ANCIENT MAYA WARFARE: EXPLORING THE SIGNIFICANCE OF LITHIC VARIATION IN MAYA WEAPONRY

K. Aoyama[1]& E. Graham[2]

ABSTRACT

Variation in the kinds of weapons used in Maya warfare—and, one could argue in warfare in general—or the ways in which weapons were manufactured has been given scant attention as a function of diverse cultures and traditions. The results of the study described here suggest that lances (thrusting weapons with long wooden shafts and chipped stone heads) were the weapon of choice among both the Preclassic and the Classic Maya. In the Classic period, from which we have pictorial as well as other archaeological evidence, Maya elites used lances in hand-to-hand combat. Atlatl darts are also present in the Classic-period record but are not as common as lance heads. Points used as arrowheads do not appear in the Maya lowlands until the Terminal Classic, and then only in certain places. These changes do not follow a pattern that can be attributed to technological advances in resource acquisition, e.g. hunting. We discuss the increase in the production and use of atlatl darts as well as bows and arrows during the Terminal Classic period, which we argue reflects cultural change in the practices of warfare. We go further to hypothesise that changing warfare practices were one symptom of the cultural destabilisation that led to the demise of Classic Maya political authority.

Our paper derives from Maya research, but we think it has implications for the study of lithics more generally. Use of stone tools in the Old World, for example, is not normally associated with urbanism. The Maya example, in which neither the cultural nor technological context of urbanism involved the use of metals, can perhaps add a new social dimension to stone tool studies. With specific regard to the research described below, there is also the implication that the primary stimulus behind adoption of an artefact can be its role in competition or conflict—that is, in the socially sanctioned killing or harming of human beings—rather than its use in resource acquisition. Such a stimulus is as likely to have existed in the Palaeolithic as in the Bronze or Iron Age.

Full reference: Aoyama, K. & Graham, E. 2015. Ancient Maya warfare: exploring the significance of lithic variation in Maya weaponry. *Lithics: the Journal of the Lithic Studies Society* 36: 5–17.

Keywords: Maya civilisation, weapons, warfare, lances, atlatl darts, bows and arrows

INTRODUCTION

The culture of warfare—the weapons used, the fighting techniques honed, the men and women involved, the rituals employed and especially the rules of engagement and how 'winning' is measured—is a major key to the nature of the society waging a war. War, which we define here as a form of socially sanctioned competition that entails conflict and violence, is not now nor has it ever been peripheral to culture; it is central. The public face of war—that is, the rationale openly presented by leaders or other heads of state in war offensives—is rarely the explanation for the conflict (see e.g. Strachan 2001, 1115) but is instead the 'excuse' provided *after* the decision to wage war has already been made based on economic and political factors.

There are two reasons why we emphasise economic motives for warfare in the discussion that follows, although economics and politics are clearly intertwined as stimuli (Kettunen 2014, 95). The first is that economic motives provide the strongest explanation available for the taking of captives; the second is that the drive to win—achieving a tangible increase in economic and hence political power—becomes a potential explanatory factor in material culture change. We consider the changes in stone tool weaponry against this background.

WHAT WAS MAYA WARFARE ABOUT?

Wars are often understood as conflicts fought by people who agree on the rules of engagement. This is because there are social norms and codes of conduct that govern the practice of warfare and the justification for

[1] Faculty of Humanities, Ibaraki University, Bunkyo 2-1-1, Mito, Ibaraki, 310-8512, Japan, kazuo.aoyama.1@vc.ibaraki.ac.jp
[2] UCL Institute of Archaeology, University College London, 31–34 Gordon Square, London, WC1H, 0PY, UK, e.graham@ucl.ac.uk

killing. As described with great insight by Halsall (2003), '[w]arfare ... is a form of communication, and in some instances a type of diplomacy. When warfare is aimed at making a particular statement to an enemy, or at achieving a specific goal, then it is important that the enemy understands that statement'. Both sides need to be aware of what actions mean (Halsall 2003, 8–9). Rules change, however, and the usual codes and norms can be ignored. At the Battle of Agincourt, Henry V ordered his men to kill the French prisoners who had been captured in battle, but his men refused. Henry had to turn to his archers, who stood outside the chivalric system, to do the dirty work (Keegan 1976, 85–86, 110–111). Thus Agincourt, an epic struggle in English history, can also be described as '... a story of slaughter-yard behaviour and of outright atrocity' (Keegan 1976, 79).

Killing in warfare is socially sanctioned by many societies, but rules about who should be killed, and how, have changed over time. Sometimes the change is dramatic, as in the case of the Spanish conquest of the Americas (Graham *et al.* 2013). Sometimes we know that changes occurred but lack of information makes them difficult to pin down, as in the post-Roman West (Halsall 2003, 9). The question to be asked is: when, in the aim to win, do individuals who are recognised by both sides as warriors change the rules of engagement?

The changes may be viewed at first as cultural violations (non-traditional practice), as in Henry's deployment of archers at Agincourt, but if they enhance the chances of 'winning', the rule-changers all too often get away with it. In fact, one could see this kind of rule-changing as the driving force behind the evolution of complex society. We do not have to look too far to find examples. From present to past we have: drones; the dropping of the atomic bomb on Hiroshima; 18th-century English colonists in what would become the United States fully condoning the use of snipers in the War of Independence; the British introduction of the long bow in the Battle of Crécy, in northern France, in 1346 (de Wailly 1987); the introduction of firearms; the introduction of metal; and the introduction of the bow and arrow. The key question is, what are the circumstances in which people change the rules? Indeed, what are the rules of engagement in the first place?

These are questions which remain to be answered in Maya warfare. Rules of engagement are critical to the understanding of conflict and its outcome because such rules are rooted in social, cultural, political and religious practices and beliefs. This is not the place to discuss these factors with regard to the Maya, but we make the point because Maya weapons are not simply flaked stone with interesting shapes that can tell us about production techniques or chronology or technology. Maya weapons are personal extensions of the men (and women?) who used them in combat or competition to achieve a goal. The weapons are the materialisations of deep-seated cultural, social, political, religious and cosmological beliefs. Any change in the form of a weapon or its hafting or its material is not simply a technological change—it is a sea change.

