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Late Chalcolithic mass graves at Tell Brak, Syria, and violent conflict during the growth of early city-states

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Excavations and surveys carried out from the mid-1990s through 2009 at Tell Brak, northeast Syria, have focused on reconstructing the socioeconomic complexity and physical growth of one of northern Mesopotamia's earliest urban settlements. The recent discovery of several mass graves on the edge of the city, created at an important threshold in its physical expansion (ca. 3800–3600 B.C.), adds to a long-standing debate about the connection between the growth of early city-states and violent conflict. These graves, with their population of as many as several hundred primarily sub-adults and young adults, are interpreted as the result of large-scale violent events and may provide evidence for the post-mortem treatment of enemies. They offer a strong counterpoint to the dominant reconstruction of a peaceful prehistory in the region.

Keywords: Mesopotamia, early urbanism, violent conflict, mass graves

Introduction

The origins of urbanism are traditionally thought to be located in the alluvial plains of southern Mesopotamia (south Iraq) in the later 4th millennium B.C. In the most widely-accepted model, the earliest city is typified by the massive settlement of Uruk/Warka, with its monumental religious buildings and evidence for writing, priest-king leadership, and industrial specialization from ca. 3500 B.C. (Adams 1972, 1981; Adams and Nissen 1972; Algaze 2008; Liverani 2006 [1998]; Nissen 2002; van de Mieroop 1997; Yoffee 1995). Recent site-based and regional surveys in northern Mesopotamia (northeast Syria and north Iraq) have revealed the presence of large settlements with networks of linked rural villages from at least 3800 B.C., several centuries before the apparent floruit of Uruk (Oates *et al.* 2007; Ur *et al.* 2007; Wilkinson and Tucker 1995). Tell Brak and Tell Hamoukar in the Upper Khabur Plains of northeast Syria (FIG. 1) experienced rapid physical expansion starting ca. 3800 B.C. or even earlier. Excavations at Tell Brak in particular have exposed monumental architecture and evidence of economic diversification and specialization from the late 5th and early 4th millennia B.C. (McMahon and Oates 2007; Oates *et al.* 2007). Ceramic production was increasingly standardized, textile production may have moved in part from households to workshops, obsidian exploitation presented a more directed acquisition strategy, and clay container sealings imply a multi-level bureaucracy with control over resources. By ca. 3500 B.C., the urban trajectory of southern Mesopotamia had surpassed that of the north, with the north experiencing varying degrees of influence and control by southern colonists during the "Uruk Expansion" (Algaze 1993, 2008; Rothman 2001; Stein 1999). But, research at sites such as Tell Brak shows that at least initially, northern Mesopotamia may have led the way in urban growth and socioeconomic complexity.

Warfare and the structured use of force are often linked with definitions of modern and ancient states (M. Weber 1968), and violent conflict within a circumscribed territory is proposed as the primary cause in an often-cited theory of state origins (Carneiro 1970). Discussion of warfare has been an occasional feature of studies of late 4th millennium B.C. city-states in Mesopotamia. Artwork from Uruk in the Late Uruk period (ca. 3200 B.C.) includes cylinder seal impressions showing a distinctive "priest-king" with a spear standing before bound captives (Boehmer 1999: Taf. 8–17, Abb. 16–19; Nissen 2002: fig. 8); additional contemporary glyptic images of bound prisoners come from Susa and Choga Mish in southwest Iran, Tepe Gawra in northern Iraq, and Habuba Kabira in northwest Syria (Boehmer 1999:

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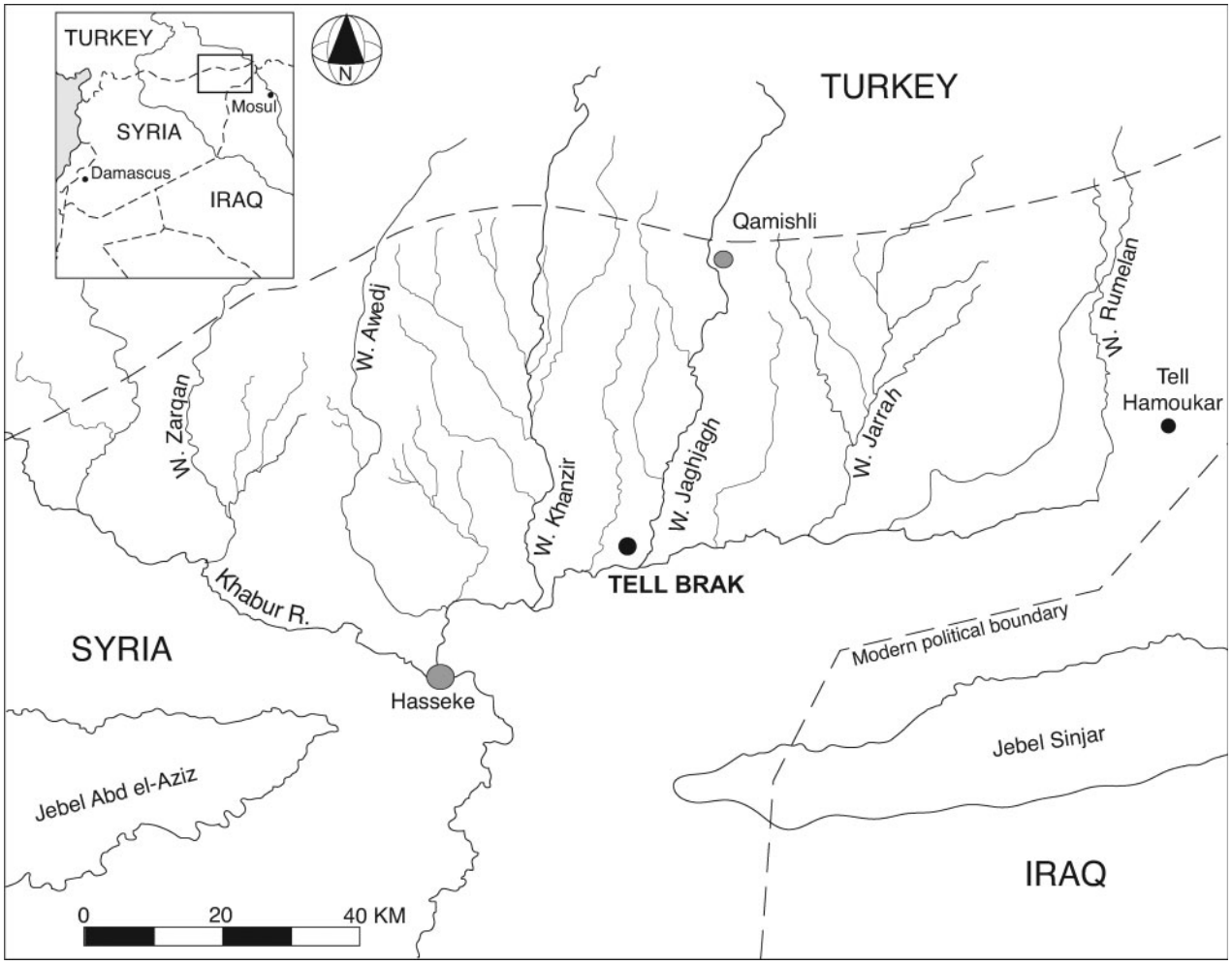

