Myth, Ritual and Human Sacrifice in Early Classic Mesoamerica: Interpreting a Cremated Double Burial from Tikal, Guatemala

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Human sacrifice in ancient Mesoamerica was strongly linked with ritual behaviour and mythical beliefs. Yet it is rarely possible to explain the mythical associations of archaeological deposits derived from human sacrifice. In this article, we integrate archaeological, taphonomic and isotopic analysis to reconstruct the ritual behaviour that resulted in the formation of a partially cremated primary burial at the Lowland Maya city of Tikal. Taphonomic reconstruction reveals details about the form of death and combustion of two males, while isotopic studies hint at their probable geographic origin. To explain this ritual, we assess the relevance of widespread Mesoamerican mythical beliefs about the origin of the sun and the moon, and discuss the theoretical and methodological issues involved in this comparison. The burial's association with an E-Group compound makes it significant for the interpretation of these specialized architectural arrangements in southern Mesoamerica. It also pertains to a critical period in Tikal's history, marked by intensified cultural and political interaction with the highland Mexican city of Teotihuacan, manifest in this burial by the presence of imported green obsidian spear points. We propose that this unique context resulted from a sacrificial reenactment of the mythological birth of the sun and the moon.

Sometime during the fifth century AD, the inhabitants of the Lowland Maya city of Tikal (Fig. 1) witnessed an extraordinary sacrificial ritual. Two individuals were thrown into a pit, especially dug for the purpose and supplied with sweltering fuel. They may have been dead or nearly dead when thrown, but it is equally possible that they died from burning. Their charred remains were left undisturbed inside the pit, which was filled shortly afterwards. In this article, we interpret the ritual sacrifice of these victims as a reenactment of a key episode from Mesoamerican mythology, in which two heroes immolated themselves in a blazing pyre or pit oven and emerged as the sun and the moon.

The archaeological context that resulted from this ritual — labelled Burial PP7TT-01 — offers a rare possibility to explore the dynamic relation between myth and ritual in an archaeological context. We approach it from multiple perspectives that combine taphonomic and osteological studies of human remains with interpretations derived from the study of Mesoamerican myths, known from colonial period written texts and contemporary oral narratives. The former set a solid foundation for the reconstruction of behaviour that led to the formation of this sacrificial deposit, while the latter provide a comparative framework for its cultural and religious interpretation (López Luján & Olivier 2010; Tiesler & Cucina 2007). We take into account the circumstances of death and post-mortem treatment of the victims, the sustained use of fire and the architectural setting in which the sacrifice took place, on the axis of a specialized architectural compound — an E-Group — whose layout has been repeatedly explained as related to the solar cycle. The burial provides clues about the ritual activities that

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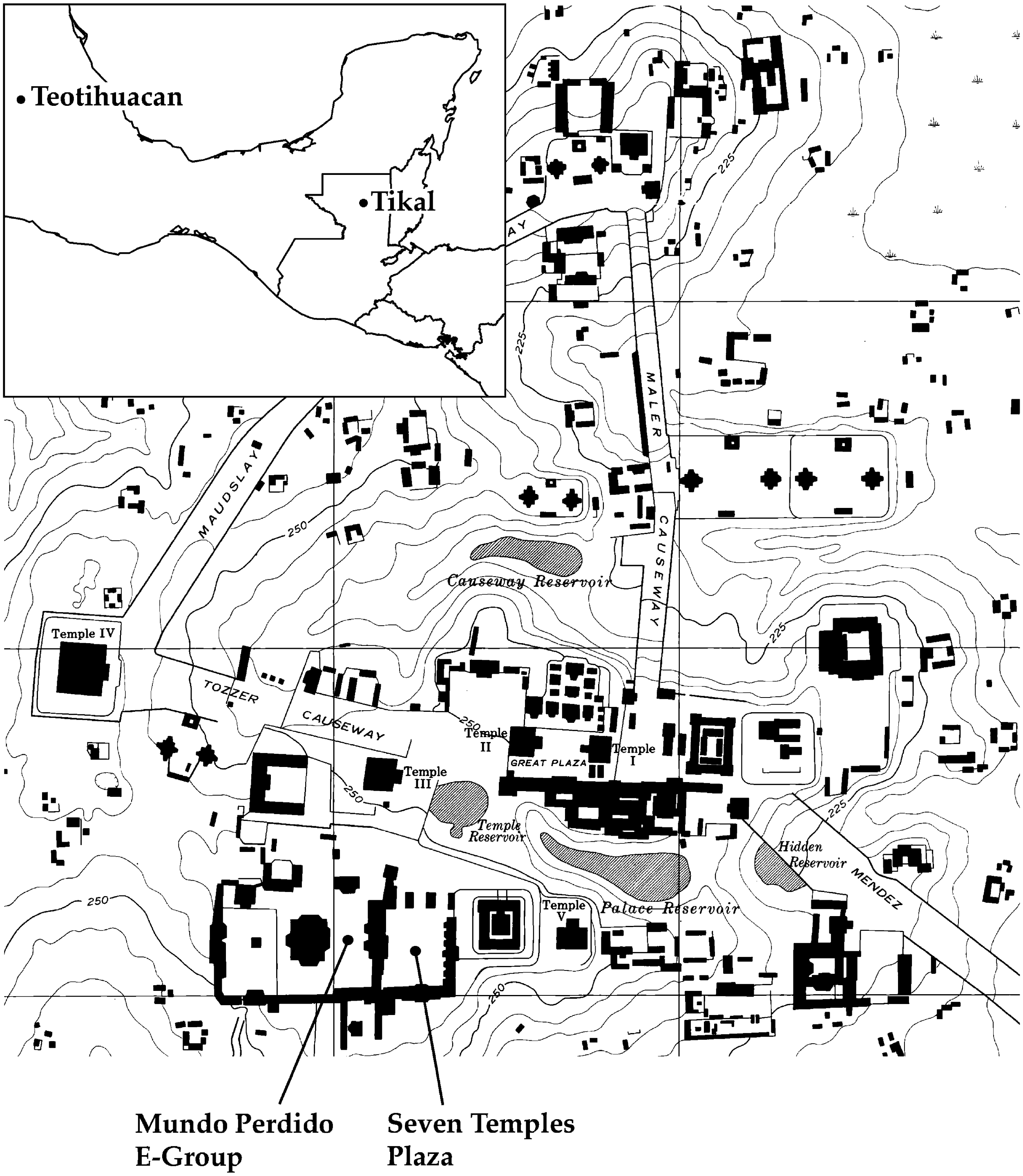

Figure 1. *Map of Tikal, showing the location of the Seven Temples Plaza and the E-Group of Mundo Perdido. Inset: Map of Mesoamerica showing the location of Tikal and Teotihuacan. (Based on map by Carr & Hazard 1961.)*

took place at the Tikal E-Group, which are relevant for ongoing discussions about the function and symbolism of Mesoamerican E-Groups in general. Moreover, the presence of spear points imported from the highland Mexican city of Teotihuacan raises the question of whether this ritual performance was related to the presence of Teotihuacanos at Tikal during the Early Classic period.

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The organization of this article requires brief explanation about the way in which we integrate multiple lines of evidence in support of our interpretation. At the outset, we discuss the theoretical and methodological issues raised by the use of myths to interpret archaeological deposits derived from religious rituals, and the relation between mythical beliefs, narratives and rituals in the Mesoamerican context. This is followed by the burial's description and the osteological and taphonomic examination of the human remains. These provide a basis to reconstruct the chain of ritual action that resulted in the formation of this mortuary assemblage. In this section, we also compare it with related contexts and discuss its possible connections with Teotihuacan ritual burial practices. The next heading describes the isotopic analyses conducted on the human remains, which provide clues about dating and the victims' geographic origin. Next we contextualize the burial, exploring the intersection between architectural setting, mythical beliefs and ritual reenactment at one of Tikal's major public spaces. Finally, we discuss the myths that may have served as models for the ritual performance that resulted in this burial, and offer final comments on the integration of multiple lines of evidence that led to our interpretation.

The archaeology of myth, ritual and human sacrifice in Mesoamerica

In previous work, Tiesler (2007, 17) noted that most attributes of funerary and post-sacrificial human placements stem from ritualized conduct, i.e. human behaviour that enacts elements of a shared ideology. Manifestations of ritualized mortuary conduct span the breadth from everyday expressions of ancestor worship to public performances of non-ancestral religious liturgies. In particular, primary deposits preserve evidence of the ritual behaviour that preceded and followed the deposition of human victims. Relevant variables include (a) the spatial settings of the sacrificial act and the deposition of the remains, which may or may not coincide, (b) the number of victims, (c) the causes of death, (d) the victims' osteobiographic information, including age, sex, health status and geographic origin, (e) elements of dress and accoutrement, (f) associated offerings, (g) other artefacts or features that may relate with the sacrificial process, and (h) other conditions, such as fire exposure, that may have affected the victims or their remains.

Archaeological and taphonomic studies of these variables can reveal much about the actions that led to the final deposition of sacrificial remains, the 'precise ritual frameworks dictating what, when, where, and how the sacrifice must be completed' (Insoll 2011, 158). Yet the reconstruction of ritual behaviour provides only a partial explanation for human sacrifice, a step towards an understanding of the ideology that made it significant. Further explanations for the ritual acts of victims and executioners should be phrased in terms of religious beliefs and worldview, which may be hard to glean solely from the archaeological record. As noted by Insoll (2011, 158), 'beliefs, unattainable as they might be archaeologically, are locked into the contexts and deposits'. Careful recourse to textual and iconographic sources is necessary to understand the religious beliefs that motivated ritual performances, and prompted the execution of ritual killings.

Explanations may be general or specific, depending on the availability of appropriate sources of information. A general explanation may be phrased in terms of broad aspects of the religion and worldview of the community in question. Specific explanations refer to beliefs that can be related to discrete ritual performances and archaeological contexts, addressing the significance of particular features in the deposits. This level of explanation is best achieved when there is prior knowledge of a society's religion and ritual practices from textual sources, iconographic evidence and ethnographic analogy. The available information must be properly assessed to posit credible links with archaeological contexts (Fogelin 2007, 56; Insoll 2011, 160).

Myths are important constituents of religious belief and practice, but their relationship with ritual, and their applicability for archaeological interpretation have been debated. As explained by Alfredo López Austin, there is no simple connection between mythical narrative and ritual act. Instead, the relationship may be visualized as a triangle in which mythical beliefs form the principal vertex, while ritual and narrative occupy the others. The latter are not simple expressions of mythical beliefs, but 'semi-autonomous systems with functions, structures, laws, and even their own history' (López Austin 1993, 88). While mythical narratives often find significant correlates in ritual practice, they do not explain every aspect of ritual. Conversely, some features of the archaeological deposits that result from ritual performance can be interpreted by reference to passages in mythical narratives, while other aspects may remain unexplained, or may find better correlates in technological, economic or political facets of social life.

Insoll (2004, 124–6) noted that myths are rarely used as sources of evidence in the archaeology of religion, partly due to the rejection of fringe tendencies. Yet, both he (2004, 119–28) and Fogelin (2007) review instances in which archaeological remains have been interpreted in the light of mythical beliefs, with greater or lesser success. A common obstacle is the lack of detailed records of the mythical beliefs and narratives of the community under study. Except in well-documented, historic societies, interpretations depend on textual records from related communities that are more or less distant in time and space, and may be separated by linguistic and ethnic barriers from the community under study. Clearly, this approach can only be applied if there are demonstrable links between the archaeological remains and the communities in which the narratives and beliefs were recorded.

A related problem involves the fluidity of mythical narratives, which are unlikely to remain unchanged through centuries, even within relatively stable communities. In a thorough analysis of Mesoamerican myths, Alfredo López Austin (1993, 249–50) distinguished the 'nodal subjects' that form the structural core of myths, as opposed to the 'adventurous subjects' — narrative incidents that may vary in every version, depending on regional, temporal, and even individual tastes and logic. The nodal subjects are those that prove to be especially resilient and, therefore, more likely to be present in ancient versions of the myths. They can be detected through the comparative study of parallel episodes that reappear in multiple versions. Archaeological interpretations that rely on comparisons with adventurous subjects taken from particular versions of myths are generally less plausible, except in cases where the mythical narratives are close in time and space to the ritual contexts under study. In our view, myths are best applied to archaeological interpretation in cases where the archaeological assemblages can be related with the nodal subjects of myths.

While there are many *lacunae* in the study of Classic Maya religion and mythology, a substantial base of information has been assembled from multiple sources that include archaeological research, epigraphic interpretations of hieroglyphic inscriptions, iconographic studies of religious imagery, historical analysis of colonial-period textual sources, and ethnographic studies of contemporary Maya religion (Coe 1973; Freidel *et al.* 1993; Houston *et al.* 2006; Schele & Miller 1986; Taube 1992; Thompson 1970). Maya religion and ritual are strongly rooted in the wider framework of the Mesoamerican Religious Tradition, a term coined by López Austin to encompass the broad range of variation of religious beliefs and practices of Mesoamerican peoples that nevertheless, share essential commonalities, extending across temporal and spatial boundaries, and intersecting the region's ethnic and linguistic diversity (López Austin 1993; 2002; 2008).