Before we discuss the Maya weaponry in question, and in the spirit of a paper on warfare, we stress that our approach is tactical. We are employing a particular standpoint—that the people we archaeologists traditionally group together as 'Maya' had primarily economic motives for engaging in wars—because this standpoint enables us to generate new ideas on Maya competition and conflict to be explored and tested on the basis of future data (Graham 2009, 28). We are not the first to emphasise the importance of economic motives (see Kettunen 2012, 2014) and we are cognisant that the motives for warfare are in fact highly complex (Freidel *et al.* 1993; Reilly & Garber 2003; Martin 2006; García Capistran 2014; Gutiérrez 2014). It has recently been stated that we must look beyond material gain to understand why people go to war (Scherer & Verano 2014, 4), but we focus here on material gain. Our working hypothesis is that among the Maya, socially sanctioned armed competition (warfare) was aimed at appropriating (or maintaining) wealth. War was waged to expand access to tribute and resources. The extent to which the actual taking of land was an aim is unclear, although the absence of evidence of combat in most Maya cities suggests that wealth was gained—and masses of people (elites and commoners alike) in order to occupy their land. We adopt the wars

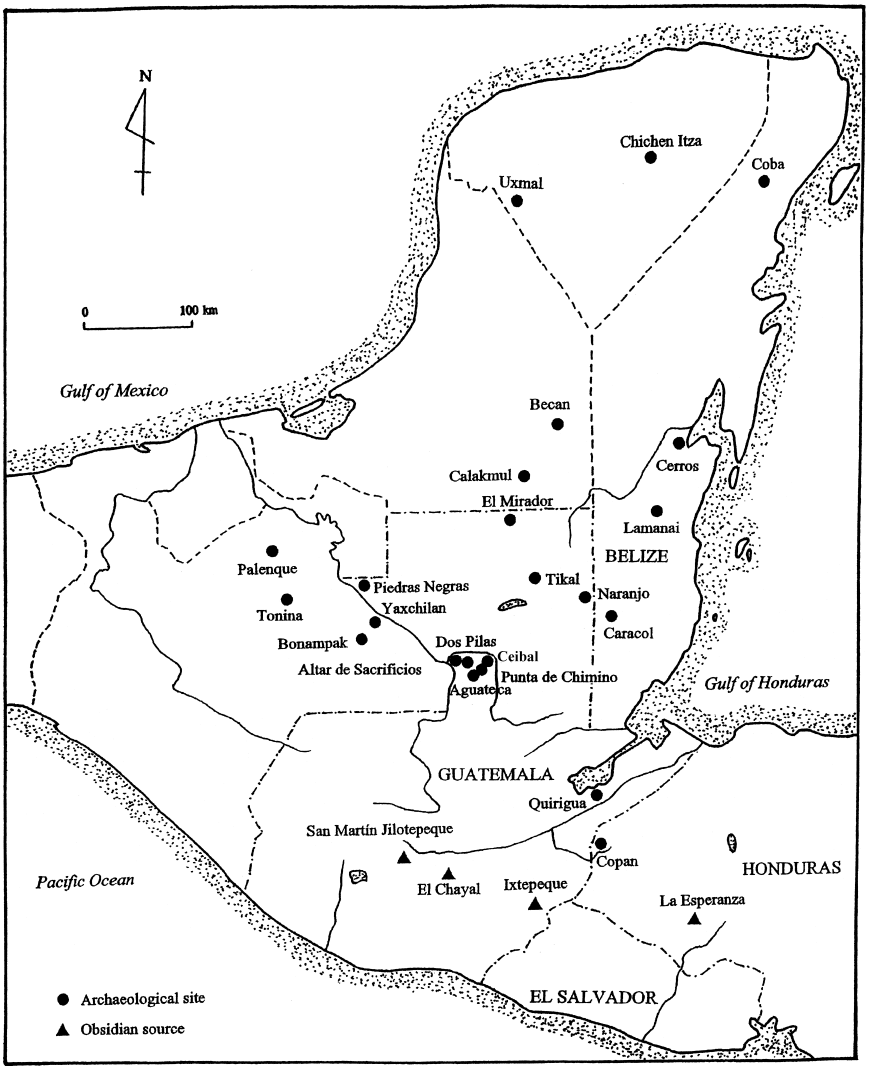

Figure 1. The Maya area, showing the location of major sites and obsidian sources.

'won'—in ways other than by killing working hypothesis that the aim was to *capture* one's opponent in close combat and, by doing so, the captor had the rights to the captive's wealth through the tribute and taxes once paid to the captive (Graham 2011, 38–43; Graham *et al.* 2013). Becoming a captive almost certainly involved a loss of honour and prestige and, in some cases, one's life was forfeit. Where and when captives were killed—and this is a key point—the social sanctioning fell under the rubric of the rules of engagement of warfare (*not* 'human sacrifice').

ARCHAEOLOGICAL EVIDENCE FOR WARFARE

Despite our knowledge from Maya hieroglyphic inscriptions of the ubiquity of conflict among the ancient Maya (Martin & Grube 2008), war is difficult to demonstrate archaeologically (Aoyama 2005), although earthworks or stone walls are often cited as evidence of a defensive system (e.g. Webster 1976; Golden *et al.* 2008). Among the Maya cities that were abandoned in the Terminal Classic, such as Tikal, Palenque, Bonampak, or Dos Pilas (Figure 1), most were abandoned gradually with inhabitants usually carrying away a large portion of their weapons and other belongings to their next residences. Identifiable ancient Maya weaponry is seldom recovered from datable contexts or contexts in which the use of the weapon is clear. Although all the lithics from a site are generally analysed technologically as a group, there are good reasons to conduct diachronic studies of possible lithic weapons in particular, from both primary and secondary contexts. Specific research questions include: what was the