Figure 1 Map of northeast Syria with locations of Tell Brak and Tell Hamoukar indicated.

Abb. 122). The lack of historical texts from this period makes interpretation difficult: the captives could be foreigners, inhabitants of a rival local city, or even rebellious city-state citizens. But the display of warrior-like power and the "legitimate use of force" aspect to the scenes are clear, suggesting that a well-developed ideology of warfare existed by the late 4th millennium B.C. The city of Uruk expanded to ca. 250 ha in the Late Uruk period (Finkbeiner 1991; Nissen 2002), and this expansion may have been driven in part by immigration, since a depopulation of its surrounding countryside is visible from ca. 3500 B.C. (Adams and Nissen 1972). This immigration, which created an empty buffer zone around the site, plus contemporary developments such as construction of a wall around the site of Abu Salabikh, may have been based in a need for defense, whether actual or symbolic (Pollock *et al.* 1991; Yoffee 1995). But it is the evidence of administrative hierarchies, new urban-hinterland relations, and economic changes that are most often addressed in studies of southern Mesopotamia's city and state origins (Adams and Nissen 1972; Postgate 2002; Wright 1984, 2006; Wright and Johnson 1975). Warfare features more frequently in interpretations of mature Mesopotamian city-states in the following Early Dynastic period, especially the mid-3rd millennium B.C. By around 2400 B.C., textually-documented conflicts over land and water were entangled with the expansion and consolidation of royal power. The Early Dynastic city-states and their kings are often characterized as involved in chronic battles for land and resources (Nissen and Heine 2009; Pollock 1999, 2007; Yoffee 1995). Yet textual descriptions of warfare, such as the Umma-Lagash border conflict (Cooper 1983) or Mari-Ebla power struggle (Archi and Biga 2003), may have been inflated for ideological reasons, while economic accounts linked to outfitting expeditions for war are few (Tonietti 2010). The conflicts the texts describe, when observed from a long-term perspective, are episodic and embedded within stronger evidence for peaceful economic exchanges and regional cultural interconnection across the 3rd millennium B.C. Archaeological evidence for warfare in Mesopotamia from all millennia is thin: site locations are not defensive, city walls are less common than is assumed, evidence of violence on skeletons is rarely reported, and destruction of buildings is essentially unseen. However, recent excavations in northern Mesopotamia, as well as forcing regional and temporal shifts in our

reconstruction of the origins of urbanism, contribute explicit evidence for violent conflicts. Evidence of conflagration and piles of sling bullets dating to ca. 3500 B.C. have been recovered from Tell Hamoukar (Lawler 2006), while mass graves dating to ca. 3800–3600 B.C. have been discovered at Tell Brak.

Tell Brak and Early Urbanism

Tell Brak is one of the largest ancient sites in northern Mesopotamia, with a height of more than 40 m and a horizontal extent of ca. 130 ha. Brak's location within the rainfall agriculture zone and its strategic placement on trade-routes that criss-crossed the region contributed to its size and its long and complex occupational history. The central mound dates from at least the Neolithic (7th millennium B.C. or earlier) through the Middle Assyrian period (later 2nd millennium B.C.); the Outer Town saw variable occupation from the 4th millennium B.C. through the Abbasid period (FIGS. 2, 3) (Ur *et al.* in press). The site experienced episodes of expansion and contraction linked to regional climatic and political changes and at times was less than 20 ha, in the Old Babylonian period for instance. At its maximum of 130 ha in the Late Chalcolithic 3 period (ca. 3800–3600 B.C.), occupation covered the central mound and the unmounded or low-mounded Outer Town. The central mound has been the subject of years of targeted excavation, from Max Mallowan's groundbreaking work in the late 1930s (Mallowan 1947) through the research of David and Joan Oates starting in 1976, Roger Matthews in the mid 1990s, and Geoff Emberling and Helen McDonald in the late 1990s–early 2000s. The Outer Town has been explored through excavation and survey since the late 1990s.

Late Chalcolithic excavations

The Late Chalcolithic levels of the central mound at Brak are sealed by large-scale 3rd millennium B.C. constructions. Deep excavations in selected locations have, however, shown that the central mound was probably fully occupied during the entire 4th millennium B.C., with a range of public buildings, houses, and industrial areas. The Eye Temple at the mound's southern edge (FIG. 2), excavated by Mallowan in 1937–1938, is traditionally dated to just