Human sacrifice, performed in the context of complex religious rituals, was widespread in Mesoamerica since ancient times. Iconographic and archaeological evidence provide abundant information on the modes of human sacrifice, allowing partial reconstructions of the associated rituals. However, the richest documentation of Mesoamerican sacrificial rituals comes from sixteenth-century texts that describe the religious feasts of the Mexica (Aztec) of highland Mexico. For our purposes, it is important to note that the Mexica feasts were closely related to mythical beliefs and narratives (Broda 1970; 1971; Broda *et al.* 1987; Graulich 1999, 19). Mexica sacrificial rituals often involved the embodiment of the gods by sacrificial victims, the *teteo imixiptlahuan*, 'images of the gods'. The victims were war captives or slaves, ritually transformed into the gods' incarnations. They were attired with the gods' attributes and received appropriate veneration until their sacrifice, which replicated the mythical death of the gods (Clendinnen 1995, 248–53; López Austin 2008, 53). While this practice is especially well documented for the Mexica, there are indications that it was extended throughout Mesoamerica. Pereira (2010, 260) noted its presence in west Mexico, according to passages in the sixteenth-century Relación de Michoacán that explain how sacrificial victims were believed to embody gods, were given blood to drink — the divine sustenance *par excellence* — and walked voluntarily to be executed.

Deity impersonation is also attested in Classic Maya hieroglyphic texts, although extant references are mainly concerned with impersonation by the kings — a practice that is also attested among the Mexica (Clendinnen 1995, 249). The kings frequently impersonated gods in the context of ritual dances and, interestingly, when performing as executioners in sacrificial rituals, although these kingly rituals did not lead to the impersonators' sacrifice (Houston 2006, 146). The inscriptions contain no explicit statements of Classic Maya sacrifice of deity impersonators, although war captives that were likely destined for sacrifice were sometimes portrayed with the attributes of gods (e.g. Miller & Martin 2004, 182). The sacrifice of gods is well represented in the Postclassic Maya codices, perhaps alluding to sacrificial rituals that involved deity impersonation (Vail & Hernández 2007).

The spatial setting of human sacrifice was crucial. Accounts of the Mexica feasts describe the movements of the victims through the city and sometimes across the surrounding landscape in the valley of Mexico. Victims were killed at specific locations that in some cases can be explained by reference to

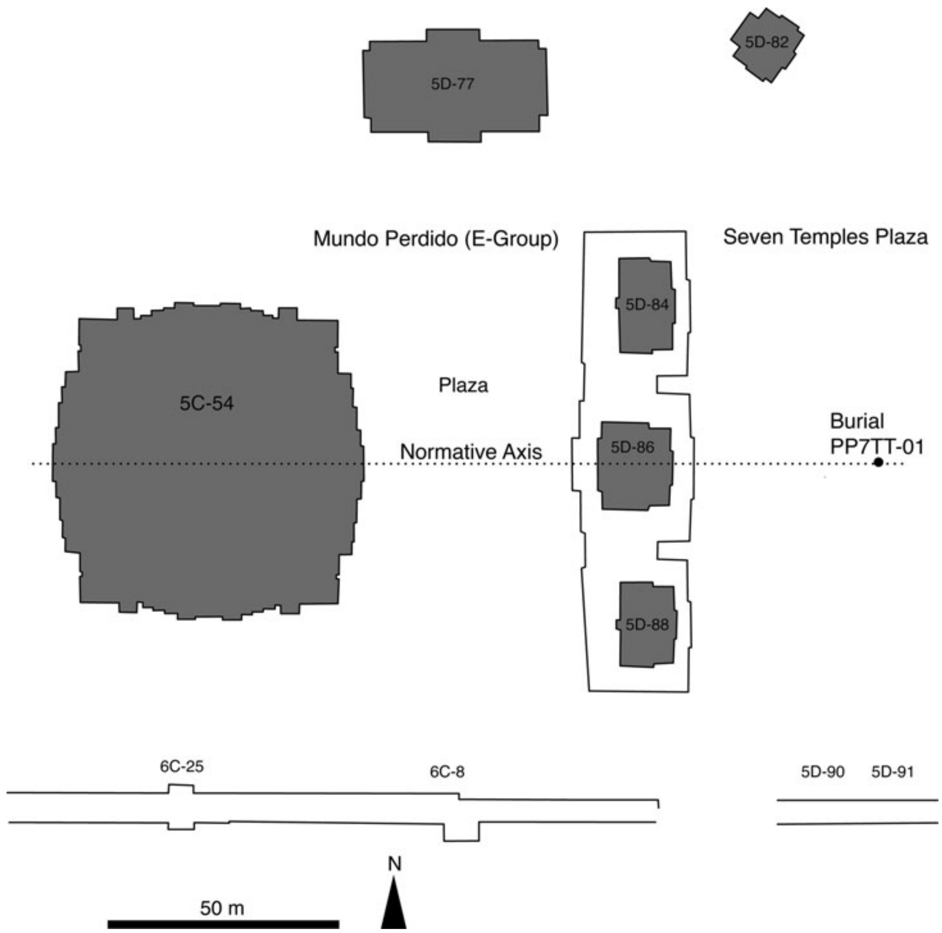

Figure 2. *The E-Group compound of Mundo Perdido and the Seven Temples Plaza, Tikal, during the Manik II phase (based on Laporte and Fialko 1995, 59). Buildings and plazas to the west and south were omitted for clarity.*

mythical landscapes. Major architectural compounds replicated mythical places and served as setting for ritual reenactment. The Great Temple of Mexico was conceived as an architectural embodiment of Coatepec, the mountain where the major god Huitzilopochtli was born. Discrete sections of the building had names that coincided with locations in the mythical mountain, and the associated sculptures represented characters known from versions of the myth (Broda *et al.* 1987, 55–7; López Austin & López Luján 2009; Seler 1996, 96). Thus, the temple recreated the landscape in which the primeval deeds of the gods were believed to have taken place.

Burial PP7TT-01 offers the rare possibility of associating a sacrificial deposit with the architectural setting in which the ritual killing was performed. The undisturbed condition of the deposit allows the possibility of building arguments about its probable mythical model, based on the archaeological, taphonomic and osteobiographic analysis described in the following paragraphs.

The formation and transformation of Burial PP7TT-01

Burial PP7TT-01 came to light in 2004, during a random test-pit program conducted by Oswaldo Gómez in the Seven Temples Plaza at Tikal (Fig. 2; Gómez 2006). Upon encountering charred human remains, the excavation was enlarged, revealing the outline of a round pit, with a diameter of 1 × 0.8 m and a depth of 1.10 m, with abundant signs of burning (Fig. 3). The burial assemblage was then excavated in four arbitrary layers, labelled A, B, BC and BD (Fig. 4). During skeletal exposure, each anatomical segment was drawn to scale with the help of a grid, and numbered according to layer. The drafts were then transferred to a layered 1:2 tracing. After exposing the full depth of the deposit, the remains of two individuals — designated as 1A and 1B — were gradually recovered in four horizontal layers. In an initial assessment, Gómez (2006, 787–9) described it as a primary burial resulting from ritual sacrifice, and suggested that both

Figure 3. *(Colour online) Burial PP7TT-01 during excavation. (Photograph: Oswaldo Gómez, Proyecto Plaza de los Siete Templos de Tikal.)*

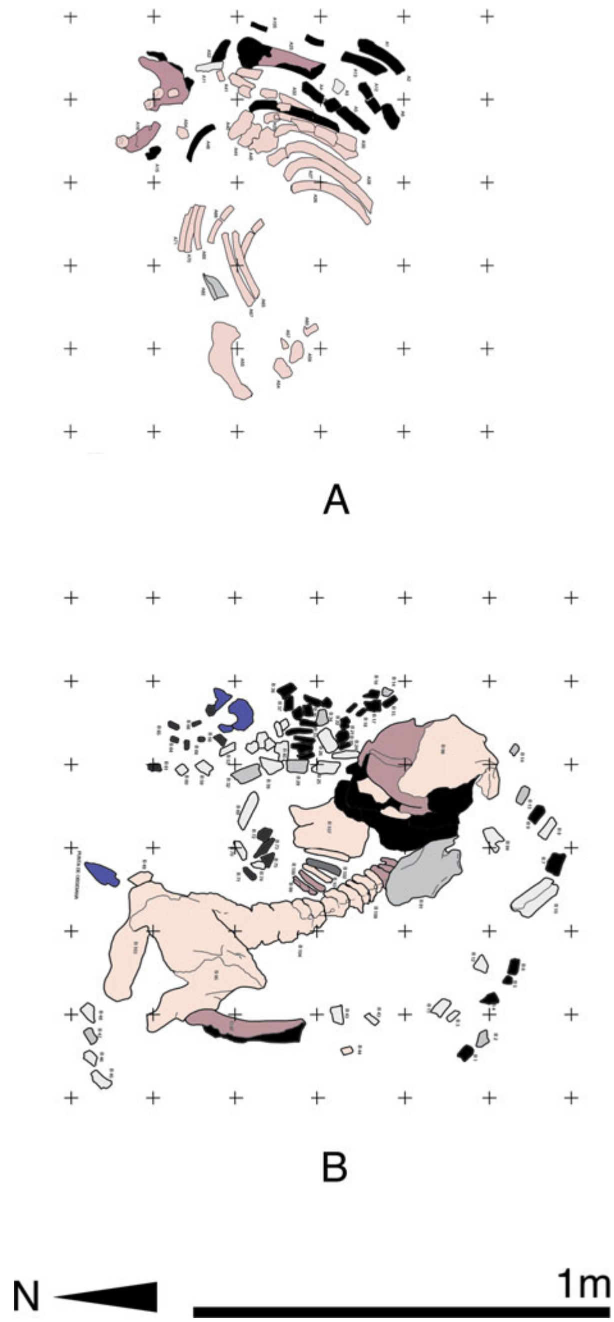

Figure 4a. *Burial PP7TT-01, excavation layers A and B. The colors correspond to degrees of fire exposure. Purple corresponds to artefacts. (Drawings: Bioarch Laboratory/UADY.)*

individuals were thrown in the blazing pit while still alive.

A detailed re-examination of the remains was conducted at Tikal in 2011 (Tiesler *et al.* 2011). After cleaning and sampling for special analyses, the human remains were laid out and information on surface colour, erosion and anthropogenic changes were recorded, specifically targeting the characteristics of combustion (following Duday 2009, 145–53; see also Chávez Balderas 2007). The Minimum Number of Individuals (MNI) was determined from fragment counts (Adams & Byrd 2008; Bello & Andrews 2006, 1–3). The skeletal inventory was employed jointly with the graphic record and the field notes to determine the original placement of each body. The interment sequence and further potential cultural disturbances were explored. Input on *peri-* and *post-mortem* body processing was derived from the principles of human taphonomy as outlined above; examination of anthropogenic marks left on the bony surfaces was also undertaken, as described by Pijoán & Mansilla (1997), Turner & Turner (1999) and White (1992), with attention to previous taphonomic observations from the Maya Lowlands (Tiesler 2007).

General osteological procedures were based on osteometry and macroscopic observation aided by a magnification glass, and histology of undecalcified bone. Common parameters were used to determine age, sex and stature, as described by Angel and Cisneros (2004), Buikstra and Ubelaker (1994) and Steele and Bramblett (1988). The presence, degree and type of artificial cranial vault modification was scored, following the scheme established by Imbelloni (Dembo & Imbelloni 1938) and adjusted by Romano (1965), and Tiesler (2012; 2014).

Individuals 1A and 1B

The recovered anatomical segments were poorly preserved and highly fragmented, reflecting their intense

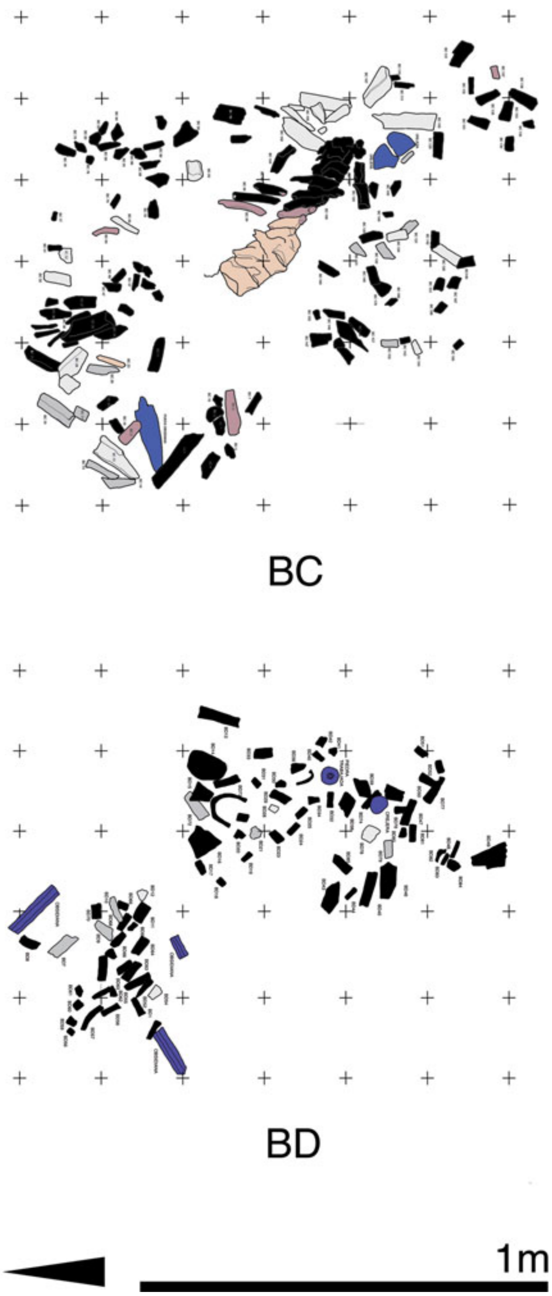

Figure 4b. *Burial PP7TT-01, excavation layers BC and BD. The colours correspond to degrees of fire exposure. Purple corresponds to artefacts. (Drawings: Bioarch Laboratory/UADY.)*

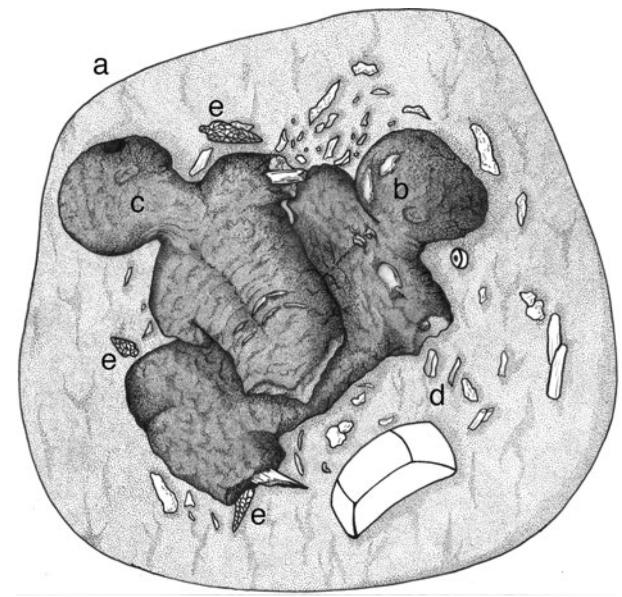

Figure 5. *Artist's reconstruction of Burial PP7TT-01: (a) outline of cremation pit; (b) Individual 1B; (c) Individual 1A; (d) sherd fragment; (e) obsidian points. (Drawing: Belem Ceballos.)*

heat exposure, which was stronger in the lower part of the deposit and affected the skeletal parts of the extremities more than those of the trunks. The MNI was two, including the bone scatters from the bottom of the context. We identified one adult individual (1B) and one adolescent (1A), both still partially articulated. Figure 5 shows a hypothetical reconstruction of the position of both victims in the fire pit.