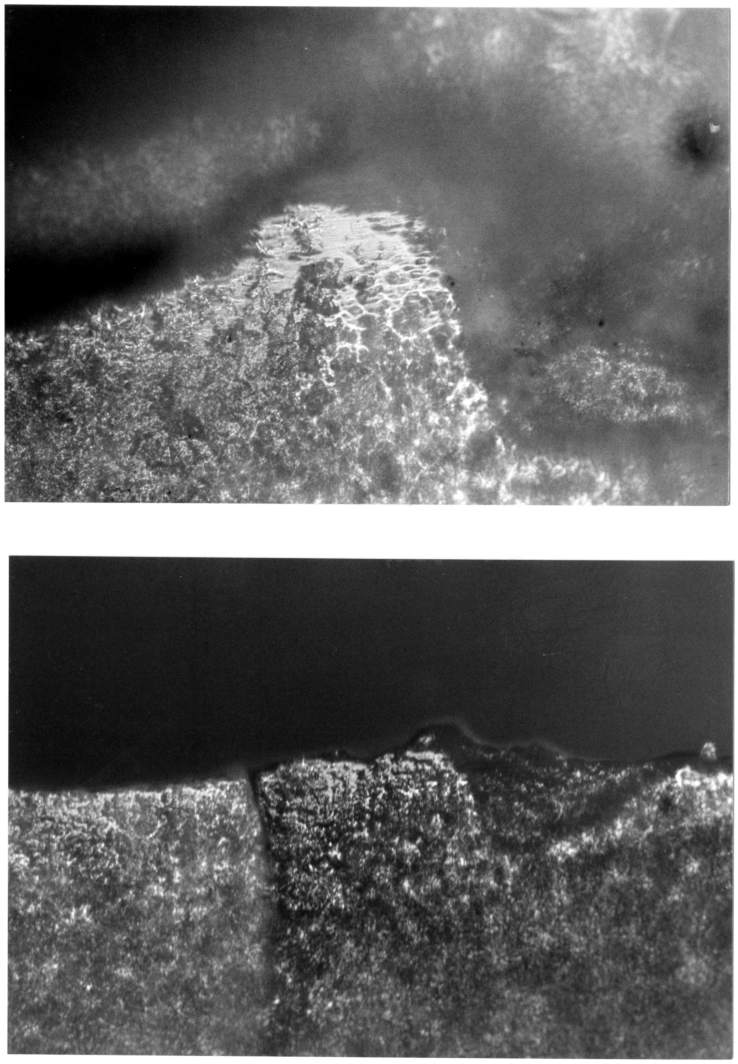

Figure 2. Examples of use-wear on chert bifacial points from Aguateca, Late Classic period (200x): (top) D2C type polish and parallel striations on a lateral edge used to cut shell or bone; (bottom) E1 type polish and parallel striations on a lateral edge used to cut meat or hide.

temporal and spatial variation in potential lithic weaponry? What was the nature of warfare, and what was its role in the rise and decline of Maya civilisation?

Since 1986, Aoyama has studied 195,947 lithic artefacts from Copan, Honduras, as well as Aguateca and Ceibal, Guatemala, including obsidian and chert points. Using high-powered microscopy techniques, he has conducted microwear analysis on 7719 stone artefacts from several Maya sites (Aoyama 1995, 1999, 2007 & 2009). In 1987, he conducted an experimental study of use-wear on obsidian and chert in Honduras in order to establish a framework for the interpretation of Maya stone-tool use (Aoyama 1989 & 1999). The results of 267 replication experiments conducted on a range of worked materials permitted identification of use-wear patterns. The instrument used in the study was a metallurgical microscope (Olympus BX60M) with 50–500x magnification and an incident-light attachment. Use-wear patterns were documented with an Olympus photomicrographic system PD-20 attached to a digital camera.

Judging by the presence of microwear in association with projectile-impact damage as well as the sizes (mean width = 36 mm, S.D. = 8.0 mm, n = 28), many obsidian and chert bifacial points were used as thrusting spears (lances) or as darts (Figure 2). Moreover, results of microwear analysis indicate that both

obsidian prismatic blade points and chert small unifacial points (mean width = 11.8 mm, S.D. = 3.6 mm, *n* = 13) were mainly used as arrowheads (Aoyama 2005, 294).

CASE STUDIES: MAYA WARFARE AND CHIPPED STONE WEAPONS

Copan, Honduras

A series of large-scale international archaeological projects conducted at Copan, Honduras, since 1975 have made it one of the more intensively studied regions in the Maya lowlands (Fash 2001). Of 74,614 chipped stone artefacts recovered from Copan, possible weapons include obsidian bifacial points (*n* = 354), obsidian prismatic blade points (*n* = 80) and chert bifacial points (*n* = 119). Imported obsidian was more frequently used than local chert for the production of these tools (Aoyama 1999). The straight-line distance from Copan to the closest obsidian source at Ixtepeque (80 km) is shorter than for most Maya lowland areas. Because they have sharper cutting edges, obsidian bifacial points should have been more effective weapons than those made from chert. In the words of one modern Lacandon Maya, '[o]bsidian makes a wound that causes heavy bleeding. A chert point will usually kill, but an obsidian point always kills' (Nations 1989, 454).

The pre-Columbian occupation of Copan began during the Early Preclassic period (1400–1000 BC) and lasted until the Early Postclassic period (AD 900–1100) (Longyear 1952; Webster 1989, 1999; Houston & Fowler 1992; Fash 2001; Bell *et al.* 2004). During the Preclassic period (1400 BC–AD 50) obsidian was mainly imported as small nodules to Copan for the production of percussion flakes. There is no evidence of local blade production or bifacial technology. During the Protoclassic and Classic periods (AD 50–900), truly significant changes in society took place at Copan, and local blade production began as the result of sociopolitical development (Aoyama 2001).

K'inich Yax K'uk' Mo' founded a royal dynasty in 426 (see Bell *et al.* 2004). Although nearly all obsidian continued to be procured from Ixtepeque, as in the previous period, this foreign ruler may have started to obtain small numbers of finished artefacts—primarily prismatic blades, but also small quantities of bifacial atlatl (spearthrower) dart points and prismatic blade points—from central Mexico, including green obsidian from the Pachuca source (Aoyama 2001, 352). We can distinguish between dart points and spear points by combining microwear analysis and attribute measurements, such as point width, thickness and weight (see Aoyama 2009, 125–126). At the beginning of the Early Classic period, the Copan Valley hilltop site of Cerro de las Mesas was founded 2 km northwest of the Principal Group (Fash 2001, 89). Fash & Barbara Fash (2000, 447–448) speculate that K'inich Yax K'uk' Mo' and his followers established themselves at this fortress-like site and unified the diverse, competing noble lines. Then the Principal Group was established in the centre of the Copan Valley. There was a marked increase in the production of obsidian bifacial points during the Early Classic period (AD 250–600); most points were used in lances but some were atlatl darts. In particular, the percentage of bifacial points among all Early Classic obsidian artefacts at the hilltop fortified center of Cerro de las Mesas in the Copan Valley (4.4%) is considerably higher than the mean percentage of obsidian bifacial points in the Copan valley (0.4%, S.D. = 0.9). This high percentage might be taken as evidence for warfare with the implication that warfare played an important role in the rise of the Copan dynasty (Aoyama 2005, 300).

It is important to note that the percentage of Pachuca green obsidian tools among all obsidian chipped stone artefacts at Cerro de las Mesas (6.7%) is the second highest in the Early Classic Copan Valley (indicating its possible ties with central Mexico), only after that for the Yax Structure (9.8%) in the central part of Copan, which K'inich Yax K'uk' Mo commissioned (Aoyama 1999, 105). The prevalence of artefacts made from central Mexican obsidian is possibly attributable to the presence of foreigners with access to Pachuca obsidian; it could also have been an outcome of marriage alliances that entailed tribute from central Mexico; and/or it could mean that trade connections in general had opened up.