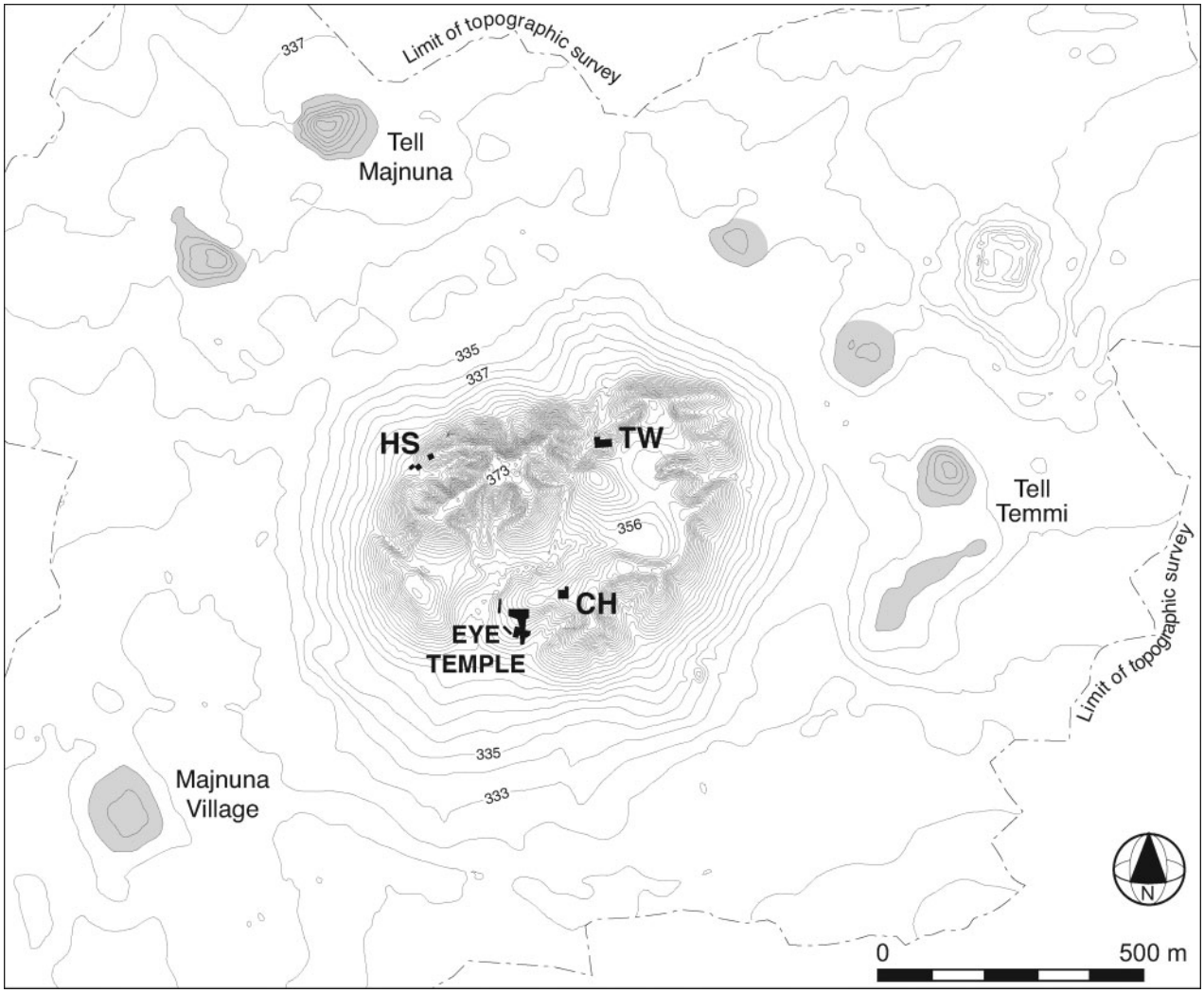

Figure 2 Topographic plan of Tell Brak and its ring of surrounding sub-mounds (shaded grey), with areas of excavated 4th millennium B.C. occupation on the central mound indicated (1 m contours).

Figure 3 Central mound and northern Outer Town of Tell Brak, from Tell Majnuna; Trench EM-1 in foreground.

before 3000 B.C., but recent excavations in Area TW indicate that the distinctive "eye idols" that gave the building its modern name were already manufactured in the early 4th millennium B.C. It is probable that the date of the Eye Temple, and of the religion-centered power it represents, should be pushed into the first half of the 4th millennium B.C. Late 5th through 4th millennium B.C. occupation layers were revealed in nearby Area CH (Oates 2002). At the northern side of the central mound, excavations in Area HS (Matthews 2004) identified similar occupation layers belonging to the late 5th through mid-4th millennia B.C., including a massive wall and houses. Excavations in Area TW, near the northern entrance to the settlement, provide a sequence through the entire 4th millennium B.C. During the Late Chalcolithic 2 period (ca. 4200–3800 B.C.) this area was an industrial zone for centralized manufacture of everyday ceramics, tools, and textiles, plus items potentially symbolic of differential wealth and power, such as obsidian beads and inlays, shell inlays, and an elaborate obsidian and marble chalice (McMahon and Oates 2007). These industries were adjacent to, and may have been controlled by the users of, a monumental building (Emberling and McDonald 2003; McMahon and Oates 2007; Oates 2005; Oates *et al.* 2007). This building has a huge basalt threshold (ca. 1.5×1.8 m) and mud-brick walls (ca. 1.8 m wide). Parts of two rooms have been cleared, which were clean and give little evidence for precise function. The scale of the structure is non-domestic, while the location of the doorway near a corner implies that it is not religious, since contemporary temple plans have symmetrical central doorways. For these reasons, a secular administrative function is proposed for this building. During the Late Chalcolithic 3 period (ca. 3800–3600 B.C.), Area TW was taken over by a "feasting" structure and ovens dedicated to processing large quantities of meat. From ca. 3500 B.C., during Late Chalcolithic 4–5, the site and region were colonized by peoples from southern Mesopotamia, and Area TW's use shifted again, to domestic buildings and trash pits (Oates 2002, 2005; Oates and Oates 1993). Excavations on Brak's central mound thus offer evidence for an early thriving urban settlement and institutions that may have held power over people and the economy.