The remains of Individual 1A appeared in the assemblage's upper layer (Layer A), although numerous isolated bone fragments percolated into the perimeter of the lower layers (B and BC), mingling with the blackened bone segments of the second individual. Despite the sustained heat-inflicted damage, the head, trunk and proximal appendicular segments were still articulated and rested lying face down, with a marked hyperextension of the lumbar spine. This disposition did not result from a cultural arrangement, but from the sustained heat exposure of this body in a fleshed state. Muscle contraction during combustion produced a characteristic 'pugilistic' pose, with the spine and head bent back and the extremities in a semiflexed state (Symes *et al.* 2008). Taken together, the combustion attributes speak of sustained but partial incineration or cremation of a fleshed body (following Duday 2009, 145–53; see also Chávez Balderas 2007). In our case, fire exposure implied high temperatures and was prolonged but did not lead to full-body consumption. The final disposure of skeletal elements argues for a primary cremation deposit, which implies that the remains were left *in situ*. In the thanatological literature, this type of burial is known as *bustum*, named after Roman burials that contained sealed cremation pyres or pits (Duday 2009, 152–3).

Figure 6. *(Colour online) Right rib shaft of Individual 1A, showing irregularly-shaped lesion in green bone. (Photograph: Vera Tiesler.)*

The relatively large size of the appendicular segments of Individual 1A together with the relatively rugged expression of muscle-insertion areas and the robust morphology of the mandible, suggests that, in life, this youngster was probably male. Concretely, the mandible displays a relatively square chin (Hernández & Peña 2010 for sexing pre-Hispanic Mexican juvenile series) and the angle established between the horizontal and ascending mandibular ramus comes close to 90 degrees. Given the problems attached to sexing juvenile skeletons macroscopically, this is a preliminary assessment that we expect to verify through future DNA analysis. The state of dental maturation, combined with that of epiphyseal closure, suggests an age-at-death of 10 to 14 years. One right rib shaft exhibits an unhealed, irregularly-shaped lesion in green bone, adjacent to the superior border. The defect caused the rib to split along its grain and protrude posteriorly. It could have resulted from the tension of high heat exposure or, more probably, given the homogeneous morphology of this segment and its partial peeling off, from peri-mortem sharp force trauma (Fig. 6).

The partially articulated skeleton of a robust male, identified as Individual 1B, was uncovered directly beneath Individual 1A (Fig. 7). The remains of his articulated, albeit heavily heat-exposed trunk rested some 20 cm below Individual 1A. The soft tissue that his torso retained during the combustion process must have shielded the youngster's body, reducing fire damage in those anatomical parts that came to lie on top of him. Like his companion, Individual 1B lay on his chest with an abnormally arched column and the head unnaturally bent backward. In the burial, his mandible rested on the ground. Like the youngster on top, his extremities show the signs of sustained exposure to high temperatures (>500°C) by their colour, fragmentation and breakage pattern

Figure 7. *(Colour online) Individual 1B in situ, showing abnormally arched column, with head facing forward. (Photograph: Oswaldo Gómez, Proyecto Plaza de los Siete Templos de Tikal.)*

(Figs. 7–9). In addition, the lateral rotation and flexion of the articulated right femur with regard to the pelvic girdle is most probably the consequence of tensions created during combustion. Taken together, the taphonomy of Individual 1B speaks of a prolonged, direct fire exposure, which led to the skeletonization and fragmentation of the appendicular body segments but left the consumption of the trunk incomplete. Like his companion, Individual B is a primary deposit.

The remains of this corpse spanned layers B, BC and BD, mixed with isolated fragments from Individual 1A, scattered in the perimeter of layers B and BC. Pelvic morphology corresponds to a male, as evidenced by the narrow sciatic notch and the angle established by both ischiopubic rami, the missing ventral arc and the general narrow and high conformation

Figure 8. *(Colour online) Cranium of Individual 1B, showing slight cranial vault modification. (Photograph: Vera Tiesler.)*

of the iliac bones. This sex determination is confirmed by the robust cranial morphology of the individual, which shows eminent mastoid processes and a supranasal crest. The age-at-death estimation between 35 and 40 years is founded on the combined assessment of the morphology of the pubic symphyses and auricular surfaces, as described in Buikstra and Ubelaker (1994). Our stature estimate of 163.5 cm is the average of estimations, established from the right and left proximal femoral segment (Genovés, in Angel & Cisneros 2004; Steele & Bramblett 1988). This stature is relatively tall for Maya males (Márquez & del Angel 1997; Tiesler 2001), but should be taken with caution due to the calculation method used to infer stature from bone segments. The skull vault of Individual 1B had been culturally modified during infancy (Fig. 8). The morphological changes were relatively slight and produced by anteroposterior compression in a cradle device, resulting in a shortened skullcap and a visibly flattened forehead. This artificial head form was common all over Mesoamerica at that time, making it difficult to associate the morphology with any specific geographic or cultural affiliation (Tiesler 2014). The forehead has a number of healed impacts, probably inflicted years before his death. Extensive periosteal reactions and thickening of the lower leg bones suggests sustained systemic inflammatory or metabolic disease.

Heat exposure

Taken together, the anatomical distribution and the extent and type of heat damage of both skeletons war-

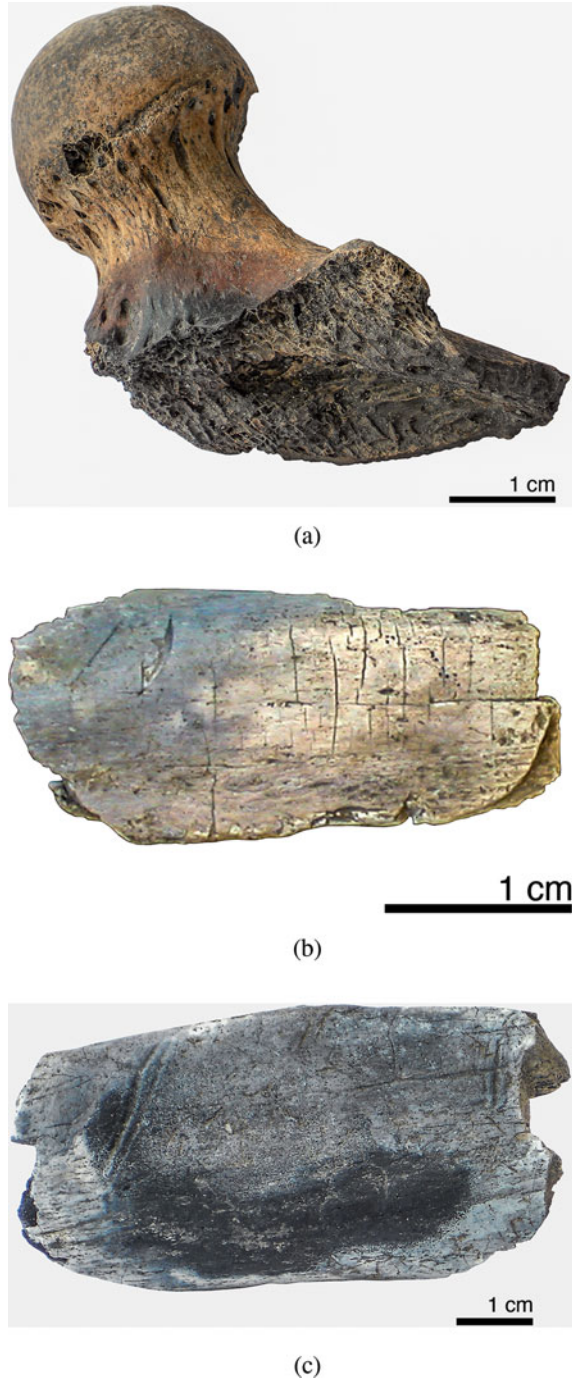

Figure 9. *(Colour online) Signs of sustained combustion in a fleshed state in Individual 1B: (a) tension fracture in green bone, colour bands and signs of charring in the neck of the right femur, which was found still articulated to the iliac bone; (b) warping (transversal fissures) and whitish external colouration of femoral cremated fragment; (c) tibial shaft of Individual 1B, showing periosteal reaction and thickening, along with signs of charring and cremation of green bone. Transverse lines at either end are venous impressions. (Photographs: Vera Tiesler.)*

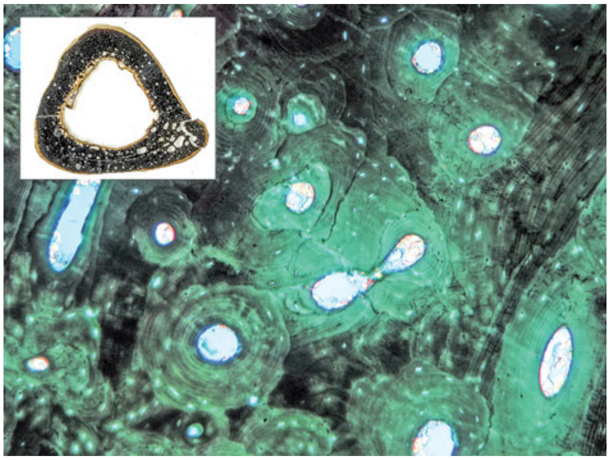

Figure 10. *(Colour online) Histological sections of cross-sectional sample PP7T-B26 (tibia; X20 with polarization and auxiliary filter). The bone substrate shows layered charring and enlargement of voids. (Photograph: Vera Tiesler.)*

rant a hypothetical reconstruction of the assemblage's formation processes. Its clear delimitation, intrusive nature and massive ash contents, together with the articulated, primary nature of both human bodies, which share one single mortuary space, suggest the following scenario. A pit was dug to a depth of 1 m, supplied with wood or charcoal, and ignited as a pit pyre (McKinley 2008; Symes *et al.* 2008, 24). A middle-aged, robust male, identified as Individual 1B, was introduced in the sweltering pit, and burned under extreme heat conditions. After some time (although as part of the same event) he was followed by the youngster, whose body came to rest immediately on top of the first. This interpretation is upheld by the distribution of the heat marks, which are more intense in the lower parts of each body (Fig. 4), and in the bony segments that were not shielded by thick packages of soft tissue. Specific signs of green-bone combustion include warping, contraction fractures, sandwiching and banding, which were recorded in both skeletons (Fig. 9). Histological sections also revealed signs of sustained fire exposure in green bone, which show the layered effects of charring and heat-related enlargement of voids (Fig. 10). As already argued above, the combined combustion attributes speak of a sustained but partial cremation of two fleshed bodied in one single process (Chávez Balderas 2007; Duday 2009, 145). Fire exposure was direct, prolonged and implied high temperatures (above 500°C), but did not lead to the full consumption of either body.

Altogether, the simultaneous placement of two individuals, their biological and taphonomic profiles, and the connotation of the burial space imply a ritual, most probably sacrificial event. Related examples are known in Mesoamerican mortuary contexts (Chávez Balderas 2007; López Luján & Olivier 2010; Tiesler & Cucina 2007). We can only speculate about how and where the two individuals met their death. The presence of obsidian knives and blades in the deposit, and the lesion in the rib of Individual 1A suggest that they may have been killed right before or during their collocation on the pyre, by stabbing, heart extraction and/or throat slashing. Full decapitation is unlikely given the lack of cut marks and presence of the articulated first vertebrae and skull segments. There is also a possibility that they were wounded but still alive when thrown into the pyre. A related question involves their placement in the restricted space of the pit. Individual 1B either entered the pyre in a standing or fully flexed position, or flexed forward rapidly, as initially suggested by Gómez (2006). The executioners then placed the smaller individual 1A over his companion's scorched body. The excavation revealed no indications of a frame or scaffold that might have been used during the process. Both individuals burned together for some time, until fire disintegrated parts of their bodies, while the trunks were scorched but remained partly unscathed (for comparisons, see McKinley 2008; Symes *et al.* 2008, 24).