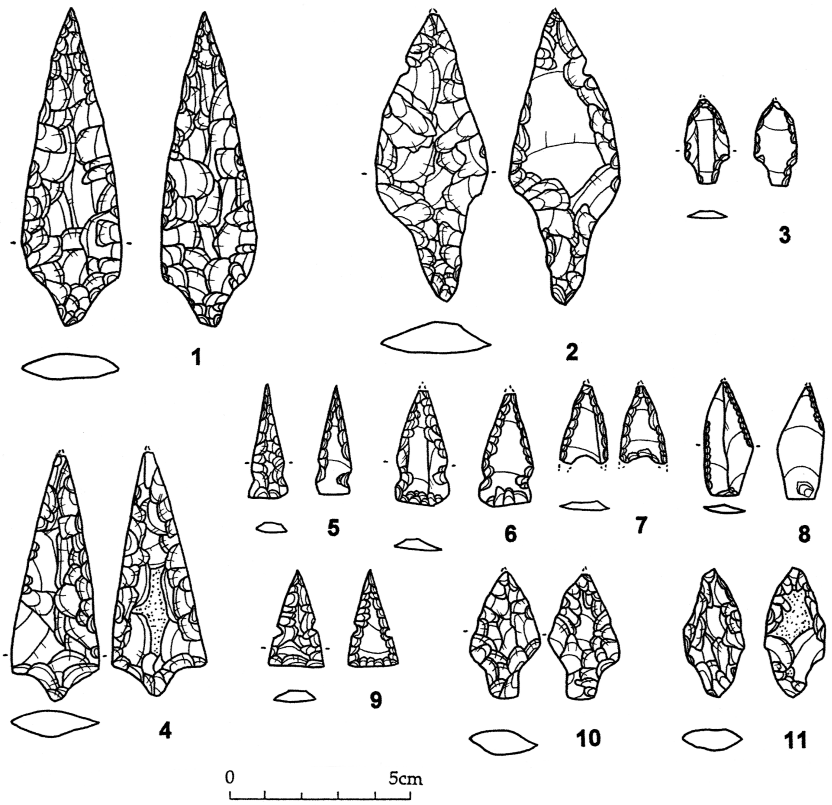

Figure 3. Obsidian and chert points from the Copan region, Honduras: (1, 4) were manufactured from chert, (3) was from Pachuca green obsidian, (11) was from La Esperanza obsidian while the others were manufactured from Ixtepeque obsidian. (1) Protoclassic period, (2–3) Early Classic period, (4–11) Late and Terminal Classic periods, (1, 2, 4, 10, 11) bifacial points, (3, 5–9) prismatic blade points. Note projectile impact damage on (2–4), (6–8) and (10). Drawings are in Japanese technical style. Each illustration shows the sequence of flake detachment. Flake scars, fissures and ripple marks demonstrate the relationships of adjacent flake scars.

In the Late Classic period in the Copan Valley, we find that small quantities of both side-notched and un-notched prismatic blade points were being manufactured from Ixtepeque obsidian. The results of microwear analysis indicate that most of them were used as arrow points. The distal tips of the prismatic blade points were exclusively used for piercing unidentified material. There is no indication of an increase in obsidian or chert lance or dart points at this time. There is, however, an increase in the production and use of atlatl darts as well as bows and arrows during the Terminal Classic period (AD 800–900), which again points to warfare. The presence of arrow points in greater numbers may also indicate a change in the practices of warfare (Figure 3). The chipped stone data are consistent with the evidence of the violent destruction of several buildings of central Copan (Andrews & Fash 1992; Fash *et al.* 1992, 427). Large concentrations of obsidian bifacial lance and dart points as well as arrow points in the final phase occupation layers in the central part of Copan in the early 9th century, along with other lines of evidence for warfare, such as stone sculptures of warriors and central Copan building destruction, indicate that warfare—and possibly warfare of a new kind—gained acceptance and was among the several causes that brought about the demise of centralised dynastic rule.

Aguateca, Guatemala

Aguateca was a walled Classic Maya city located in the Petexbatun region of Guatemala (Inomata 1997). It occupied a highly defensible location on the top of a steep 90 m escarpment. Archaeological, epigraphic and iconographic studies show that the Dos Pilas/Aguateca dynasty expanded its power through warfare in

the eighth century (Martin & Grube 2008). More than 4 km of defensive walls and barricades were constructed in a hasty manner in Aguateca at the beginning of the 9th century. Its epicentre was burned down during an attack by an enemy or rival group around AD 810. Elite residents of the central part of the city fled rapidly or were captured, leaving most of their belongings behind (Inomata 1997). In fact the way in which Aguateca is said to have met its demise stands in contrast to Maya warfare as we know it throughout most of the Classic period. For a city to be abandoned, the rules of engagement must have changed because, in the past, winners would often bring those over whom they triumphed back to the city. Losing (captured) rulers or their lords were almost assuredly made vassals so that they would pay tribute to the new captor/conqueror. An abandoned Aguateca was not going to be paying tax or tribute, which implies serious cultural disruption in the region far beyond the effect of being the losing side in a battle.

In total, 437 chert bifacial points were collected in the Aguateca region (of which 308 came from Aguateca), while other possible chipped stone weapons from Aguateca include two obsidian bifacial lances, 27 obsidian prismatic blades and four chert small unifacial points (Figure 4). The royal palace and the residences of the elite scribes/artists of Aguateca each contained some 30 to 40 chert bifacial lance and dart points. Because many weapons were used in the last battle, each household must have originally possessed many more pointed tools. Some complete and nearly complete points appear to have been stored in the royal palace, elite residences, and other structures, but most chert bifacial lance and dart points were snapped or otherwise broken.

The broken lance and dart points were scattered more or less evenly across the burned structures in the final occupation layers, as one would expect if they had been used in the fighting; they were not concentrated as would be the case in a midden or cache context. The residents of Aguateca, including elite scribes/artists, seem to have used most of their inventory of chert bifacial points during the final defense of the city. Without exception, the structures excavated in the epicentre of Aguateca burned to the ground at the time of abandonment. Together these data strongly suggest that many broken lances and atlatl darts were deposited in battle (Aoyama 2005, 297).