Outer Town survey and soundings

Soundings and an intensive survey of the site's Outer Town have further contributed to our knowledge of the site's extent and variable density of occupation during the crucial 4th millennium B.C. A "corona" of small sub-mounds (1–4 ha each) encircling Brak's central mound has been a recognized feature of topographic plans from Mallowan's research onward (FIG. 2) (Mallowan 1947: 49, pl. LVI). The first organized investigation of Brak's Outer Town and these mounds took place in the late 1990s, when a program of strategic soundings was carried out (Skuldboel 2009; Skuldboel in Emberling *et al.* 1999). These soundings showed that the creation of some sub-mounds belonged within the Late Chalcolithic 2 period (late 5th–early 4th millennium B.C.), but that

their intensive use was dateable to the Late Chalcolithic 3, with sparse 3rd millennium B.C. and later occupations. The sounding program was supplemented by an intensive survey and surface ceramic collection across the Outer Town during 2004–2006 (Oates 2005; Ur *et al.* in press). The Outer Town survey explored the site's full occupational history, but developments in the Late Chalcolithic period proved to be the most significant. The survey confirmed that the majority of the sub-mounds, and some of the non-mounded areas between them, were first utilized in the Late Chalcolithic 2 period. This ring of sub-mounds then experienced intensified use in the Late Chalcolithic 3 period, and the "empty" space between them and the central mound gradually filled in over the course of the several centuries of this period (Ur *et al.* 2007, in press). The result of this Outer Town survey was a new vision of the mechanics of urban growth in northern Mesopotamia, comprising development from outside in, through the merging of small settlements with a larger center. In southern Mesopotamia, Uruk may have developed from the merging of two settlements originally separated by a channel of the Euphrates (Nissen 2002), but the customary reconstruction of southern Mesopotamian urban growth comprises inexorable outward expansion from a core centered on one or more religious-administrative institutions. Like Uruk, Brak may have expanded through immigration as well as internal growth and settlement merging. The evidence for this is the emptying of a ring of land up to 3 km from Brak during the Late Chalcolithic 3 period, while the area 3–8 km away was only sparsely settled, with contemporary sites clustered mostly on the opposite bank of the Wadi Jaghjagh (Wright *et al.* 2007).

Since completion of the Outer Town survey, excavation in one of the sub-mounds compels an amendment to this merged-settlement urban growth model. The most prominent of the sub-mounds at the site's northern edge, Tell Majnuna (FIG. 2), consists not of occupation layers as expected but entirely of massive quantities of rubbish, which was deliberately deposited over approximately 200 years and reached 2–3 ha in extent (the precise area is unclear due to modern damage). This discovery has important implications for definitions of 'the city' and for the calculation of site size and density of occupation from surface surveys in any region. Trait-lists of ancient cities (e.g., Childe 1950; van de Mieroop 1997) have so far not included rubbish dumps, but the generation of garbage would have increased in pace with population expansion and nucleation. A new variable of space assigned for rubbish deposition and a factor that represents its growth with population increase should be added to any calculations of population size from survey or surface evidence. It must be emphasized that only urbanism, with its implications for increased population and industrial scales of production, consumption, and discard, could have produced enough rubbish to create Tell Majnuna. It is also urbanism and its corollary of socio-political organization that embrace the number of people needed to transport the rubbish to the site's edge and the leaders necessary to manage this activity. Even though it does not directly reflect traditional domestic occupation, Tell Majnuna (and possibly the other sub-mounds) retains implications for urban growth at Brak.

Taken together, the Brak excavations and site survey allow us to build a picture of northern Mesopotamian settlement expansion, increase in urban spatial structuring, growth of institutions, and increased complexity in economy and society some 300–500 years earlier than our current evidence from southern Mesopotamia.

Tell Brak (Tell Majnuna) Mass Graves

Tell Majnuna lies approximately 450 m north of Brak's central mound and is one of seven visible sub-mounds that form a discontinuous ring around the high mounded center (FIG. 2). At 7 m high and 2–3 ha in extent, it is one of the larger sub-mounds; most are 3–4 m high and 1 ha or less. During his excavations at Brak in 1937, Max Mallowan briefly excavated two trenches on Majnuna; this work was abandoned when no architectural remains were recovered (Mallowan 1947: 50, pl. LVI). No further excavations were made on Tell Majnuna until the autumn of 2006, when modern construction led to the unexpected discovery of the first of a series of mass graves and a brief exploratory sampling program.

Tell Majnuna became the primary focus of excavations during 2007 and 2008 (McMahon and Oates 2007). Sixteen trenches were opened across the site's maximum diameter, and three more mass graves were exposed in these, supplemented by several additional smaller deposits of human bones (FIG. 4). The mass graves had been made episodically during approximately two centuries of the Late Chalcolithic 3 period (3800–3600 B.C.), when survey indicates that Brak underwent a rapid increase in area and which precedes the well-known colonization of the region by peoples from southern Mesopotamia. Samples have been taken for ^{14}C dating but have not yet been analyzed; however, the Late Chalcolithic ceramic sequence and discrete assemblages from its sub-periods are well known and dated from excavations at Areas TW and HS at Brak, Tepe Gawra (north Iraq), and Hacinebi Tepe (southeast Turkey). Here, we focus on the two earliest and most complex mass graves, dated to ca. 3800 B.C., in Areas MTW and EM.

The mass grave in Area MTW

Area MTW lies at the southwestern edge of Majnuna and partly within adjacent agricultural fields. A modern construction trench associated with a grain storage area, plus four of our own trenches, opened a significant window onto the grave and its context. The pre-grave deposits comprise a waterlogged clay