Post-cremation history

The lack of evidence of human or animal disturbance indicates that, after the fire ceased, the pit was left in place with its human and artefactual contents, filled with earth and ashes, and sealed within a short period of time. This makes Burial PP7TT-01 one of very few cremated primary deposits (*bustum*) known in Mesoamerica. As discussed below, multiple deposits of this sort are even less common. Intriguingly, Individual 1A's cranium was entirely absent, and must have been extracted prior to the burial's sealing, especially considering the good preservation of the mandible. A metate and fragmentary sherds were also introduced, perhaps unintentionally, and became part of the deposit's upper stratigraphic layer. These objects exhibit no heat exposure, unlike the objects found deeper in the pit, most of which showed clear signs of discolouration, charring and/or smoking. No further disturbance was noticeable.

Associated artefacts

Burial PP7TT-01 was not supplied with identifiable mortuary offerings *per se*. The only items of personal adornment were the shell ear spools of Individual 1B, possibly decorated with minute greenstone flakes (Gómez 2006). The deposit included four

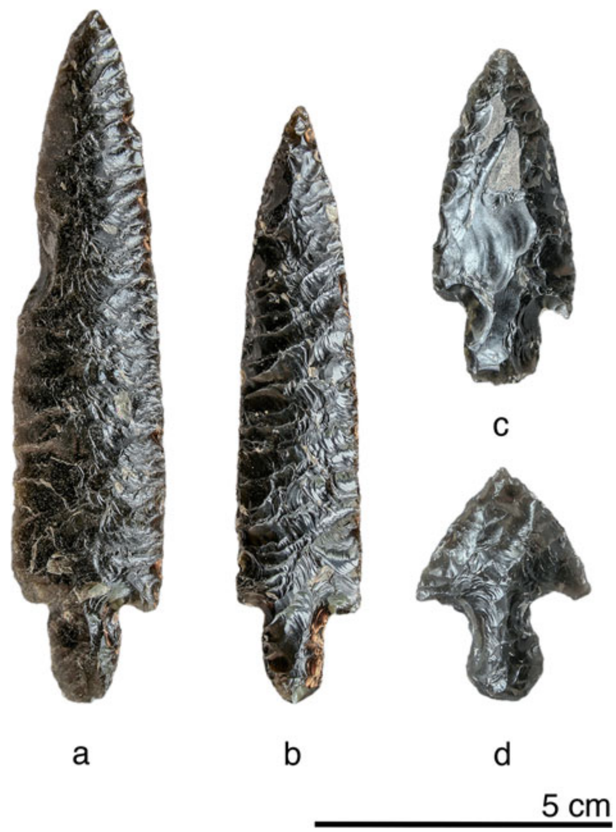

Figure 11. *(Colour online) Obsidian bifacial points from Burial PP7TT-01. Points a–c are made of green obsidian from Pachuca, Mexico. (Photographs: Oswaldo Chinchilla Mazariegos.)*

obsidian spear points, three of which were made of green obsidian from the Pachuca source, located 50 km northeast of Teotihuacan (Fig. 11). Two of them were Stemmed B type points imported from Teotihuacan (Spence 1996). The third is a smaller stemmed point, also made of green obsidian. The fourth is a small, fish-shaped point of grey obsidian from an undetermined source. In addition, there were a small number of green obsidian blade segments.

These artefacts may have been employed during the sacrificial process, although it is equally possible that they were placed there for other reasons. The apparent rib lesion of Individual 1A may have been inflicted with one of these points, although we cannot confirm this supposition. They may also have been used by the victims themselves or by their executioners for penance involving bloodletting, during the course of rituals preceding their final killing. Be that as it may, their final inclusion in the burial cannot be explained simply by their possible use during the ritual process. Moholy-Nagy (1999) noted only a few green obsidian prismatic blades and débitage fragments in the Tikal burials and caches. No positively identified Stemmed B points were present in her sample, although she found possible fragments. Elsewhere, Stemmed B points and other fine green obsidian bifaces are known at Kaminaljuyú in the highlands, and at the lowland sites of Uaxactun, Pacbitun, Altun Ha and Caracol (Chase & Chase 2010; 2011; Spence 1996). Considering their rarity at Tikal, it seems unlikely that these points would have been left there without a purpose. In an assessment of Teotihuacan obsidian in the Maya area, Spence (1996, 32) noted 'the artifacts generally appear in contexts that suggest their use as symbols to express some form of affiliation with Teotihuacán'. The utilization of these points during this ritual, and their deposition in the burial may have been intended to signal a connection of the executioners, the victims, or the ritual itself with the highland Mexican city.

Comparisons

The ritual departed in various ways from Lowland Maya practices. The evidence of fire exposure is rare at best among reverentially motivated primary deposits in Classic Maya funerary archaeology, despite reiterative references to fire ceremonies and smoking events in the inscriptions (Eberl 2005; Fitzsimmons 2009; Stuart 1998; Tiesler 2007, 28; Weiss-Krejci 2006). Most of the documented fire-exposed assemblages appear in elite contexts. In some of them, the remains appear to be superficially blackened; others are charred or partially cremated as part of tomb re-entry rituals (Chase & Chase 2003; Fitzsimmons 2009, 142–60; Houston *et al.* 2003; Weiss-Krejci 2006). Conversely, many extra-funerary cache assemblages contain human remains exposed to fire in different forms and states of preservation (Medina & Sánchez 2007; Tiesler 2007; Weiss-Krejci 2010). Unfortunately, their diverse origin, along with their fragmentary and highly disturbed nature, makes generalizations on their ritual processing highly problematic. At Tikal itself, partially cremated human deposits were documented among the problematic deposits recorded during the explorations of the University of Pennsylvania and the Proyecto Nacional Tikal (e.g. Coe 1990; Iglesias Ponce de León 2003; Laporte 1999; Weiss-Krejci 2010; Wright 2002). Unfortunately, no detailed information is available regarding the primary or secondary nature of these assemblages. By contrast, Laporte and Fialko (1995) did not report cremations among the sacrificial burials deposited in earlier stages of the E-Group compound associated with Burial PP7TT-01.

Primary cremation contexts are rare in world archaeology, in contrast with the more common, secondary disposal of cremated remains, usually in urns. Few examples are known in Mesoamerica, despite the abundance of secondary, unarticulated cremation deposits at many sites (Chávez Balderas 2007, 138–45; Iglesias Ponce de León 2003; Lucero & Gibbs 2007). One site where they are present is Teotihuacan, where Cid Beziez and colleagues (1999, 301, 334) recorded undisturbed primary cremation deposits with evidence of low heat exposure (below 800°C), but there are no indications about their ritual or ancestral quality (Cabrera Castro 1999, 520; Chávez Balderas 2007, 139–40). Apart from the above, we did not find published reports of double or multiple primary cremations in highland Mexico. This absence may find explanation in the rarity of this anthropogenic treatment, but it may also be due to insufficient taphonomic recording.

The closest comparison for Burial PP7TT-01 comes from the Northeast Acropolis of the Lowland Maya site of Caracol, where Chase and Chase (2010; 2011) describe the Early Classic Special Deposit C117F-1, dated *c.* AD 330. This pit pyre was slightly larger and its temperature clearly exceeded that of the Tikal case. It contained the remains of one adult, one adolescent, and possibly a third individual of subadult age. While the authors report signs of intense fire and a thick layer of carbonized wood at the bottom of the pit, they remain uncertain about the primary or secondary nature of the deposit, arguing poor bone preservation. In contrast with the deposit from Tikal, this pit was packed with offerings that included 20 ceramic vessels, shell artefacts, a haematite mirror and a complete mano and metate. Yet the parallel between the cremations at both sites is underlined by the presence of green obsidian artifacts — two knives, six points and fifteen blades — in the Caracol cremation.

Chase and Chase (2011, 13) suggest that the Caracol deposit evidences knowledge and emulation of Teotihuacan ritual practices, and elaborate on the display of economic, religious and political power evidenced by the disposition of valuable goods of local and foreign provenance. The deposit from Tikal warrants a similar interpretation, not only because of the presence of green obsidian artefacts imported from Teotihuacan, but also because it harboured patent evidence of primary double cremation. Moreover, the date of these burials coincides with a period of intensified contacts with the highland Mexican city, which were especially strong at Tikal, although their precise nature is the subject of an ongoing debate (Braswell 2003; Stuart 2000). The burial may have resulted from a Maya emulation of Teotihuacan ritual practices or, conceivably, it may have been enacted at Tikal by incomers of Teotihuacan origin.

While compelling, these interpretations find meagre support in the absence of precise counterparts at Teotihuacan itself, where no example of a double primary cremation has been identified. Moreover, there is no clear association of obsidian points with primary cremated burials at that site. In any case, it appears that the Tikal and Caracol deposits were part of an Early Classic trend of limited duration in the Maya Lowlands.

Isotopic studies

Isotopic analyses were conducted to date the burial and determine the victims' geographic origin. A charred wood sample from the fire pit, analysed by Beta Analytic (sample TIKAL B58 B1) yielded a $\delta^{13}C$ value of –24.3 parts per thousand, typical of hardwood trees in the Maya region. It yielded a calibrated radiocarbon date of 1530±30 BP, converted to cal. AD 430 to 600. The dating was consistent with a lone ceramic fragment recovered from the deposit, identified by Gómez as a Lucha Incised dish, corresponding to the Early Classic Manik ceramic complex (Culbert 1993, fig. 135). The combined data suggest that the ritual took place during the Manik 3 phase, dated by Laporte and Fialko between AD 400 and 550.

For $^{87}Sr/^{86}Sr$ isotopic measurements in Individual 1A, we used one tooth enamel sample taken from the first upper molar and one humeral bone sample. Only one femoral sample was taken from Individual 1B's skeletal remains. The tooth sample was measured also for carbon ($\delta^{13}C$) and oxygen ($\delta^{18}O$) isotopes that, respectively, provide supplementary information on diet and geographic origin.

Samples were mechanically cleaned. Small bone samples weighing approximately 0.25 g were repeatedly sonicated for 10 minutes until the distilled water was clear. The process was then repeated in 5 per cent acetic acid. The cleaned fragments were then ashed to powder for eight hours at 750°C. Clean powdered enamel samples of –2 to 5 mg were dissolved in 5M HNO_3, and the Sr fraction was purified using EiChrom SrSpec resin and elution with HNO_3, followed by H_2O. The Sr was then placed on single Re filaments and analysed using a VG (Micromass) Sector 54 thermal ionization mass spectrometer (TIMS) at the University of North Carolina-Chapel Hill. Internal precision for $^{87}Sr/^{86}Sr$ analyses is typically 0.0006 to 0.0009 per cent standard error, $<\pm 0.000006>$. Several milligrams of powdered enamel were sent to the University of Arizona Isotope Geochemistry Laboratory, where oxygen and carbon isotopes in enamel carbonate were measured simultaneously, using an

Table 1. *Results of isotopic measurements on the samples from Tikal Burial PP7TT-01.*

Burial	Age/Sex	Material	Element	87Sr/86Sr	$\delta^{13}C$	$\delta^{18}O$
PP7T-1A	Adolescent, probably male	bone	humerus	0.7079		
PP7T-1A		enamel	URM1	0.7078	−4.96	−2.65
PP7T-1B	Middle-aged male	bone	femur	0.7061		

automated carbonate preparation device (KIEL-III) coupled to a gas-ratio mass spectrometer (Finnigan MAT 252). Powdered samples were reacted with dehydrated phosphoric acid under vacuum at 70°C in the presence of silver foil. The isotope ratio measurement was calibrated, based on repeated measurements of NBS-19 and NBS-18 and the precision was ±0.1 parts per thousand for $\delta^{18}O$ and ±0.06 parts per thousand for $\delta^{13}C$ (1 sd).

Table 1 shows the results of these analyses. The strontium isotopic values in Individual 1A measured 0.7079 (enamel) and 0.7078 (bone), while the isotopic value form the bone sample of Individual 1B scored 0.7061. Carbon and oxygen isotopes were measured only in the enamel sample of Individual 1A, because of problems of contamination in bone and potential fractionation of these lighter isotopes under conditions of heat. The results indicate a value of –4.96 for the first and –2.65 for the latter.

To interpret these results, it is essential to consider the isotopic background of the Central Peten and the Maya region more generally. Because of an age-dependent trend in marine carbonates, the Sr isotopic characteristics of the region can be directly inferred from the well-defined Cretaceous-to-Quaternary seawater $^{87}Sr/^{86}Sr$ values, which increase northwards from approximately 0.7070 in the southern Cretaceous carbonates to 0.7092 in the latest Quaternary deposits of the northern coasts (Hess *et al.* 1986; Hodell *et al.* 2004; Price *et al.* 2008). The lowest $^{87}Sr/^{86}Sr$ values in Mesoamerica, in the range of 0.703–0.704, come from the Quaternary volcanics of basaltic composition in the Tuxtla Mountains of Veracruz. The highest ratios are likely to be those of the Maya Mountains in the southeastern part of the Maya region where there are relatively ancient rocks with $^{87}Sr/^{86}Sr$ ratios in the range of 0.711–0.712 (Hodell *et al.* 2004; Price *et al.* 2008).

Tikal is in the middle of an extensive region underlain by limestones of Cretaceous age. Because the local strontium should be derived predominately from the underlying bedrock, the local $^{87}Sr/^{86}Sr$ range should be approximately that of Cretaceous seawater, approximately 0.7078 (e.g. Howarth & McArthur 1997). Our own baseline assessment for Tikal is approximately 0.7078–0.7080 (Price *et al.* 2008), in accordance with the local estimate made by Wright (2005; 2012) in her studies of human mobility at Tikal.