The percentage of bifacial points in the total sample of chert artefacts at the epicenter of Aguateca (5.5%) is greatly higher than those outside of Aguateca (1.3%, S.D. = 0.07). The areas outside the epicentre were abandoned shortly after the destruction of the epicentre itself, as if commoners—or at least those based outside the epicentre—were forced to leave (Inomata 1997). The large number of broken lance points and atlatl darts found in the epicenters suggests strongly that elites (rulers, nobles, scribes, retainers) controlled the fighting. This along with other lines of evidence, such as the violent destruction of residential structures and the pattern of point deposition, further indicates that fighting involved hand-to-hand combat and personal contact. Scant skeletal evidence was found to indicate that bodies had been left, although this is a risky statement in the tropics where preservation is so poor. The aim of the enemy seems to have been to terminate Aguateca as a political and economic power.

Variation in production

The results of lithic and other studies suggest that a significant portion of Maya elites, both men and women, engaged in craft production at Aguateca (Aoyama 2007 & 2009; Emery & Aoyama 2007) and produced prismatic blades and points. Concentrations of obsidian blade manufacturing debris and chert small bifacial thinning flakes were found in some elite residences in the epicenter of Aguateca. Some elite household members appear to have manufactured obsidian prismatic blades or bifacial points in or near their residences. The male scribe/artist of Structure M8-4 specialised in the production of shell and bone objects of high symbolic value and other royal regalia in a courtly setting (Aoyama 2007, 20–21). A female household member seems to have mainly used the north room of Structure M8-4 and engaged in bone or shell and wood carving there, in addition to food preparation and textile production. In addition, the largest concentration of chert small bifacial thinning flakes in this structure was recovered from the north room, which suggests that it was the female household member who was engaged in

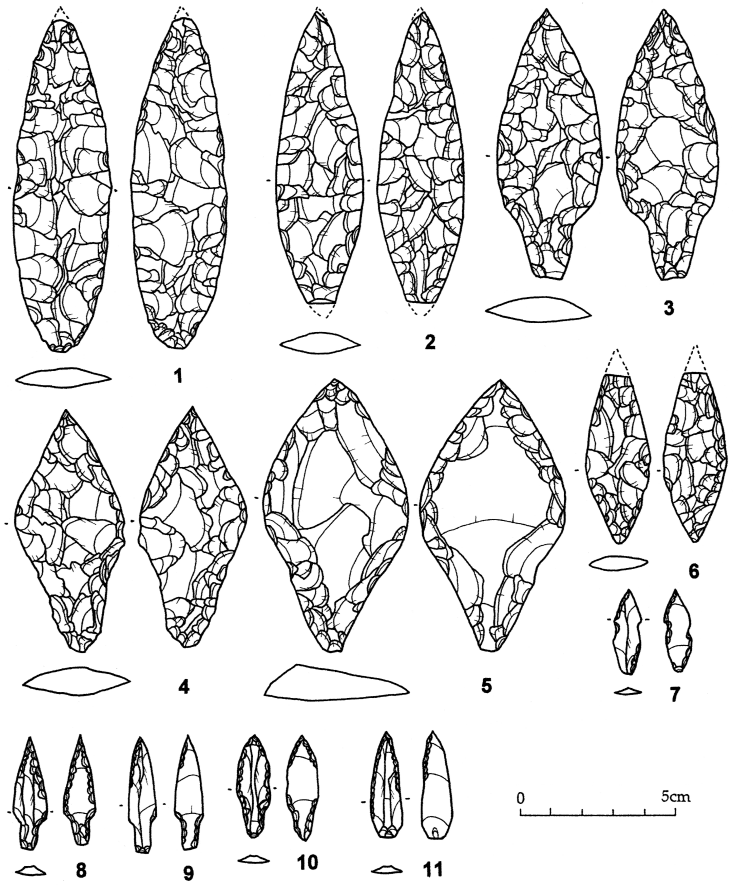

Figure 4. Chert and obsidian points from Aguateca, Guatemala. (1–7) were manufactured from chert while the others were manufactured from El Chayal obsidian; (1–6) bifacial points, (7) small point, (8–11) prismatic blade points. Note projectile impact damage, such as longitudinal macrofracture on (1), lateral macrofracture on (2) and distal break on (6). Drawings are in Japanese technical style. Each illustration shows the sequence of flake detachment. Flake scars, fissures and ripple marks demonstrate the relationships of adjacent flake scars.

bifacial point manufacture. Furthermore, it is interesting to note that 11 of the 36 chert bifacial points recovered from this structure were found in this room (Aoyama 2009, 128). Microwear analysis indicates that at least some bifacial points were used as lances and darts. The male scribe/artist may have used all of them. Alternatively, the larger number of bifacial points found in the north room suggests that the female household member may have used some bifacial points in defence of the city or other purposes. Although portraits of Maya warrior queens are rare in Classic Maya art, two stelae of Naranjo show Lady Six Sky (AD 682–741) trampling captives in the manner of a warrior-king. A similar depiction is also known from Calakmul (Martin & Grube 2008, 74) and Naachtun. At least some elite women at Aguateca may have acted defensively in the final battle.

Ceibal, Guatemala

Ceibal (also spelled 'Seibal') was the largest city in the Pasion region and was occupied from 1000 BC to AD 900. Since 2005, the members of the Ceibal-Petexbatun Archaeological Project have uncovered evidence of substantial construction activities in the early stages of settlement at Ceibal, especially during the Middle Preclassic period (1000–400 BC). The site's first ceremonial platform and public plaza were constructed around 1000 BC (Inomata *et al.* 2013).

During the Middle Preclassic period, obsidian was imported from the Guatemalan highlands primarily in the form of blade cores used in the manufacture of percussion and pressure blades. There was also local production of chert bifacial artefacts, including bifacial spear or lance points. A chert spear/lance point and a shell

ornament representing a decapitated human head (Inomata *et al.* 2010, 34), both recovered from the Central Plaza of Ceibal and dated to the early Middle Preclassic period (1000–700 BC), are the earliest evidence of warfare at Ceibal. Stemmed unifacial points made from obsidian were recovered from late Middle Preclassic contexts (700–400 BC). These are the earliest obsidian pointed weapons at Ceibal recovered to date.

A medial fragment of a bifacial atlatl dart point made of Pachuca green obsidian from central Mexico was found in an Early Classic deposit in the central part of Ceibal. Its material, form and workmanship, especially the overlapping fine transverse parallel pressure flaking along the edges and faces (Carballo 2007, 178), leave no doubt that it was manufactured at Teotihuacan, in central Mexico. During the Early Classic period (AD 250–600), the elites of the nearby fortified centre of Punta de Chimino in the Petexbatun region obtained small numbers of prismatic blades made of Pachuca and other central Mexican obsidian, as well as a bifacial point made of green obsidian from the Pachuca source (Aoyama 2011, 47). Again, the appearance of Mexican obsidian artefacts in the archaeological record may reflect the presence of foreigners, and/or developing long-distance exchange networks and/or marriage alliances that entailed some tribute coming from central Mexico. It might also reflect the presence of warriors culturally rooted in warfare practices common to central Mexico.