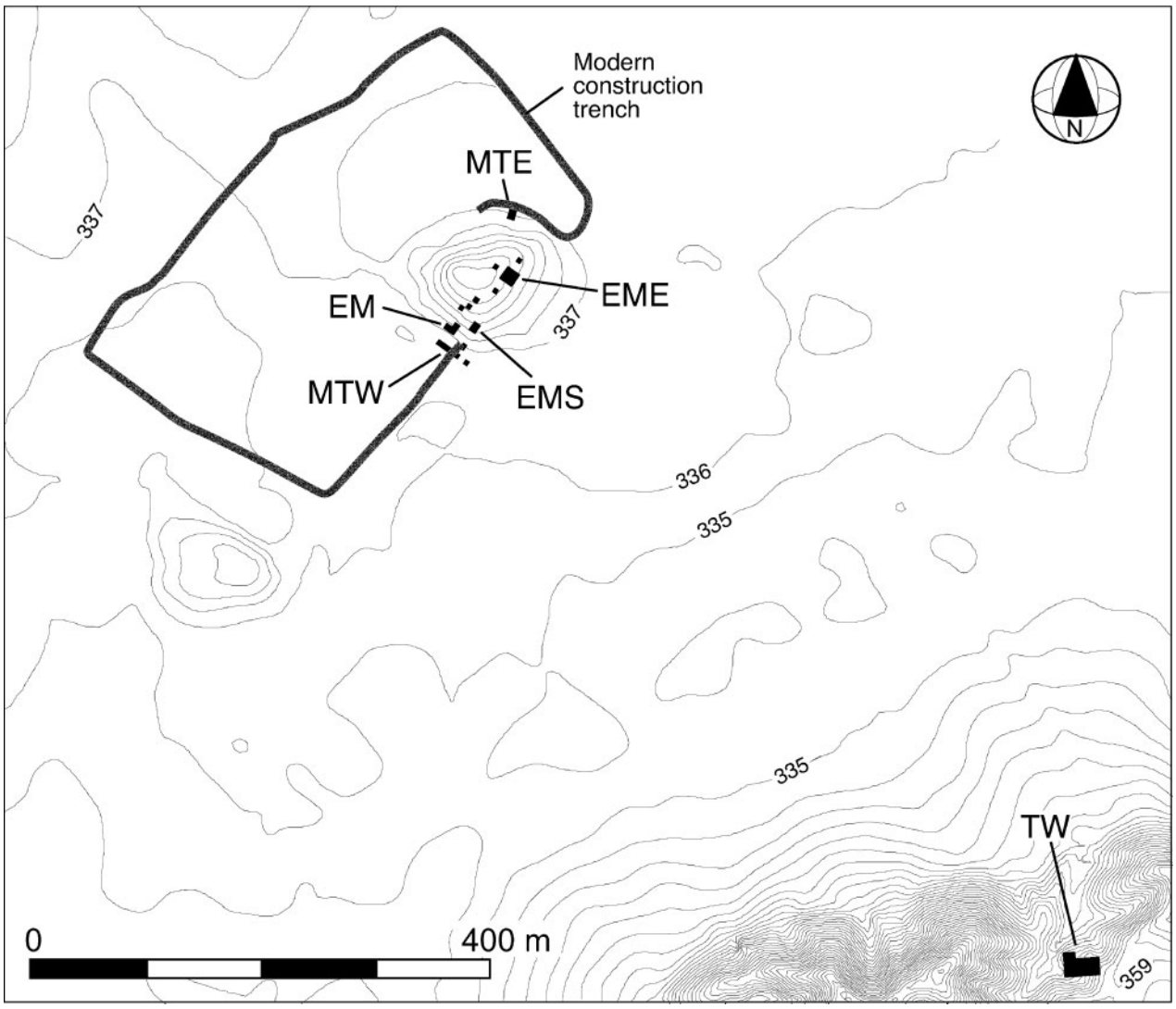

Figure 4 Topographic plan of northern Outer Town of Tell Brak and Tell Majnuna with main excavation areas indicated.

layer over reddish virgin soil, followed by thin stratified rubbish layers and lenses containing sherds, animal bones, and scattered disarticulated human body elements. It appears that this area was occasionally used for rubbish deposition during the very early 4th millennium B.C. and had not seen any previous occupation. However, around 3800 B.C. this area was chosen for the deposition of a large pile of human and animal remains. This mass grave could not be fully excavated, but sections provided by the modern trench together with our own excavations reveal that it was at least 20 m long by 3–4 m wide. The pile varied in density and thickness over its length, from dense, deep, and jumbled at the eastern end (FIG. 5), tailing out to single body portions with short gaps between at the western end (FIG. 6). The conservative minimum number of human individuals recovered from our excavations is 54, while an estimate of the total number in the pile (based upon number of individuals recovered in excavation and during random collection of remains from the modern trench dumps, together with reconstruction of the pile's horizontal extent) is several hundred.

The pile was placed directly on a single consolidated surface, and it was essentially contiguous along its width and length; the gaps between bone clusters were insignificant. The layer of soil and rubbish that completely sealed the bone pile was also a single internally-consistent and easily-defined unit with no later disturbances or additions. Thus, depositional and stratigraphic evidence points to the grave's creation being a single event of short duration, probably lasting a few days at most.

The skeletons were significantly disarticulated, although articulated elements such as torso segments (thoracic vertebrae with attached ribs) and full upper or lower limbs were frequently found intact. The bones were mingled, with no attempt to keep the parts of any individual together or to keep any individual separate from others. This degree of disarticulation and mingling, together with the rarity of smaller body elements such as feet and hands, implies that this pile is a secondary context. There

Figure 5 Mass grave in Area MTW, east end, with dense thick deposit of human and animal bones.

was some sorting during deposition that may be related to the mode of collection and transport from the presumed primary context: the lowest layer of the pile comprised mostly separate large elements such as femora, covered by a layer of partly-articulated body segments, and the top of the pile was made up mostly of smaller single elements and skulls. The disarticulations in all cases appear to be accidental, derived from natural decomposition, as there are no cut-marks or indicators of dismemberment on bones. The loss of smaller bones may have occurred during gathering and transport to the burial site or may be related to animal scavenging before the bones were gathered for transport. The damage includes small, paired, parallel incisions from rodent teeth plus deep punctures and furrows probably produced by dogs or even lions, to judge from the scale and depth of marks. This scavenging implies that the primary context involved exposure in the open air. In part, scavenging may explain the absence of smaller body elements, such as feet and hands, which could easily be transported away from the death site by such animals. The presence of at least two almost-complete skeletons within the pile (missing only heads and arms) implies that little time passed between death and removal for burial. Rates of human post-mortem disarticulation are notoriously difficult to track with precision, as they depend upon season, temperature, humidity, micro-climate, soil conditions, micro-organisms, clothing or lack thereof, and other factors (Bass 1996; Forbes 2008; Galloway 1996; Ubelaker 1996). The pattern of disarticulations in the MTW grave implies that weeks to perhaps months elapsed between death and burial. Notably, the disarticulations of the human remains across the pile are internally consistent. Given that their placement in the mass grave was a single depositional event, the equal degree of disarticulation of the skeletons implies that death was simultaneous for all, as were their decay and their gathering and removal. Other possible explanations for the mass grave, such as relocation of a normative cemetery, are belied by this internal consistency in degree of disarticulation observed across all the bodies.