Oxygen isotopes have been used in a number of studies in Mesoamerica (e.g. Price *et al.* 2008; White *et al.* 1998; 2001; 2007; Wright & Schwarcz 1998) and there is a nascent data base from major archaeological sites. More importantly, variation within sites is generally less than among sites, demonstrating the potential for useful signals of mobility and provenience. There is a strong distinction among sites depending on whether their rainfall is predominantly from the Atlantic and Gulf of Mexico (–1 to –7 parts per thousand) or from the Pacific (–9 parts per thousand). There is also a crude trend corresponding with distance inland and elevation, with lower coastal regions (–1 to –4 parts per thousand) at the lighter end and interior sites heavier (–5 to –7 parts per thousand), as would be expected. Oxygen isotopes from the enamel at Tikal should be at the heavy end of the spectrum (*c.* –1 to –4 parts per thousand $\delta^{18}O_{apatite}$) due to the low elevation, low latitude, and especially due to the local presence of small lakes, which provide water heavier than that of local rainfall.

Carbon isotopes should reflect the consumption of maize, a C_4 plant, as a primary dietary component. Carbon isotope ratios in enamel apatite are expected to be at the heavy end of the isotope range for $\delta^{13}C_{apatite}$ with values between –5 and 0 parts per thousand.

Our seriated $^{87}Sr/^{86}Sr$ values for the bone and enamel provide possible scenarios for the provenience of these two individuals. Figure 12 shows the strontium isotope ratios for all human samples from Tikal (Wright 2012) and includes the new values from the two individuals under investigation here. Individual 1A has both bone and enamel values (0.7079 and 0.7078 respectively) that fall within the range of the local Tikal population, between 0.7078 and 0.7080. Individual PP7T-1B with a value of 0.7061 lies below the local range at Tikal appears to be non-local. His lower value suggests that he came recently from a region to the south of Tikal but probably still within the limestone lowlands (if this were to represent the place of recent adult residence). This is a very low value, however, for the Maya region in general and may be more representative of the southern highlands of Guatemala or the Copan region to the east, in Honduras. Another possibility is highland Mexico,

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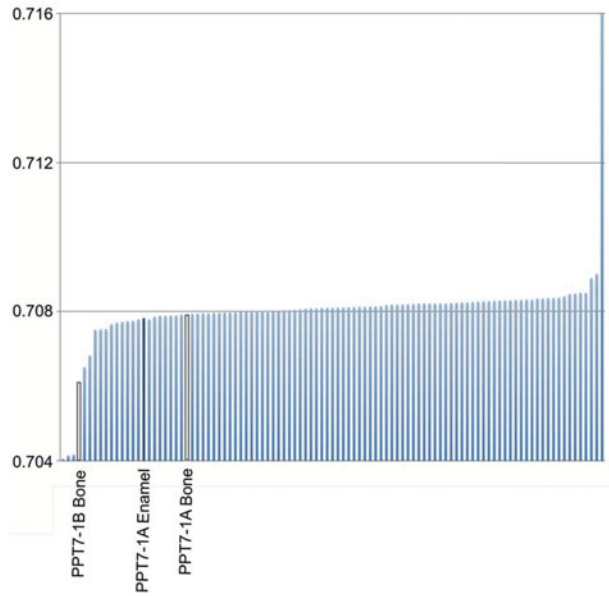

Figure 12. *(Colour online) Distribution of strontium isotope ratios ($^{87}Sr/^{86}Sr$) for all human samples from Tikal. Bone and enamel samples from Individuals 1A and 1B are highlighted. (Modified from Wright 2005.)*

especially in view of the burial's links with Teotihuacan artefacts and burial practices. However, given that the strontium value of Individual 1B was taken from bone, the *ante-mortem* timing of residential shift is relevant to interpret possible origins. A residential history at or near Teotihuacan may have led to the values ascertained in this study, depending on the *ante-mortem* timing of residential change. Naturally, this is only one possibility among others, and we expect to test it through future isotopic examination of Individual 1B's enamel. At any rate, there is little doubt that the individual is non-local.

The analysed tooth for Individual 1A falls well within the local range of Tikal in the values of $^{87}Sr/^{86}Sr$, $\delta^{18}O_{apatite}$, and $\delta^{13}C_{apatite}$. Figure 13 is a plot of $^{87}Sr/^{86}Sr$ *vs* $\delta^{18}O_{apatite}$ for the human enamel samples from Tikal, based on Wright's analysis (2012, fig. 6). Individual 1A clearly falls in the middle of this group. We cannot distinguish this individual from those locally born at Tikal, and moreover, we can distinguish him from those born farther north (with higher $^{87}Sr/^{86}Sr$ and lighter $\delta^{18}O_{apatite}$) and farther south (with lower $^{87}Sr/^{86}Sr$ and lighter $\delta^{18}O_{apatite}$). Thus we argue that this individual was local to the Tikal region while Individual 1B was not.

Architectural setting

The architectural setting is key to understanding the ritual significance of Burial PP7TT-01. Its location and dating led Gómez to link it with the E-Group compound known as Mundo Perdido. The label 'E-Group' derives from the early recognition of Group E at the site of Uaxactún as a specialized architectural assemblage, whose layout and orientation suggested solar connotations (Blom 1924; Ricketson & Ricketson 1937; Ruppert 1940). E-Groups consist of an open plaza with a square pyramid on the west side, and a long rectangular platform on the east side. In the best-known examples, including Tikal and Uaxactún, the west pyramid has stairways on the four sides, while the east platform supports three symmetrically distributed temples. E-Groups may include additional buildings, such as temples or range structures on the northern and southern sides of the plaza; ball courts and triadic compounds are sometimes found in their vicinity (Chocón 2013; Fialko 1988; Flores Esquivel & Šprajc 2008; Laporte & Fialko 1995).

Laporte and Fialko (1995) emphasized the importance of the E-Group's 'normative axis', an imaginary east–west line that ran through the center of the west pyramid, the plaza and the east platform. The normative axis served as a key guideline dictating the compound's growth pattern for more than a thousand years. The Tikal E-Group's symmetric shape and orientation around the normative axis remained unchanged through six major construction stages spanning the Preclassic (700 BC–AD 200) and Early Classic periods (AD 200–550). Both the west pyramid and the east platform were enlarged without encroaching on the plaza, whose size and shape remained basically unchanged. The marked conservatism of this growth pattern was broken only in the Late Classic period, when Structure 5D-87 was built between the central and southern temples of the east platform (Laporte & Fialko 1990; 1995).

The normative axis was also the locus of ritual events that involved the deposition of burials and cache deposits at several stages, beginning in the Middle Preclassic Tzec phase (600–400 BC). Laporte and Fialko (1995, 49–51) mention a number of dedicatory caches containing human remains, placed in the west pyramid and along the E-Group's normative axis in Preclassic times. A close precedent for Burial PP7TT-01 was Burial PNT-022, located in front of Structure 5D-86 — on the compound's axis — during the Manik 1 phase (AD 200–300). The burial consisted of a broad pit carved in bedrock, containing the remains of 17 individuals, including men, women and children that were probably sacrificed (Pijoán & Salas 1984). While their mortuary treatment is different from Burial PP7TT-01, it signals the recurrent association of the normative axis with human sacrificial deposits.

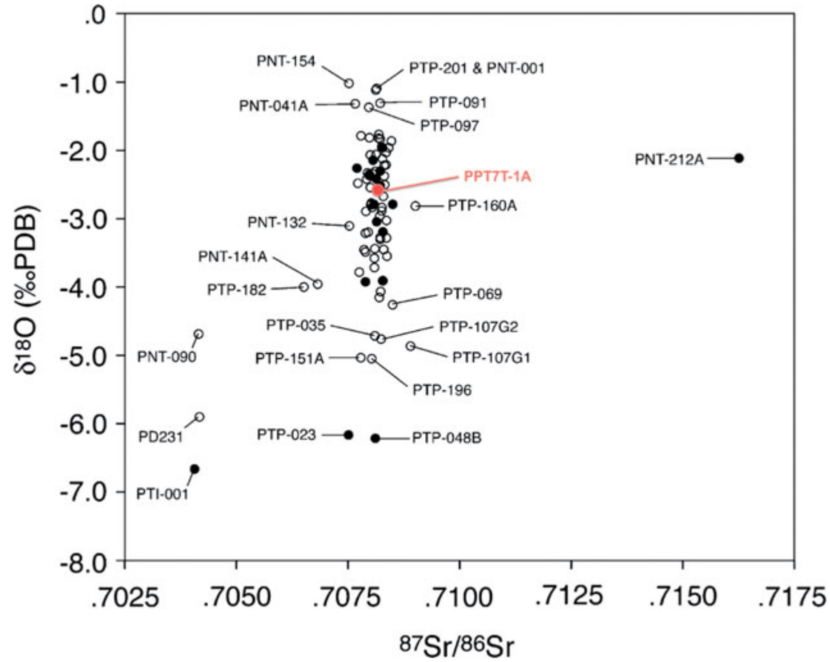

Figure 13. *(Colour online) Graph of* $^{87}Sr/^{86}Sr$ *and* $\delta^{18}O_{apatite}$ *from Tikal, with immigrant individuals labelled. PPT7T-1A, in red, falls centrally within the local Tikal data. (Modified from Wright 2012.)*

Burial PP7TT-01 was found on the E-Group's normative axis, within the adjacent architectural compound known as the Seven Temples Plaza, 39 m east of Structure 5D-86, the central temple of the E-Group's east platform (Fig. 2). Gómez's excavations showed that the plaza was levelled during the Preclassic period, but it remained an empty space extending between the Tikal South Acropolis and the east platform of the E-Group. During the Early Classic, a series of structures with talud-tablero architectural profiles were built along the southern side of the E-Group, extending into what would later become the Seven Temples Plaza, and effectively integrating this space with the E-Group. Gomez found remains of these platforms within the fill of the Late Classic structures 5D-90, 5D-91 and 5D-92 on the southern side of the plaza (Fig. 14; Gómez n.d.; Laporte & Fialko 1995). The area remained accessible from the E-Group until the Late Classic period (AD 600–900), when further construction effectively segregated these spaces. Thus, the burial resulted from ritual activities that took place in the architectural backdrop of the Tikal E-Group, and its eastern location on the group's normative axis suggests an association with the rising sun.

Figure 14. *(Colour online) Excavation of Structure 5D-90, on the southern side of the Seven Temples Plaza. The dotted line highlights the Talud-Tablero architectural profile of an Early Classic building stage. (Photograph: Oswaldo Gómez, Proyecto Plaza de los Siete Templos de Tikal.)*

Numerous E-Groups have been identified throughout the Maya Lowlands, highland Chiapas and the Gulf Coast, and there is an ongoing discussion about their origins, geographic distribution, ritual functions and astronomical connotations. Research at several sites has shown that their initial construction was a foundational event, marking the establishment of early communities in the Maya Lowlands during the Early and Middle Preclassic periods (Chase & Chase 2012, 257–9; Clark & Hansen 2001; Doyle 2012; Estrada-Belli 2011, 67–83; Inomata *et al.*

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2013). At Uaxactun, Blom (1924) first measured the E-Group's alignment to true north, and noted that an observer standing on the west pyramid would watch the sun rise behind the three temples in the eastern platform at the solstices and equinoxes. This observation stimulated protracted debate about the function of E-Groups as astronomical observatories, although the alignments observed at Uaxactun do not hold true at other sites, including Tikal (Aveni & Hartung 1989; Ruppert 1940).

From a different perspective, Cohodas (1980, 217–19) interpreted E-Groups as architectural settings that reproduced the quadrangular shape of the world and the cosmic levels, functioning as ritual spaces related to the solar cycle. More recently, Aveni and his collaborators proposed alternative ways in which they may have been used for sun watching, while acknowledging that their purpose was broader, related to 'a deep and widespread concern with religion, cosmology, myth, and ritual' (Aveni *et al.* 2003, 174). Aimers and Rice (2006) agreed that the solar associations of E-Groups are best understood in terms of sacred geography and ritual performance related to calendric and agricultural cycles. Summarizing the debate, Houston and Inomata (2009, 80) suggested that E-Groups 'reproduced and remade the features of a natural landscape, channeling particular rituals that spread cult-fashion across the Maya lowlands'. This explanation is grounded on a growing awareness about the landscape connotations of Mesoamerican religious architecture. As noted, the best-known case is the Great Temple of Mexico, conceived as Coatepec, the mountain in which major creational events transpired (Broda *et al.* 1987; López Austin & López Luján 2009).

In previous work, Chinchilla Mazariegos and Gómez (2010) proposed that E-Groups represented mythical landscapes related to the places of origin of the sun and the moon. With or without astronomical accuracy, the east platform's north–south orientation relates to the yearly path of the sun, while its three temples likely relate to the major stations of the yearly solar cycle. The pyramid on the compound's west side is often linked with centrality and the four-sided shape of the world (Cohodas 1980; for a comparative case at Palenque: Stuart & Stuart 2008, 193). However, at Tikal itself, pyramids with four stairways were built on both the east and the west sides of the Late Classic Twin Pyramid groups, suggesting that this shape is no strictly tied to centrality. The pyramid's position in the E-Group links it with the western side of the world, the setting sun, and perhaps with the night and the moon. Rather than the pyramid, the plaza corresponds best with the flat surface of the earth, traversed by the daily path of the sun that made it inhabitable for humanity. The flat earth, the western mountain, and the eastern horizon were key features in this mythical geography.