The Ceibal-Petexbatun Archaeological Project has recovered a total of 116 chert points and 11 obsidian points from primary and secondary contexts, while the Ceibal Project of Harvard University uncovered 77 chert bifacial points and 11 obsidian points from all periods (Willey 1978, 102). Stela 2 of Aguateca portrays Ruler 3 of the Dos Pilas-Aguateca dynasty as a warrior, standing over the captured ruler of neighbouring Ceibal in AD 735 (Figure 5 [I. Graham 1967, figure 5]). In contrast to the absence of bifacial and unifacial points at the nearby minor centre of Caobal (Aoyama & Munson 2012), it should be noted that more than one-half of chert bifacial points (n = 63) in the present Ceibal sample as well as a small unifacial point made of chert were recovered from Late Classic contexts, which suggests the

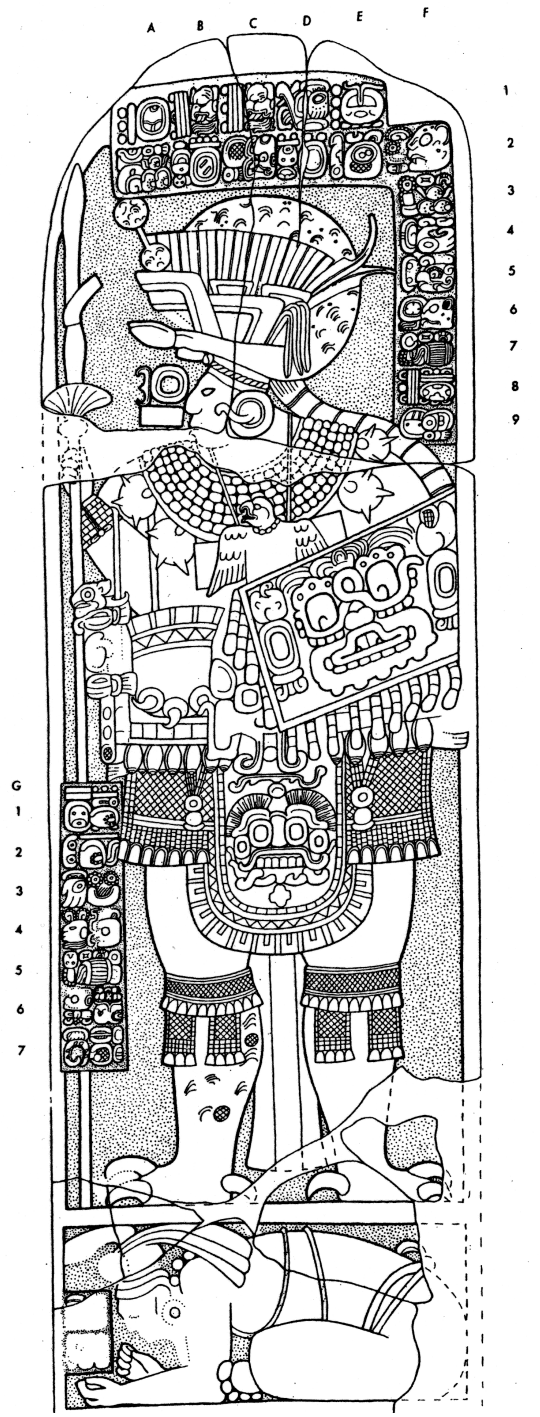

Figure 5. Stela 2 of Aguateca portrays Ruler 3 as a warrior (I. Graham 1967, Fig. 5).

intensification of warfare at Ceibal during this period.

Possible chert pointed weapons, in addition to four bifacial points from primary contexts, include 37 bifacial points and a small unifacial point recovered from secondary contexts of the Terminal Classic period in the central part of Ceibal. Apart from a small unifacial point made

of chert, obsidian prismatic blade points, including a side-notched stemmed point used as an arrow point, appear for the first time from contexts of the Terminal Classic period. Although lance or dart points were more important than the bow and arrow in Classic Maya warfare, as was apparently true at Copan, the bow and arrow were present at Ceibal during the Terminal Classic period.

There is increasing evidence of the production and use of chert and obsidian bifacial points as well as both side-notched and un-notched arrow points in the central part of Ceibal during the Terminal Classic period, as there is compelling epigraphic and archaeological evidence for warfare in the Petexbatun and Pasion regions (Martin & Grube 2008, 61; Inomata & Triadan 2010). The artefact changes almost certainly are tied to changes in the practice (and ethics?) of warfare in these regions. The fall of the Ceibal dynasty was marked by the destruction of its temple pyramid and royal palace (Houston & Inomata 2009, 309). Stucco sculptures of human figures that decorated the royal palace were intentionally beheaded. Lithic and other data do point towards Ceibal's direct involvement in such events, suggesting that warfare may have been one of the factors that led to the demise of centralised dynastic authority at Ceibal during the 10th century.

CONCLUSION

The gradual changes in weaponry at sites such as Ceibal do not suggest a major late invasion of outsiders or even a case of Mayas fighting Mayas according to age-old fighting traditions. Instead, we appear to have a long and gradual 'infiltration' of some important Maya cities—probably carefully chosen—by people whose culture had roots outside the lowlands. Despite the fact that some individuals, on the basis of weapons material and style as well as epigraphic evidence, hail from Teotihuacan in the Early Classic period, the connection to central Mexico may not have been so direct in all cases through time (Stuart 2000). The weapons—as seen through different hafting and manufacturing techniques—vary enough, as do the engagements (as witnessed at Aguateca) to introduce the possibility of variety in place of origin.

Spear/lance points were chipped stone weapons among the Preclassic Maya. The relative scarcity of stone points, however, suggests that more perishable weapons, such as those of hard wood, may have been used more extensively during the Preclassic period than in later periods. We know from Classic Maya art that elites were involved in hand-to-hand combat mainly with what we have called lance points, and, to a lesser degree, atlatl darts (Miller 1999). The adoption of atlatl darts from highland central Mexico in the 4th century AD did not result in replacement of hand-held lances as a predominant weapon in the Maya lowlands but instead seems to have supplemented or complemented their use. An unusually high percentage of bifacial points among all obsidian artefacts at the fortified centre of Cerro de las Mesas in the Copan Valley indicates that warfare was instrumental in the rise of the Copan dynasty during the Early Classic period.