The human skeletal material from MTW was aged through standard techniques of measurement and assessment of tooth formation and wear, plus degrees

Figure 6 Mass grave in Area MTW, central, with dense ceramic sherds and less dense human and animal bone deposit.

of epiphyseal and cranial bone fusion. Assigning ages was complicated by the fact that we had to rely upon single age indication factors for many bones, when best practice in aging should summarize age markers available across an entire skeleton; however, a significant number of body elements could be aged with a reasonable degree of certainty. A normal attritional cemetery population derived from natural causes should show a higher relative proportion of older adults and infants than would have been present in a living population, because of the greater risk of death in these age groups. A catastrophic mortality profile, such as that from a rapid, deadly disease, should show a close relationship to the living population profile, but again with a higher proportion of infants, children, and the elderly (Margerison and Knüsel 2002). The Majnuna MTW mass grave shows neither profile type (FIG. 7). The MTW grave age range was dominated by adults over age 20 but younger than 40 (the majority falling in the relatively young 20–35 age class), thus comprising the portion of the population who should normally be the least likely to die from disease or most other life risks. This portion of any population is the most likely to take part in violent conflict, which is thus a plausible cause of death for the individuals in the mass grave. Children between the ages of 7 and 14 and adolescents 15–20 years old were also present in significant numbers, while there are a very few bones from children younger than 6. The presence of children does not detract from the interpretation of a warfare cause of death; the violent event must have taken place within or near the settlement (see below, Interpretation) with the inevitable involvement of many members of the community.

The absence of infants is not surprising. Infant burials in jars or small pits have been found throughout the 4th millennium B.C. levels in Area TW, in contexts such as abandoned ovens and near trash pits. This separate mode of burial is perhaps appropriate for those who have not yet achieved a significant social identity, and discrete locations for infant graves are also used in the preceding 5th millennium B.C. The elderly may also have been buried apart, in special situations reflecting their accumulated identities. It is the simultaneous death of so many young adults and sub-adults, more than the low numbers of younger and older individuals, however, which is the most compelling evidence that those in the MTW grave died through violence.

The MTW remains were sexed by methods appropriate to the varied and often unconnected body

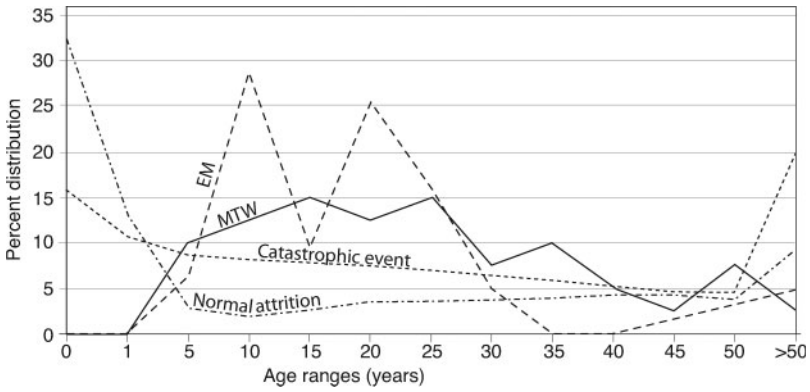

Figure 7 Mortality profile of skeletons from Areas MTW and EM, compared to profiles of a normal attritional cemetery population and catastrophic event in Model West (Coale *et al.* 1983).

elements present. The most reliable indicators of human sex are features of the pelvic bones, but unfortunately, the recovery rate of complete pelvic bones in MTW was low. Pelvic bones have relatively thin cortical layers compared to long bones, meaning they frequently do not preserve well in archaeological contexts. In addition, the pelvis is in a high meat-yield zone of the human body and may have been targeted, broken apart, and partly removed by scavengers; the transport from primary to secondary context may have also introduced damage to this rather fragile element. Thus we relied, in addition, on the identification of cranial and mandibular features and robustness, specific measurements of long bones (e.g., epiphyseal measurements of humerus and femur), and assessment of the general robustness of postcranial bones. The latter aspect was assessed primarily through a series of measurements of long bone shaft diameters or circumferences and epicondylar breadth, compared to a growing sample of human remains from sites across northern Mesopotamia dating from Late Chalcolithic through Early Islamic periods (Sołtysiak 2010). The MTW mass grave population includes both sexes, but the ratio is skewed towards males among those elements that could be sexed with reliability (ca. 65% male to 35% female). As with the presence of children, the presence of women in the mass grave in no way diminishes the possibility of warfare being the cause of death. The violent event, as above, must have taken place within or near the settlement and involved individuals outside the traditional "standing army."

Injuries, weapons, and pathologies

Death from violent conflict should be revealed in visible injuries, such as parry fractures to arms, crushing or hacking injuries to skulls, gashes from swords or spears, and embedded projectile points (Dawson *et al.* 2003; Jordana *et al.* 2009; Liston and Baker 1996; Ortner 2003; Walker 1989, 2001). Although many of the MTW bones are damaged, it was difficult to distinguish possible peri-mortem trauma from damage resulting from processes of decomposition, scavenging, transport, and secondary deposition. While the MTW skeletons lack explicit evidence for peri-mortem injuries, a significant percentage of the remains shows healed cranial injuries, evidence of previous violent events. The healed injuries provide some—albeit limited—support for the theory that violent conflict may have also been involved in the individuals' eventual deaths. Ten cranial elements from Area MTW show healed injuries, a relatively high percentage of the total cranial bones recovered. Skulls of both men and women showed healed injuries of various forms, from small pointed dents through larger oval depressions up to 2 cm in diameter to longer grooves ca. 5 cm long (FIG. 8). Other evidence of healed trauma, including fractures, dislocations, and periostitis, were rare and may have occurred from accidental injury or violence.