This interpretation is relevant for broader debates about Mesoamerican E-Groups. We cannot assume that the symbolism of E-Groups was uniform through the long time spans of their construction and use, nor can we assume that every E-Group materialized the same beliefs at different sites. Yet their marked architectural conservatism suggests that the attached meanings may have changed at a slow pace. The ritual event that produced Burial PP7TT-01 was late in the long history of the Tikal E-Group, which was more than eight centuries old by then. Our conclusions from the analysis of this deposit are not directly applicable to earlier stages in the compound's long history, although they may contribute to formulate interpretations about them. There are two possible scenarios: (a) the E-Group was chosen as the appropriate location for this Early Classic ritual reenactment because of its ancestral association with solar mythology; and (b) the compound was reinterpreted at this time, acquiring new meanings according to changing mythical beliefs and ritual practices. While we cannot ascertain the precise circumstances, we suggest that the answer lies somewhere in between these alternatives.

Like the Great Temple of Mexico, the architectural landscape of the Tikal E-Group became significant through ritual performances, related in dynamic ways with mythical beliefs. Throughout its long history, it may have served as a backdrop for many kinds of rituals. However, the compound's pervasive solar connotations provide a basis to think that they included commemorations related to the solar cycle and solar deities. We reiterate the proposition that the architectural landscape of the Tikal E-Group condensed beliefs about a mythical geography, materializing the places where the primeval events that resulted in the advent of the sun and the moon transpired in primeval times. The axial location of the cremation pit that contained Burial PP7TT-01, on the compound's eastern side — associated with the sunrise — appears to be an appropriate place for a ritual performance that alluded to and reenacted the immolation of the heroes that became the sun and the moon.

Mesoamerican solar myths

In Maya communities, the daily path of the sun is a basic ordering principle, related with notions about the shape of the world, the yearly agricultural cycles and the human life cycle (Earle 1986; Gossen 1979; Sosa 1985; Watanabe 1983). The movements of the sun are not conceived as those of an inert celestial body.

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Instead, they are explained in terms of the life cycle of the sun god, as expressed in mythical beliefs and narratives. The origin of the sun and the moon are major topics in Maya myths recorded from colonial times to the present (Gossen 1979; Thompson 1970, 363–9). There is a strong probability that related solar myths were widely known in the Maya Lowlands since ancient times, although their precise unfolding remains unknown. They were not recorded in the extant corpus of Maya hieroglyphic writing, which only contains terse mythical passages — a minute sample of what was clearly an extremely rich complex of beliefs and narratives. Nevertheless, Classic Maya art and inscriptions provide important clues that can be productively compared with extant narratives recorded throughout Mesoamerica.

Beginning with Michael Coe (1973), scholars have noted correspondences between mythical characters represented in Classic Maya art and the twin heroes that became the sun and the moon, according to the sixteenth-century highland Maya narrative known as Popol Vuh. In the Popol Vuh, the heroes reached their destiny as luminaries only after they died by throwing themselves in a pit oven provided with heated stones and burning coal (Christenson 2003, 179; Tedlock 1996, 131). While the circumstances of their death can be readily compared with those described for Tikal Burial PP7TT-01, a simple likeness is not enough, since the Early Classic Maya of Tikal may have conceived the origin of the sun and the moon differently than the sixteenth-century K'iche'. The analogy becomes stronger with further analysis of this key mythical passage.

The fire sacrifice of the Popol Vuh heroes finds parallel in numerous myths about the origin of the sun and the moon. In López Austin's terminology (1993, 249–50), this is a nodal subject, whose reiteration in multiple versions provides an indication of the myth's resilience and longevity. The myth's reiteration in multiple versions across the region provides a basis to regard colonial and modern versions as deeply rooted in religious traditions that may go back to the origins of settled communities in Mesoamerica. The fire sacrifice of the sun and moon heroes is commonly associated with the Nahua peoples of central Mexico, where several versions were recorded in the sixteenth century (Mendieta 1973, vol. 1, 50; Sahagún 1989, vol. 2, 479–81; Tena 2002, 39, 183). Yet these texts are no older than the highland Maya Popol Vuh, and they provide no substantial indication about the myth's origin. In fact, the myth is broadly distributed throughout Mesoamerica. Modern versions have been recorded in Q'eqchi, K'iche', Tzotzil, Otomí, Nahua, Totonac, Cora and Huichol communities extending from Guatemala to west Mexico (Barlow & Ramírez 1962; De la Cruz Torres 1978, 63–4; Díaz de Salas 1963, 260; Galinier 1990, 693–9; Guzmán 2002, 143; Ichon 1973, 66; Lupo 1991; Münch Galindo 1992; Oropeza Escobar 2007, 183–5, 202–8, 214–23; Petrich & Ochoa García 2001, 32).

The discrepancies among these versions are significant, and provide a measure of the variability that may have characterized ancient beliefs and narratives. None of them can be assumed to be identical with those that circulated in Classic and Preclassic Mesoamerica. The version contained in the Popol Vuh departs from most others in that it fails to explain why one hero became the sun, and the other, the moon. This is a major topic in most narratives, which describe at length the heroes' contrasting character. Some Maya stories present the moon as female, either the sun's mother or his wife. More frequently, both are male, but the solar hero is generally starker and stronger. He is often described as poor and destitute, suffering from grains, sores or pustules, and sixteenth-century Nahua versions tell how he performed self-sacrifice, piercing his pustules with spines. By contrast, the lunar hero is normally rich and handsome. He enjoys water, and is often associated with women. In some versions he comes late, takes the wrong direction — to the west — or simply fails to throw himself in the pyre. The solar hero performs the sacrifice without hesitation and takes the better part of the heat. In some versions, the lunar hero follows him in the fading pyre and obtains only the feeble glow of the moon.

There are indications that the Lowland Maya conceived a pair of heroes with contrasting characters that approximate those described in colonial and modern narratives (Fig. 15). In a recent revision, Chinchilla Mazariegos (2011) showed that the Maya Maize God displays the distinctive features of Mesoamerican lunar heroes. He is a handsome young man, adorned with abundant jewellery, and closely associated with jade and cacao — markers of wealth in ancient Mesoamerica (Martin 2006; Taube 2005). He often appears in watery places, enjoying the company of young women, and he is sometimes explicitly marked with the attributes of a lunar god. Chinchilla Mazariegos contrasted him with God S — also labelled as the 'Spotted Headband Twin' (Coe 1989; Taube 1992, 115–19) — who shares the attributes of Mesoamerican solar heroes. He is a simple hunter, and in some representations he performs painful bloodletting sacrifice. He does not receive the attentions of women, and his body is covered with black spots that may represent sores or pustules. In Classic Maya art, God S is often paired with a companion, God CH, whose skin is marked with jaguar skin patches. Both contrast

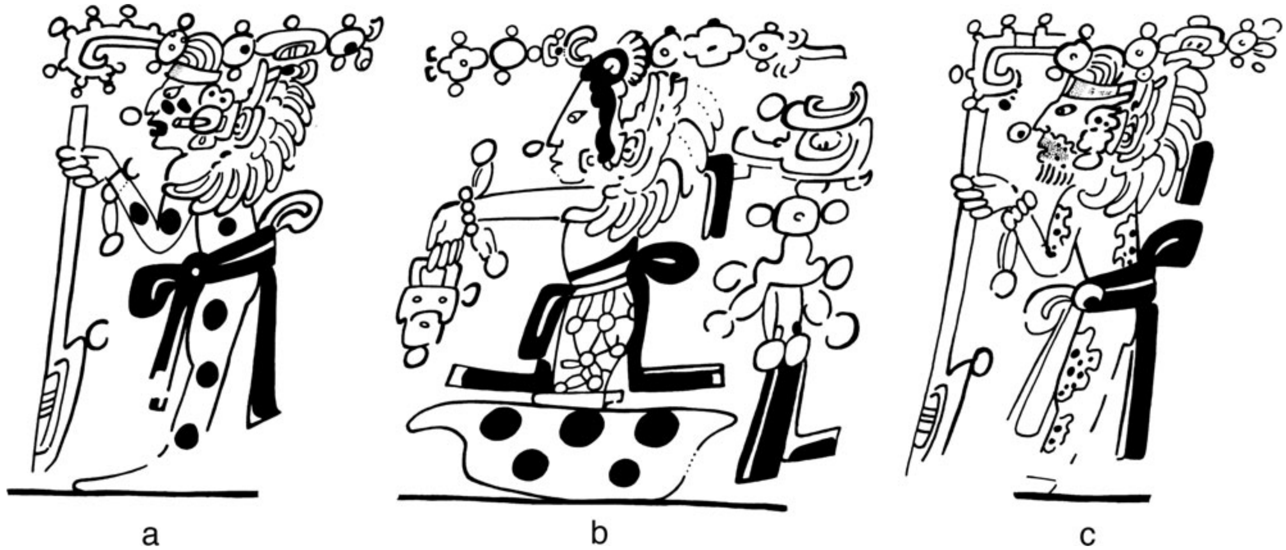

Figure 15. *Mythical heroes related to solar and lunar mythology in Maya art: (a) God S; (b) Maize God, standing on a canoe; and (c) God CH. (Details from Late Classic painted vase in the collection of the Museo Popol Vuh, Universidad Francisco Marroquín. Drawings: Oswaldo Chinchilla Mazariegos.)*

markedly with the Maize God, although the ulcerated skin brings God S closer to Mesoamerican solar heroes.

The imagery suggests that Classic Maya versions conceived three heroes who were paired and contrasted with each other in various mythical passages (Chinchilla Mazariegos 2011; Coe 1989). For present purposes, suffice it to reiterate that Preclassic and Classic Maya art featured mythical characters — God S and the Maize God — that shared significant attributes with Mesoamerican solar and lunar heroes. They provide indications that ancient Maya concepts about the origin of the luminaries were not radically different from the versions documented throughout Mesoamerica, from colonial times to the present. No known artistic representation shows their immolation in a pyre or oven, but neither have such representations been clearly documented in central Mexico, despite the prominent presence of the heroes' sacrifice in early colonial narratives from that region.

A related question is whether the heroes' fire sacrifice was known in Classic Teotihuacan. While there is no direct evidence, mural paintings at Teotihuacan include representations of an important mythical episode related to the defeat of a monstrous avian being (Nielsen & Helmke n.d.). In colonial and modern Mesoamerican myths, this episode commonly appears in narratives about the origin of the sun and the moon, some of which also feature the heroes' immolation (Chinchilla Mazariegos 2011, 112–23). On a separate note, there is no evidence to suggest a significant temporal depth for the sixteenth-century Mexica tradition recorded by Sahagún (1989, 479), which placed the heroes' fire sacrifice specifically at Teotihuacan. While intriguing, this detail is absent in other versions; therefore, it is an adventurous subject that reflects Postclassic views of the ancient ruined site as a model city and place of origin (Boone 2000).

The components of PP7TT-01 do not correspond neatly with the details of any single version of the myth. Because of its salience in Maya mythology, it is pertinent to compare this assemblage with the sixteenth-century version of the Popol Vuh. The pit pyre of Burial PP7TT-01 corresponds well with the pit oven described there, but the victims' age and separate origins depart from the heroes' description as twins in the K'iche' document. In particular, the mature age of Individual 1B deviates from this and other narratives that describe both heroes as youngsters. Yet there is no reason to believe that the versions known to the Early Classic inhabitants of Tikal were especially close to the highland version compiled many centuries later in the Popol Vuh. As noted, this version departs significantly from most others, reflecting local beliefs that were peculiar to the sixteenth-century K'iche' (Chinchilla Mazariegos 2011, 143–5). Consequently, it should not be taken in isolation as a model for Classic Maya versions of the myth. The precise unfolding of the myths that may have served as models for this ritual, and the circumstances that prompted the selection of the victims are presently lost. Our comparisons only become significant when we focus on the nodal subject of the myth — the fire sacrifice of the solar and lunar heroes.

Final comments

In this article we integrated multiple levels of analysis to interpret a unique burial at Tikal. Osteotaphonomic studies of the cremated remains allowed us to reconstruct with some detail the sequence of actions that resulted in the deposit's formation, and understand the transformations that the victim's bodies underwent during the ritual process. Osteological and isotopic analyses allowed us to extract details about their geographic origin and lives. Combining these approaches, we conclude that the burial likely resulted from a ritual process that involved human sacrifice, *peri-mortem* cremation of two probable male victims in a pit pyre, and primary deposition of the undisturbed remains at the location where the ritual took place. This rare circumstance enabled us to relate this sacrificial ritual with the architectural landscape of the Tikal E-Group, where it took place. We posited parallels with the mythical immolation of the sun and moon heroes, a nodal subject in Mesoamerican solar myths that can be plausibly related with our reconstruction of the sacrificial ritual and its architectural setting. In sum, we proposed a specific interpretation about the mythical connotations of this ritual and the resulting deposit, grounded on our understanding of Mesoamerican ritual practices and their mythical paradigms.

The burial's possible association with Teotihuacan ritual practices deserves attention. While the evidence is inconclusive at present, the primary deposition of the cremains and the presence of green obsidian points in the burial may signal a connection. The ritual process that led to the formation of this burial may have replicated Teotihuacan models, or local perceptions about them, although the available evidence from that city does not provide definite parallels. In any case, there are no grounds to suggest that the mythical episode involving the fire sacrifice of the sun and moon heroes was foreign to the Early Classic Maya.

On a more analytical note, we have learned in the course of this and other, similar contextual studies that a conjoined approach, combining different perspectives and levels of approximation, involving archaeological and osteotaphonomic analyses in combination with studies of textual and artistic media, is well suited to analyse the links between myth, ritual and human sacrifice in Mesoamerica and elsewhere. We hope that future research along these lines will advance the theoretical and methodological issues raised by our study at Tikal.

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References

Adams, B. & J.E. Byrd (ed.), 2008. *Recovery, Analysis and Identification of Commingled Human Remains*. New York (NY): Humana Press.