The evidence described here adds support to the idea that Classic Maya warfare was fought mainly by elites. Based on the large number of broken pointed weapons found in the epicenters along with other lines of evidence, such as the violent destruction of residential structures and the pattern of point deposition, the ruler and elite scribes/artists were also warriors. If the goal of Maya warfare was, as suggested, to take captives for the purpose of expanding access to tribute and wealth as well as power and prestige (Graham *et al.* 2013), then the predilection for hand-to-hand combat makes sense. As Keeley (1996, 49–54) points out, if one's objective is to kill or to severely injure, projectile or fire weapons are far outclassed by shock weapons such as axes, maces and bladed weapons. Chert lance points, which were less effective in killing or wounding than obsidian points, were prevalent in most Maya lowland areas except at Copan, whose inhabitants took advantage of its unusual location near one of the primary obsidian sources for the Maya lowlands and used mainly obsidian points.

Throughout most of Maya Classic history, lance points and dart points were more important than the bow and arrow in Maya warfare. Atlatl darts, in fact, seem to represent the first significant change in Maya warfare in the Early Classic. The increase in the production and use of atlatl darts as well as bows and arrows suggests that further significant changes in the

cultural practices of warfare took place in the Terminal Classic. Whereas most conflict probably took place in areas outside of major settlements, the epicentre of Aguateca was attacked and burned, which suggests deeper change in the rules of engagement. These lines of evidence suggest that warfare at some level was always a means to an end in the lowlands. They also suggest that the changes manifested in warfare were closely linked to changes that challenged or at least competed with traditional lowland Maya cultural values.

Variation in the kinds of weapons used by the Maya in combat and the ways in which weapons were manufactured has been given scant attention as a reflection of diverse cultures and traditions. If we are correct in assuming that rules of engagement changed over time, then cultural values are a strong candidate as a stimulus to change, and changes in weapon styles are changes in material culture. Such conflicts of cultural values and not just warfare alone may well have been a major stimulus to the destabilisation that resulted, ultimately, in the demise of centralised dynastic authority that characterised the Maya collapse.

ACKNOWLEDGEMENTS

Funding for Aoyama's research in Honduras (1986–1995) and Guatemala (1998–2015) has been provided by the Ministry of Education, Culture, Sports, Science and Technology-Japan (Grants-in-Aid for Scientific Research No. 21101001 and No. 21101003), the Japan Society for the Promotion of Science (Grants-in-Aid for Scientific Research No. 11710209, No. 13571033, No. 17401024, No. 21402008, No. 26101001 and No. 26101003), Foundation for the Advancement of Mesoamerican Studies (FAMSI), the Tinker Foundation, the Instituto Hondureño de Antropología e Historia, the Mitsubishi Foundation, and the Takanashi Foundation. Funding for Graham's recent research in Belize has been provided by the Leverhulme Trust, the British Academy and the UCL Institute of Archaeology. Major funding organisations for past research include the Social Sciences and Humanities Research Council of Canada and the National Geographic Society. We greatly appreciate the significant improvements to the manuscript suggested by two anonymous reviewers. Any errors remain entirely our own responsibility.

REFERENCES

Andrews, W. & Fash, B. 1992. Continuity and Change in a Royal Maya Residential Complex at Copán. *Ancient Mesoamerica* 3: 63–88.

Aoyama, K. 1989. Estudio Experimental de las Huellas de Uso sobre Material Lítico de Obsidiana y Sílex. *Mesoamérica* 17: 185–214.

Aoyama, K. 1995. Microwear Analysis in the Southeast Maya Lowlands: Two Case Studies at Copan, Honduras. *Latin American Antiquity* 6: 129–144.

Aoyama, K. 1999. *Ancient Maya State, Urbanism, Exchange, and Craft Specialization: Chipped Stone Evidence from the Copán Valley and the La Entrada Region, Honduras.* University of Pittsburgh Memoirs in Latin American Archaeology 12, Pittsburgh.

Aoyama, K. 2001. Classic Maya State, Urbanism, and Exchange: Chipped Stone Evidence of the Copán Valley and Its Hinterland. *American Anthropologist* 103: 346–360.

Aoyama, K. 2005. Classic Maya Warfare and Weapons: Spear, Dart and Arrow Points of Aguateca and Copan. *Ancient Mesoamerica* 16: 291–304.

Aoyama, K. 2007. Elite Artists and Craft Producers in Classic Maya Society: Lithic Evidence from Aguateca, Guatemala. *Latin American Antiquity* 18: 3–26.

Aoyama, K. 2009. *Elite Craft Producers, Artists, and Warriors at Aguateca: Lithic Analysis*. Monographs of the Aguateca Archaeological Project First Phase Vol. 2. The University of Utah Press, Salt Lake City, Utah.

Aoyama, K. 2011. Socioeconomic and Political Implications of Regional Studies of Maya Lithic Artifacts: Two Case Studies of the Copan Region, Honduras, and the Aguateca Region, Guatemala. In Z. Hruby, G. Braswell & O. Chinchilla (eds) *The Technology of Maya Civilization: Political Economy and Beyond in Lithic Studies*: 37–54. Equinox, Sheffield.

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

Bell, E.E., Canuto, M.A. & Sharer, R.J. (eds) 2004. *Understanding Early Classic Copan.* University of Pennsylvania Museum of Archaeology, Philadelphia.

Carballo, D. 2007. Implements of State Power: Weaponry and Martially Themed Obsidian Production near the Moon Pyramid, Teotihuacan. *Ancient Mesoamerica* 18: 173–190.

Emery, K. & Aoyama, K. 2007. Bone, Shell and Lithic Evidence for Crafting in Elite Maya

Households at Aguateca, Guatemala. *Ancient Mesoamerica* 18: 69–89.

Fash, W. 2001. *Scribes, Warriors, and Kings: The City of Copán and the Ancient Maya.* Revised edition. Thames and Hudson, London.

Fash, W. & Fash, B. 2000. Teotihuacan and the Maya: A Classic Heritage. In D. Carrasco, L. Jones & S. Sessions (eds) *Mesoamerica's Classic Heritage: From Teotihuacan to the Aztecs*: 433–463. University Press of Colorado, Boulder.

Fash, B., Fash, W., Lane, S., Larios, R., Schele, L., Stomper, J. & Stuart, D. 1992. Investigations of a Classic Maya Council House at Copán, Honduras. *Journal of Field Archaeology* 19: 419–442.

