Interventions: Evidence for Tooth Extractions at Piedras Negras, Guatemala. *Bioarchaeology International* 5(1):47–67.

Schrader, Sarah A., and Christina Torres-Rouff

2020 Embodying Bioarchaeology: Theory and Practice. In *Theoretical Approaches in Bioarchaeology*, edited by Colleen M. Cheverko, Julia R. Prince-Buitenhuys, and Mark Hubbe, pp. 15–27. Routledge, New York.

Sommerville, Andrew D., Mikael Fauvelle, Andrew W. Froehle

2013 Applying New Approaches to Modeling Diet and Status: Isotopic Evidence for Commoner Resiliency and Elite Variability in the Classic Maya Lowlands. *Journal of Archaeological Science* 40:1539–1553.

Tiesler, Vera

2014 The Bioarchaeology of Artificial Cranial Modifications: New Approaches to Head Shaping and its Meanings in Pre-Columbian Mesoamerica and Beyond. Spring, New York.