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Aimers, J.J. & P.M. Rice, 2006. Astronomy, ritual, and the interpretation of Maya 'E-Group' architectural assemblages. *Ancient Mesoamerica* 17, 79–96.
Angel, A. del & H.B. Cisneros, 2004. Technical note: modification of regression equation used to estimate stature in Mesoamenrican skeletal remains. *American Journal of Physical Anthropology* 125(3), 264–5.
Aveni, A.F. & H. Hartung, 1989. Uaxactun, Guatemala, Group E and similar assemblages: an archaeoastronomical reconsideration, in *World Archaeoastronomy*, ed. A.F. Aveni. Cambridge: Cambridge University Press, 441–61.
Aveni, A.F., A.S. Dowd & B. Vining, 2003. Maya calendar reform? evidence from orientations of specialized architectural assemblages. *Latin American Antiquity* 14, 159–78.
Barlow, R.H. & V. Ramírez, 1962. Tonatiw iwan meetstli: el sol y la luna. *Tlalocan* 4(1), 55–7.
Bello, S. & P. Andrews, 2006. The intrinsic pattern of preservation of human skeletons and its influence on the interpretation of funerary behaviours, in *Social Archaeology of Funerary Remains*, eds. R. Gowland & C. Knüsel. Oxford: Oxbow Books, 1–13.
Blom, F., 1924. Report on the preliminary work at Uaxactun, Guatemala. *Carnegie Institution of Washington Yearbook* 23, 217–19.
Boone, E., 2000. Venerable place of beginnings: the Aztec understanding of Teotihuacan, in *Mesoamerica's Classic Heritage: From Teotihuacan to the Aztecs*, eds. D. Carrasco, L. Jones & S. Sessions. Boulder (CA): University Press of Colorado, 371–95.
Braswell, G.E. (ed.), 2003. *The Maya and Teotihuacan: Reinterpreting Early Classic Interaction.* Austin (TX): University of Texas Press.
Broda, J., 1970. Tlacaxipehualiztli: a reconstruction of an Aztec calendar festival from 16th century sources. *Revista Española de Antropología Americana* 5, 197–274.
Broda, J., 1971. Las fiestas aztecas de los dioses de la lluvia. *Revista Española de Antropología Americana* 6, 245–327.
Broda, J., D. Carrasco & E. Matos Moctezuma, 1987. *The Great Temple of Tenochtitlan: Center and Periphery in the Aztec World*. Berkeley (CA): University of California Press.
Buikstra, J.E. & D. Ubelaker (ed.), 1994. *Standards for Data Collection from Human Skeletal Remains*. (Arkansas Archaeological Survey Research 44.) Fayetteville (AR): Arkansas Archaeological Survey.
Cabrera Castro, R., 1999. Las prácticas funerarias de los antiguos teotihuacanos, in *Prácticas funerarias en la ciudad de los dioses: los enterramientos humanos de la antigua Teotihuacán*, eds. L. Manzanilla & C. Serrano. México: Universidad Nacional Autónoma de México, 503–39.
Carr, R.F. & J.E. Hazard, 1961. Map of the Ruins of Tikal, El Petén, Guatemala. Tikal Report 1. Philadelphia (PA): University of Pennsylvania.
Chase, A.F. & D.Z. Chase, 2010. Household Patterning, the 'Collapse,' and LiDar Ground Checks: Continued Investigations in and near Caracol's Epicenter: 2010 Field Report of the Caracol Archaeological Project. http//www.caracol.org/reports/2010.pdf. [Accessed 24 August 2013].
Chase, A.F. & D. Z. Chase, 2011. Status and Power: Caracol, Teotihuacan, and the Early Classic Maya World *Research Reports in Belizean Archaeology* 8, 3–18.
Chase, A.F. & D. Z. Chase, 2012. Complex Societies in the Southern Maya Lowlands: Their Development and Florescence in the Archaeological Record, in *Oxford Handbook of Mesoamerican Archaeology*, eds. D.L. Nichols & C.A. Pool. Oxford: Oxford University Press, 255–63.
Chase, D.Z & A.F. Chase, 2003. Secular, sagrado y 'revisitado': la profanación, alteración y reconsagración de los antiguos entierros mayas, in *Antropología de la eternidad: la muerte en la cultura maya*, eds. A. Ciudad, M.H. Ruz Sosa & M.J. Iglesias Ponce de León. Madrid: Sociedad Española de Estudios Mayas, 255–77.
Chávez Balderas, X., 2007. *Rituales Funerarios en el Templo Mayor de Tenochtitlan*. México: Instituto Nacional de Antropología e Historia.
Chinchilla Mazariegos, O., 2011. *Imágenes de la Mitología Maya*. Guatemala: Museo Popol Vuh, Universidad Francisco Marroquín.
Chinchilla Mazariegos, O. & O. Gómez, 2010. El nacimiento del sol en Tikal: Interpretación de un Entierro Asociado al Conjunto de Tipo Grupo 'E' de Mundo Perdido, in *XXIII Simposio de Investigaciones Arqueológicas en Guatemala, 2009*, eds. B. Arroyo, A. Linares & L. Paiz. Guatemala: Museo Nacional de Arqueología y Etnología, Guatemala, 1193–201.
Chocón, J.E., 2013. Complejos de conmemoración astronómica, complejos de ritual público o grupos tipo E, in *XXIII Simposio de Investigaciones Arqueológicas en Guatemala, 2009*, eds. B. Arroyo & L. Méndez Salinas. Guatemala: Museo Nacional de Arqueología y Etnología, Guatemala, 519–28.
Christenson, A.J. (ed.), 2003. *Popol Vuh: the Sacred Book of the Maya*. Winchester: O Books.
Cid Beziez, J. & Rodolfo L. Torres Sanders, 1999. Los entierros del occidente de la ciudad, in *Prácticas funerarias en la ciudad de los dioses: los entierros humanos de la antigua Teotihuacan*, eds. L. Manzanilla & C. Serrano. Mexico: Universidad Nacional Autónoma de México, 285–344.
Clark, J.E. & R.D. Hansen, 2001. The architecture of early kingship: comparative perspectives on the origins of the Maya Royal Court, in *Royal Courts of the Ancient Maya, vol. 2: Data and Case Studies*, eds. T. Inomata & S.D. Houston. Boulder (CO): Westview Press, 1–45.
Clendinnen, I., 1995. *Aztecs: an Interpretation*. Cambridge: Cambridge University Press.
Coe, M.D., 1973. *The Maya Scribe and His World*. New York (NY): Grolier Club.
Coe, M.D., 1989. The Hero twins: myth and image, in *The Maya Vase Book: a Corpus of Rollout Photographs of Maya Vases by J. Kerr*. New York (NY): Kerr Associates, 161–84.

Coe, W.R., 1990. *Excavations in the Great Plaza, North Terrace and North Acropolis of Tikal*. (Tikal Report 14, 5 volumes; Museum Monograph 61.) Philadelphia (PA): University of Pennsylvania.

Cohodas, M., 1980. Radial pyramids and radial-associated assemblages of the central Maya area. *Journal of the Society of Architectural Historians* 39, 208–23.

Culbert, T.P., 1993. *The Ceramics of Tikal: Vessels from the Burials, Caches, and Problematical Deposits*. (Tikal Report 25, part A.) Philadelphia (PA): The University Museum, University of Pennsylvania.

De la Cruz Torres, M.E., 1978. *Rubelpec: Cuentos y leyendas de Senahú, Alta Verapaz*. Guatemala: Editorial del Ejército.

Dembo, A. & J. Imbelloni, 1938. *Deformaciones intencionales del cuerpo humano de carácter étnico*. Buenos Aires: Biblioteca Humanior.

Díaz de Salas, M., 1963. Notas sobre la visión del mundo entre los tzotziles de Venustiano Carranza, Chiapas. *La Palabra y el Hombre: Revista de la Universidad Veracruzana* 26, 253–67.

Doyle, J.A., 2012. Regroup on 'E-Groups': monumentality and early centers in the Middle Preclassic Maya Lowlands. *Latin American Antiquity* 23, 355–79.

Duday, H., 2009. *The Archaeology of the Dead. Lectures in Archaeothanatology*. Oxford Oxbow Books.

Earle, D.M., 1986. The metaphor of the day in Quiche: notes on the nature of everyday life, in *Symbol and Meaning Beyond the Closed Community: Essays in Mesoamerican Ideas*, ed. G.H. Gossen. Albany (NY): Institute of Mesoamerican Studies, State University of New York, 155–72.

Eberl, M., 2005. *Muerte, entierro y ascención. Ritos funerarios entre los antiguos mayas.* Mérida: Universidad Autónoma de Yucatán.

Estrada-Belli, F., 2011. *The First Maya Civilization: Ritual and Power before the Classic Period*. New York (NY): Routledge.

Fialko, V., 1988. Mundo Perdido, Tikal: un ejemplo de complejos de conmemoración astronómica. *Mayab* 4, 13–21.

Fitzsimmons, J.L., 2009. *Death and the Classic Maya Kings*. Austin (TX): University of Texas.

Flores Esquivel, A. & I. Šprajc, 2008. Reconocimiento arqueológico en el sur de Campeche: nuevos hallazgos y contribuciones para una visión regional. *Estudios de Cultura Maya* 32, 17–38.

Fogelin, L. 2007. The archaeology of religious ritual. *Annual Review of Anthropology* 36, 55–71.

Freidel, D.A., L. Schele & J. Parker, 1993. *Maya Cosmos: Three Thousand Years on the Shaman's Path*. New York (NY): Quill.

Galinier, J., 1990. *La mitad del mundo: cuerpo y cosmos en los rituales otomíes*. México: Universidad Nacional Autónoma de México, Centro de Estudios Mexicanos y Centroamericanos, and Instituto Nacional Indigenista.

Gómez, O., 2006. El proyecto plaza de los siete templos de Tikal: nuevas intervenciones, in *XIX Simposio de Investigaciones Arqueológicas en Guatemala, 2005*, eds. J.P. Laporte, B. Arroyo & H. Mejía. Guatemala: Museo Nacional de Arqueología y Etnología, Guatemala, 768–89.

Gómez, O., n.d. El sector sur del centro ceremonial de Tikal. Unpublished paper presented at the VI Mesa Redonda de Palenque, Palenque, 2010.

Gossen, G.H., 1979. Temporal and spatial equivalents in Chamula ritual symbolism, in *Reader in Comparative Religion: an Anthropological Approach*, eds. W.L. Lessa & E.Z. Vogt. New York (NY): Harper and Row Publishers, 116–29.

Graulich, M., 1999. *Ritos Aztecas: las Fiestas de las Veintenas*. Mexico City: Instituto Nacional Indigenista.

Guzmán, A., 2002. *Mitote y Universo Cora*. Guadalajara: Instituto Nacional de Antropología e Historia, and Universidad de Guadalajara.

Hernández, P.O. & M.E. Peña, 2010. *Manual para la identificación del sexo y la estimación de la edad a la muerte en esqueletos de menores de quince años*. Mexico City: Instituto Nacional de Antropología e Historia, Escuela Nacional de Antropología e Historia.

Hess, J., M.L. Bender & J.G. Schilling, 1986. Evolution of the ratio of strontium-87 to strontium-86 in seawater from Cretaceous to present. *Science* 231, 979–84.

Hodell, D.A., R.L. Quinn, M. Brenner & G. Kamenov, 2004. Spatial variation of strontium isotopes ($^{87}Sr/^{86}Sr$) in the Maya region: a tool for tracking ancient human migration. *Journal of Archaeological Science* 31, 585–601.

Houston, S.D., 2006. Impersonation, dance, and the problem of spectacle among the Classic Maya, in *Archaeology of Performance: Theaters of Power, Community, and Politics*, eds. T. Inomata & L.S. Coben. Lanham (MD): Altamira Press, 135–55.

Houston, S.D. & T. Inomata, 2009. *The Classic Maya*. Cambridge: Cambridge University Press.

Houston, S., H.L. Escobedo, A. Scherer, M. Child & J.L. Fitzsimmons, 2003. Classic Maya Death at Piedras Negras, Guatemala, in *Antropología de la eternidad: la muerte en la cultura maya*, eds. A. Ciudad, M.H. Ruz Sosa & M.J. Iglesias Ponce de León. Madrid: Sociedad Española de Estudios Mayas, 113–43.

Houston, S.D., D. Stuart & K. Taube, 2006. *The Memory of Bones: Body, Being, and Experience Among the Classic Maya.* Austin (TX): University of Texas Press.

Howarth, R.J. & J.M. McArthur, 1997. Statistics for strontium isotope stratigraphy: a robust LOWESS fit to the Marine Sr-isotope curve for 0 to 206 Ma, with look-up table for derivation of numeric age. *Journal of Geology* 105, 441–56.

Ichon, A., 1973. *La Religión de los Totonacas de la Sierra*. México: Instituto Nacional Indigenista.

Iglesias Ponce de León, M.J., 2003. Contenedores de cuerpos, cenizas y almas: el uso de las urnas funerarias en la cultura maya, in *Antropología de la eternidad: la muerte en la cultura maya*, eds. A. Ciudad, M.H. Ruz Sosa & M.J. Iglesias Ponce de León. Madrid:

Sociedad Española de Estudios Mayas/Centro de Estudios Mayas, 209–54.

Inomata, T., D. Triadan, K. Aoyama, V. Castillo & H. Yonenobu, 2013. Early ceremonial constructions at Ceibal, Guatemala, and the origins of Lowland Maya civilization. *Science* 340(6131), 467–71.

Insoll, T., 2004. *Archaeology, Ritual, Religion*. London: Routledge.

Insoll, T., 2011. Sacrifice, in *The Oxford Handbook of the Archaeology of Ritual and Religion*, ed. T. Insoll. Oxford: Oxford University Press, 151–65.