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

García Capistrán, H. 2014. Religión y política en el Clásico maya: dioses patronos como via de legitimación del poder. In V.A. Vásquez López, R. Valencia Rivera & E. Gutiérrez González (eds) *Socio-Political Strategies among the Maya from the Classic Period to the Present*: 67–81. BAR International Series 2619. Archaeopress, Oxford.

Golden, C., Scherer, A.K., Muñoz, A.R. & Vasquez, R. 2008. Piedras Negras and Yaxchilan: Divergent Political Trajectories in Adjacent Maya Polities. *Latin American Antiquity* 19(3): 249–274.

Graham, E. 2009. Close Encounters. In L.G. Cecil & T.W. Pugh (eds) *Maya Worldviews at Conquest*: 17–38. University Press of Colorado, Boulder.

Graham, E. 2011. *Maya Christians and Their Churches in Sixteenth-Century Belize.* University Press of Florida, Gainesville.

Graham, E, Simmons, S. & White, C. 2013. The Spanish Conquest and the Maya Collapse: How 'Religious' is Change? *World Archaeology* 45: 161–185.

Graham, I. 1967. *Archaeological Explorations in El Petén, Guatemala.* Middle American Research Institute, Publication 33, Tulane University, New Orleans.

Houston, S. & Fowler, W. (eds) Special section: The archaeology of ancient Copan (various authors). *Ancient Mesoamerica* 3: 61–197.

Gutiérrez, E. 2014. God effigies stolen in Classic Maya wars. In V.A. Vásquez López, R. Valencia Rivera & E. Gutiérrez González (eds) *Socio-Political Strategies among the Maya from the Classic Period to the Present*: 83–94. BAR International Series 2619. Archaeopress, Oxford.

Halsall, G. 2003. *Warfare and Society in the Barbarian West, 450–900.* Routledge, London.

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

Inomata, T. 1997. The Last Day of a Fortified Classic Maya Center: Archaeological Investigations at Aguateca, Guatemala. *Ancient Mesoamerica* 8: 337–351.

Inomata, T. & Triadan, D. (eds) 2010. *Burned Palaces and Elite Residences of Aguateca: Excavations and Ceramics*. Monographs of the Aguateca Archaeological Project First Phase Vol. 1. The University of Utah Press, Salt Lake City, Utah.

Inomata, T., Triadan, D. & Román, O. 2010. La transformación y continuidad de ritos durante el período Preclásico en Ceibal, Guatemala. In A. Ciudad Ruiz, M.J. Iglesias & M. Sorroche Cuerva (eds) *El ritual en el mundo maya: De lo privado a lo público*: 29–48. Sociedad Española de Estudios Mayas, Madrid.

Inomata, T., Triadan, D., Aoyama, K., Castillo, V. & Yonenobu, H. 2013. Early Ceremonial Constructions at Ceibal, Guatemala, and the Origins of Lowland Maya Civilization. *Science* 340: 467–471.

Keegan, J. 1976. *The Face of Battle*. Pimlico, London.

Keeley, L. 1996. *War before Civilization: The Myth of the Peaceful Savage*. Oxford University Press, Oxford.

Kettunen, H. 2012. Struggle for Supremacy: Armed Conflicts in the Eastern Peten during the Late Classic Period. In C. Helmke & J. Źrałka (eds) *Contributions in New World Archaeology, Vol. 3*: 127–134. Polish Academy of Arts and Sciences & Jagiellonian University, Institute of Archaeology, Kraków.

Kettunen, H. 2014. Ancient Maya Warfare: An Interdisciplinary Approach. In V.A. Vásquez López, R. Valencia Rivera & E. Gutiérrez González (eds) *Socio-Political Strategies among the Maya from the Classic Period to the Present*: 95–107. BAR International Series 2619. Archaeopress, Oxford.

Longyear, J. 1952. *Copan Ceramics: A Study of Southeastern Maya Pottery*. Carnegie Institution of Washington, Publication 597. Washington, D.C.

Martin, S. 2006. Under a Deadly Star—Warfare among the Classic Maya. In N. Grube (ed.) *Maya: Divine Kings of the Rain Forest*: 174–185. Könemann, Cologne.

Martin, S. & Grube, N. 2008. *Chronicle of the Maya Kings and Queens: Deciphering the Dynasties of the Ancient Maya*. Second edition. Thames & Hudson, London.

Miller, M. 1999. *Maya Art and Architecture*. Thames and Hudson, London.

Nations, J. 1989. The Lacandon Maya Bow and Arrow: An Ethnoarchaeological Example of Postclassic Lowland Maya Weapon Manufacture. In M. Gaxiola & J. Clark (eds) *La Obsidiana en Mesoamérica*: 449–457. Instituto Nacional de Antropología e Historia, Mexico.

Reilly, F.K. & Garber, J.F. 2003. The Symbolic Representation of Warfare in Formative Period Mesoamerica. In Brown, M.K. & Stanton, T.W. (eds) *Ancient Mesoamerican Warfare*: 127–148. Altamira Press, Walnut Creek, CA.

Scherer, A.K. & Verano, J.W. 2015. Introducing War in Pre-Columbian Mesoamerica and the Andes. In A.K. Scherer & J.W. Verano (eds) *Embattled Bodies, Embattled Places*: 1–23. Dumbarton Oaks, Washington, D.C.

Strachan, H. 2001. *The First World War, Volume 1: To Arms*. Oxford University Press, Oxford.

Stuart, David. 2000. The Arrival of Strangers: Teotihuacan and Tollan in Classic Maya History., eds. In Carrasco, D., Jones, L., & Sessions, S.(eds) *Mesoamerica's Classic Heritage: Teotihuacan to the Aztecs* 465–513. University Press of Colorado, Boulder.

Wailly, H. de. 1987. *Crécy 1346: Anatomy of a Battle.* Blandford Press, Poole.

Webster, D. 1976. *Defensive Earthworks at Becan, Campeche, Mexico: Implications for Maya Warfare.* Middle American Research Institute, Publication 41. Tulane University, New Orleans.

Webster, D. (ed.) 1989. *The House of the Bacabs.* Studies in Precolumbian Art and Archaeology 92. Dumbarton Oaks, Washington, D.C.

Webster, D. 1999. The archaeology of Copan, Honduras. *Journal of Archaeological Research* 7(1): 1–53.

Willey, G. 1978. *Excavations at Seibal, Department of Peten, Guatemala: Artifacts.* Memoirs 14, No. 1. Peabody Museum, Harvard University, Cambridge, MA.