Cranial injuries are a good indicator of interpersonal violence in societies such as Late Chalcolithic Mesopotamia, where the primary weapon was probably the club or mace. Such weapons are effective in hand-to-hand combat when used to provide a transfixing or killing blow to the head. Maces are rarely recovered in excavations (although cf. Emberling and McDonald 2003: 9, fig. 15 for slightly later examples of mace-heads from Area TW), but polished stone axes, which have been recovered from Late Chalcolithic 2 and 3 levels in Area TW, are possible weapons. They

Figure 8 Healed depressed cranial fracture from Area MTW.

seem small and lightweight to have inflicted serious damage (average dimensions are $5 \times 3.5 \times 1.5$ cm), but their pointed ends are of an appropriate size to have made some of the healed depressions in the MTW skulls. These axes are made from beautiful dark stones, such as black marble, and are highly polished, aspects that might imply that they were symbolic rather than functional. However, weapons used in creation of a visible "warrior" identity can incorporate both functional and sensual qualities. Copper weapons (spears and swords) were known in the region at this time, but would have been expensive and rare; bows and arrows were possibly more common but their wounds leave few archaeologically-visible traces. There is an additional possibility that slings were common weapons in this period. Recent excavations at Tell Hamoukar have revealed a slightly later destruction layer with hundreds of clay sling bullets (Lawler 2006). Sling bullet injuries are likely to have been disabling rather than fatal, and they are unlikely to be represented in skeletal damage.

The MTW human bones were also studied for pathologies, general health, and diet. Tooth enamel hypoplasia was notable; in humans this is evidence of malnutrition or stress from disease during enamel formation, mainly between the ages of two and seven years. Correlation of enamel hypoplasia with degree of tooth wear indicative of age was carried out for the MTW remains, mainly on teeth from the better-represented maxilla. Although the sample size was small, the results indicate the possibility that the younger individuals had gone through an episode of nutritional stress lasting for several years shortly before their deaths. Evidence from older adults indicated that an earlier episode of stress had occurred, perhaps a decade or more before the deaths (Sołtysiak 2010).

Animal Bones in Area MTW

Animal bones are mixed with and overlie the upper layer of human bones in the MTW mass grave pile. These bones primarily consisted of disarticulated but whole skeletons of sheep, goat, and cattle in large numbers. The remains of at least 25 cattle and 100 sheep and goat skeletons were recovered from the area excavated. We estimate that we have exposed only approximately one-third of the complete mass grave, and thus it is possible that up to 375 animals were butchered and buried (75 cattle and 300 sheep and goats). The density of animal remains decreases towards the western end of the grave, as does the density of human remains, so these numbers may be lower. The animal carcasses were buried amid and on top of the human skeletal remains in the same single disposal event, sealed by a contiguous and undisturbed rubbish layer. Some elements remained in articulation, particularly among the cattle; meat joints were fairly common and a whole side of beef was discarded intact. Despite that fact that these bones were deposited fresh, they exhibit no evidence for disturbance by carnivores or weathering, indicating that they were quickly covered.

The animals were slaughtered within a short span of time, probably as a single event. The age range of the animals indicates that death was neither catastrophic nor attritional; animals of all ages were killed, but certain ages were selected with greater frequency than others. Among the cattle, younger animals are three times more common than adults (older than 4 years). Infants (under 1 year), juveniles (1–3 years), and sub-adults (3–4 years) occur in equal numbers. The presence of so many younger cattle is unusual (at least 17 were recovered, but the total number may possibly be as many as 51, if the young to adult ratio was maintained and the density of animal bones persisted across the unexcavated portion of the grave). Cattle's slow reproductive rates make for slow herd renewal rates, and thus young animals are rarely slaughtered. Culling of so many young animals at one time indicates either the presence of large cattle herds at Brak, or off-take from many different herds from Brak and its environs. The adult cattle thus far recovered were prime-age individuals, which is also unusual as adults represent large investments of labor, land, and water, with the potential return of dairy and draft for many years. That investment balance reduces the frequency with which healthy, adult animals are slaughtered. Slaughter of greater numbers of males or females might suggest greater expendability, respectively, for draft and sire duties or dairy animals. So far, however, males and females are found in similar numbers; but further analysis is required to determine whether there are sex differences between age groups, which could offer insight into the use-value of the living animals. Overall, the slaughter of so many cattle would have been an expensive endeavor unless distributed over several herds, settlements and/or people.

The sheep and goats were fairly evenly divided between males and females. Nearly half were killed as adults (older than 42 months), and the majority of these were slaughtered between 4–6 years of age, when healthy animals are still highly productive. Few animals of older age were recovered. Another spike appeared in the 2–3 year old range, after individuals have already achieved their maximum meat weight and have many more years of wool, hair, and dairy production. A few animals were killed prior to 6 months of age, but in general the youngest recovered were killed in an early stage between 6–12 months; no newborns were identified, but their fragile bones do not survive well. However, since the

animals were all killed at the same time, the ages should be found in classes of 1-year interval. There are a number of animals killed just before and just after 6 months of age, suggesting that the lack of newborns is due to the time of year when the slaughter event occurred. Around Tell Brak, there is currently a single birthing season that occurs over 2–3 months in the spring. If this were the same in the past, given that the youngest animals were just less than 6 months of age, then we expect the event to have occurred in the fall.