Laporte, J.P., 1999. Exploracioón y restauración en el Conjunto de Palacios de Mundo Perdido, Tikal (Estructura 5C-45/47), in *XII Simposio de Investigaciones Arqueológicas en Guatemala, 1998*, eds. J.P. Laporte & H.L. Escobedo. Guatemala: Museo Nacional de Arqueología y Etnología, 183–214.

Laporte, J.P. & V. Fialko, 1990. New perspectives on old problems: dynastic references for the Early Classic at Tikal, in *Vision and Revision in Maya Studies*, eds. F.S. Clancy & P.D. Harrison. Albuquerque (NM): University of New Mexico Press, 33–66.

Laporte, J.P. & V. Fialko, 1995. Un reencuentro con Mundo Perdido, Tikal, Guatemala. *Ancient Mesoamerica* 6, 41–94.

López Austin, A., 1993. *The Myths of the Opossum: Pathways of Mesoamerican Mythology*. Albuquerque (NM): University of New Mexico Press.

López Austin, A., 2002. Indigenous mythology from present-day Mexico, in *Native Religions and Cultures of Central and South America: Anthropology of the Sacred*, ed. L.E. Sullivan. New York (NY): The Continuum International Publishing Group, 33–66.

López Austin, A., 2008. Características generales de la religión de los pueblos nahuas del centro de México en el Posclásico Tardío, in *La religión de los Pueblos Nahuas*, ed. S. Limón Olvera. (Enciclopedia Iberoamericana de las Religiones 7.) Madrid: Editorial Trotta, 31–72.

López Austin, A. & L. López Luján, 2009. *Monte Sagrado, Templo Mayor*. México: Universidad Nacional Autónoma de México.

López Luján, L. & G. Olivier (eds.), 2010. *El sacrificio humano en la tradición religiosa mesoamericana*. México: Instituto Nacional de Antropología e Historia.

Lucero, L.J. & S.A. Gibbs, 2007. The creation and sacrifice of witches in Classic Maya Society, in *New Perspectives on Human Sacrifice and Ritual Body Treatments in Ancient Maya Society*, eds. V. Tiesler & A. Cucina. New York (NY): Springer, 45–73.

Lupo, A., 1991. El sol en Jerusalén. *La Palabra y el Hombre, Revista de la Universidad Veracruzana* 80, 197–206.

Márquez, L. & A. del Angel, 1997. Height among Prehispanic Maya of the Yucatán Peninsula: a reconsideration, in *Bones of the Maya: Studies of Ancient Skeletons*, eds. S.L. Whittington & D.M. Reed. Washington (DC): Smithsonian Institution, 51–61.

Martin, S, 2006. Cacao in ancient Maya religion: First Fruit from the Maize Tree and other tales from the underworld, in *Chocolate in Mesoamerica: a Cultural History of Cacao*, ed. C.L. McNeil. Gainesville (FL): University Press of Florida, 154–83.

McKinley, J.I., 2008. In the heat of the pyre: efficiency of oxidation in Romano-British cremations - Did it really matter?, in *The Analysis of Burned Human Remains*, eds. C.W. Schmidt & S.A. Symes. London: Elsevier, 163–83.

Medina, C. & M. Sánchez, 2007. Posthumous body treatments and ritual meaning in the Classic Period northern Peten: a taphonomic approach, in *New Perspectives on Human Sacrifice and Ritual Body Treatments in Ancient Maya Society*, eds. V. Tiesler & A. Cucina. New York (NY): Springer, 102–19.

Mendieta, J. de, 1973. *Historia Eclesiástica Indiana*, ed. Francisco Solano y Pérez-Lila. 2 vols. Madrid: Ediciones Atlas.

Miller, M.E. & S. Martin, 2004. *Courtly Art of the Ancient Maya*. London: Thames & Hudson.

Moholy-Nagy, H., 1999. Mexican obsidian at Tikal, Guatemala. *Latin American Antiquity* 10, 300–313.

Münch Galindo, G., 1992. Acercamiento al mito y a sus creadores. *Anales de Antropología* 29, 285–99.

Nielsen, J. & C. Helmke, n.d. La caída del gran ave celestial: un mito cosmogónico del Clásico Temprano en el México central, in *Teotihuacan: medios de comunicación y poder en la Ciudad de los Dioses*, eds. N. Grube & I. Kummels.

Oropeza Escobar, M., 2007. Mitos cosmogónicos de las culturas indígenas de Veracruz, in *Relatos ocultos en la Niebla y el Tiempo: selección de mitos y estudios*, ed. B.R. Castellón Huerta. México: Instituto Nacional de Antropología e Historia, 163–259.

Pereira, G., 2010. El sacrificio humano en el Michoacán antiguo, in *El Sacrificio Humano en la Tradición Religiosa Mesoamericana*, eds. L. López Luján & G. Olivier. Mexico: Instituto Nacional de Antropología e Historia, 247–72.

Petrich, P. & C. Ochoa García, 2001. *Ri Qati't Ik'. La Abuela Luna*. Guatemala: Cholsamaj.

Pijoán, C. & J. Mansilla, 1997. Evidencia de sacrificio humano, modificación ósea y canibalismo en el México prehispánico, in *El cuerpo humano y su tratamiento mortuorio*, eds. E. Malvido, G. Pereira & V. Tiesler. Mexico: Instituto Nacional de Antropología e Historia, 193–212.

Pijoán, C.M. & M.E. Salas, 1984. Costumbres funerarias en Mundo Perdido, Tikal, in *Estudios de antropología biológica, II coloquiode antropología Física Juan Comas*. Mexico: Universidad Nacional Autónoma de México, 237–52.

Price, T.D., J.H. Burton, P.D. Fullagar, L.E. Wright, J.E. Buikstra & V. Tiesler, 2008. Strontium isotopes and the study of human mobility in ancient Mesoamerica. *Latin American Antiquity* 19, 167–80.

Ricketson, O.G. & E.B. Ricketson, 1937. *Uaxactun, Guatemala, Group E, 1926–1931*, part 1: *The Excavations*; part II: *The Artifacts*. (Publication 477.) Washington (DC): Carnegie Institution.

Romano, A., 1965. *Estudio morfológico de la modificación cultural craneana en Tamuín, S.L.P., y en la Isla del Idolo, Veracruz*. Mexico: Instituto Nacional de Antropología e Historia.

Ruppert, K.J., 1940. A special assemblage of Maya structures, in *The Maya and their Neighbors: Essays on Middle American Anthropology and Archaeology*, eds. C.L. Hay, R.L. Linton, S.K. Lothrop, H.L. Shapiro & G.C. Vaillant. New York (NY): Appleton, 222–31.

Sahagún, B. de, 1989. *Historia General de las Cosas de la Nueva España*, ed. J. García Quintana & A. López Austin. 2 vols. Mexico: Consejo Nacional para la Cultura y las Artes.

Schele, L. & M.E. Miller, 1986. *The Blood of Kings: Dynasty and Ritual in Maya Art*. Fort Worth (TX): Kimbell Art Museum.

Seler, E., 1996. Myths and religion of the ancient Mexicans, in *Collected Works in Mesoamerican Linguistics and Archaeology*, vol. 5, ed. F. Comparato. Culver City (CA): Labyrinthos, 3–99.

Sosa, J.R., 1985. *The Maya Sky, the Maya World: a Symbolic Analysis of Yucatec Maya Cosmology*. PhD dissertation, State University of New York at Albany. Ann Arbor (MI): University Microfilms International.

Spence, M.W., 1996. Commodity or gift: Teotihuacan obsidian in the Maya region. *Latin American Antiquity* 7, 21–39.

Steele, D.G. & C.A. Bramblett, 1988. *The Anatomy and Biology of the Human Skeleton*. College Station (TX): Texas A&M University Press.

Stuart, D., 1998. 'The fire enters his house': architecture and ritual in Classic Maya texts, in *Function and Meaning in Classic Maya Architecture*, ed. S. Houston. Washington (DC): Dumbarton Oaks, 373–425.

Stuart, D., 2000. The arrival of strangers: Teotihuacan and Tollan in Classic Maya history, in *Mesoamerica's Classic Heritage: from Teotihuacan to the Aztecs*, eds. D. Carrasco, L. Jones & S. Sessions. Boulder (CO): University Press of Colorado, 465–513.

Stuart, D. & G. Stuart, 2008. *Palenque: Eternal City of the Maya*. London: Thames & Hudson.

Symes, S.A., C.W. Rainwater, E.N. Chapman, D.R. Gipson & A.L. Piper, 2008. Patterned thermal destruction of human remains in a forensic setting, in *The Analysis of Burnt Human Remains*, eds. C.W. Schmidt & S.A. Symes. London: Elsevier, 15–54.

Taube, K., 1992. *The Major Gods of Ancient Yucatan*. Washington (DC): Dumbarton Oaks.

Taube, K., 2005. The symbolism of jade in Classic Maya religion. *Ancient Mesoamerica* 16, 23–50.

Tedlock, D. (ed.), 1996. *Popol Vuh: the Mayan Book of the Dawn of Life*. New York (NY): Simon and Schuster.

Tena, R. (ed.), 2002. *Mitos e Historia de los Antiguos Nahuas*. Mexico: Consejo Nacional para la Cultura y las Artes.

Thompson, J.E.S., 1970. *Maya History and Religion*. Norman (OK): University of Oklahoma Press.

Tiesler, V., 2001. La estatura entre los mayas prehispánicos: consideraciones bioculturales. *Estudios de Antropología Biológica* 10, 257–73.

Tiesler, V., 2007. Funerary or nonfunerary? New references in identifying ancient Maya sacrificial and postsacrificial behaviors from human assemblages, in *New Perspectives on Human Sacrifice and Ritual Body Treatments in Ancient Maya Society*, eds. V. Tiesler & A. Cucina. New York (NY): Springer, 14–44.

Tiesler, V., 2012. *Transformarse en maya: el modelado cefálico entre los mayas prehispánicos y coloniales*. Mexico: Universidad Nacional Autónoma de México.

Tiesler, V., 2014. *The Bioarchaeology of Artificial Cranial Modifications: New Approaches to Head Shaping and its Meanings in Pre-Columbian Mesoamerica and Beyond.* New York (NY): Springer.

Tiesler, V. & A. Cucina (ed.), 2007. *New Perspectives on Human Sacrifice and Ritual Body Treatments in Ancient Maya Society*. New York (NY): Springer.

Tiesler, V., J. Chi & S. Chay, 2011. Registro tafonómico y estudio general de los restos humanos del entierro PP7TT-01, Proyecto Arqueológico Plaza Siete Templos, Tikal, Guatemala. Unpublished report.

Turner II, C.G. & J.A. Turner, 1999. *Man Corn: Cannibalism and Violence in the Prehistoric American Southwest*. Salt Lake City (UT): The University of Utah Press.

Vail, G. & C. Hernández, 2007. Human sacrifice in Late Postclassic Maya iconography and texts, in *New Perspectives on Human Sacrifice and Ritual Body Treatments in Ancient Maya Society*, eds. V. Tiesler & A. Cucina. New York (NY): Springer, 120–64.

Watanabe, J., 1983. In the world of the sun: a cognitive model of Mayan cosmology. *Man new series* 18, 710–28.

Weiss-Krejci, E., 2006. The Maya corpse: body processing from Preclassic to Postclassic times in the Maya Highlands and Lowlands, in *Jaws of the Underworld: Life, Death, and Rebirth Among the Ancient Maya*, eds. P. Colas, G. LeFort & B. Liljefors Tersson. (Acta Mesoamericana 16.) Markt Schwaben: Anton Saurwein, 71–86.

Weiss-Krejci, E., 2010. Depósitos rituales en los Complejos de Pirámides Gemelas de Tikal, in *El ritual en el mundo maya: de lo privado a lo público*, eds. A. Ciudad Ruiz, M.J. Iglesias Ponce de León & M. Sorroche Cuerva. Madrid: Sociedad Española de Estudios Mayas, 83–105.

White, C.D., M.W. Spence, H.L. Stuart-Williams & H.P. Schwarcz, 1998. Oxygen isotopes and the identification of geographical origins: the Valley of Oaxaca versus the Valley of Mexico. *Journal of Archaeological Science* 25, 643–55.

White, C.D., F.J. Longstaffe & K.R. Law. 2001. Revisiting the Teotihuacan connection at Altun Ha: oxygen-isotope analysis of Tomb f-8/1. *Ancient Mesoamerica* 12, 65–72.

White, C.D., T.D. Price & F.J. Longstaffe, 2007. Residential histories of the human sacrifices at the Moon Pyramid: evidence from oxygen and strontium isotopes. *Ancient Mesoamerica* 18, 159–72.

White, T., 1992. *Prehistoric Cannibalism at Mancos 5MTUMR-2346.* Princeton (NJ): Princeton University Press.

Wright, L.E., 2002. *The Inhabitants of Tikal: a Bioarchaeological Pilot Project. Final Report to the Foundation for the Advancement of Mesoamerican Studies, Inc.* http://www.famsi.org/reports/95050/index.html. [Accessed 9 February 2014.]

Wright, L.E., 2005. Identifying immigrants to Tikal, Guatemala: defining local variability in strontium isotope ratios of human tooth enamel. *Journal of Archaeological Science* 32, 555–66.

Wright, L.E., 2012. Immigration to Tikal, Guatemala: evidence from stable strontium and oxygen isotopes. *Journal of Anthropological Archaeology* 31, 334–52.

Wright, L.E. & H.P. Schwarcz, 1998. Stable carbon and oxygen isotopes in human tooth enamel: identifying breastfeeding and weaning in prehistory. *American Journal of Physical Anthropology* 106, 1–18.

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