The animals were all slaughtered for the same purpose, as indicated by consistent butchery patterns. For the cattle, the toes (phalanges) and ankle bones (tarsals) were repeatedly struck with a cleaver-like implement. This would have been used to hack through the hoof, sever the strong tendons of the feet, aid in the disarticulation of the extremities, and probably also remove the metapodial bones. There is evidence for further disarticulation in the form of cleaving marks around the tight elbow joint (humerus, radius, and ulna), and around the hip (pelvis and femur). The metapodial bones were split lengthwise and the shafts of the remaining limb bones were smashed. This may have occurred prior to cooking in order to release more juices, a practice common in the Late Chalcolithic 3 levels in Area TW (Charles *et al.* 2001; J. Weber in Emberling and McDonald 2003). It could have happened after cooking in order to access the marrow. The latter is indicated for many of the tibia, which bear distinct traces of polishing along the inner edge of a spiral-pattern break. We associate this with the repeated scooping out of marrow with a finger or bone splinter, creating a polished edge where the grease rubs past the bone. In contrast to full exploitation of the limbs, the rib cage does not seem to have been broken-down further despite the presence of good meat there. There is no sign of meat removal from any of the bones, indicating it was probably cooked on the bone. It is also possible that meat removal was done without leaving marks, but the heavy cleaving on other bones suggests that such care was unlikely. Signs of heavy, though unsystematic, burning were found on numerous elements; we cannot say whether the burning resulted from the cooking of meat or from the burning of rubbish. Numerous burnt horncore fragments were recovered, but there is no indication if or how the neck and head were prepared.

Sheep and goat were butchered similarly to cattle, but with smaller, finer tools. Marks of butchering are found on the extremities and at most limb joints. These were generally the result of disarticulation and skinning rather than meat filleting. Again, we suggest that meat was cooked on the bone. Bone smashing was quite common, and the edge polish that we interpret as resulting from marrow removal occurs on the deliberately broken shaft of all the limb elements but most frequently on the tibia. Unlike cattle ribs, those of sheep and goat were broken down, probably for meat removal. At least one animal had its head removed from its neck—though this was probably systematic. All of the skulls were smashed, possibly for access to the brain, and the horn and horncores were removed. Burning on the bones was common, but as with the cattle bones, we cannot determine from which activities it resulted.

The slaughter and preparation of these animals occurred as part of a single event, which we interpret as a feast. The human and animal bones are also mixed with Late Chalcolithic 3 ceramics, dominated by large shallow plates and fine-ware bowls such as might have been used in communal feasting. Many of these dishes were scarcely worn and had been simply broken in half, suggesting symbolic destruction after their use. Butchery was focused on disarticulation of meaty limb-bones and was consistent throughout the entire assemblage. Yet individual variation in the depth, length, or style of cut marks suggests that the consistency was not the result of a specialist, but was rather a communal effort of several individuals following the same general pattern for the desired result. The breakage of most long-bone shafts for marrow and the smashing of the skull to access the brain together further suggest that these animals were slaughtered on this occasion for mass consumption. It might also indicate the serving of a dish similar to the modern *mensef*, a feast dish in which meat bones are placed on trays of rice, topped by a split skull with brain intact but accessible. That this was a major event is indicated by the size and cost of the meal. Together, 25 cattle and 100 sheep and goat equate to roughly 6200 kg of meat. If there were, in fact, 75 cattle and 300 sheep and goats, as estimated, then there would have been approximately 21,300 kg of meat. Even if consumption occurred over a three-day period, for instance, 7100 people could have had 1 kg of meat each day. The selection of animals seems to have been done with little regard for cost. Highly productive and prime-age animals were slaughtered for this feast; this wastefulness means it is possible that some of the meat was discarded uneaten.

Mass disposal of butchered carcasses of sheep, goat, and cattle has been observed in contemporaneous contexts at Tell Brak in Area TW, though never in such large quantities. These remains, too, are identified as the discard from feasting activity by the signature features of whole carcass disposal of a large number of sheep, goat, and cattle in a single episode, consistent butchery, bone-smashing, and meat roasting (Charles *et al.* 2001; J. Weber in press). The MTW feast, so closely associated with human bodies that may have died in violence, could have been a ritual

Figure 9 Detail of internal layer within mass grave in Area EM.

that either celebrated a victory or commemorated the dead. As the final deposit of the mass grave, it acts as a ritual closure event, and its scale implies that the creation of the mass graves was a public event.

The mass grave in Area EM

Area EM lies at the southwestern edge of the Majnuna mound, some 10 m northeast of MTW. Two trenches revealed the full extent of a second pile of human remains, created slightly later than that in MTW, according to stratigraphy. In Area EM, however, there is a rather different situation. Again, natural soil was reached at the bottom of the trench; above it there was no material dating to earlier than Late Chalcolithic 3 (LC 3), confirming our impression of the light use of this area before the graves. The layer resting immediately on natural soil was dense in LC 3 sherds and may be connected to the rubbish and sherd layer covering the MTW mass grave; this was followed by a series of very ashy layers, within which was the second mass grave. Stratigraphically, the EM grave is later than the MTW grave, but we assume that the intervening layers were deposited rapidly and do not represent more than a decade. The ceramic and clay container sealing assemblages associated with both graves were very similar.

Like the MTW grave, the body elements in EM were heaped up in a long narrow pile, but here a smaller 6 m long by 1 m wide. Most importantly, the disarticulation of the human remains was more extensive than that in MTW, with only parts of spinal columns remaining more or less intact. The body elements represented had also been specifically selected, comprising chiefly femora, fibulae, tibiae and humeri, smaller numbers of skulls and spine segments, and a few ribs (FIG. 9). Bones of the hands and feet were almost absent, as were pelvic bones. Near the top of the pile in particular, there were visible "armloads" of long bones, lying parallel to each other. The pile rested on an easily traceable surface and was contiguous; it was created during a single short-term event, lasting at most a few days and was sealed by a continuous, undisturbed layer of ashy soil. There was significant pre-transport carnivore damage to the ends of long bones, in the same pattern and to the same extent as in Area MTW; again, there was no evidence for dismemberment. Animal bones are almost absent and the few that were associated with the human remains are comparable to the persistent low-level presence of bones in most occupational and discard contexts at Brak and other sites in the region. There is thus no feast associated with this mass grave.

The minimum number of individuals represented in the EM mass grave is 89. The age profile was assessed with the same methodology used for the MTW grave and is distinctively different from the latter, showing a higher proportion of children, including five children aged between 1 and 3 years old (FIG. 7). Almost all categories of ages except infants are represented: young children (1–6), older children (7–14), adolescents (15–20), full adults (20–30), and a few older adults over 40 years of age. This age range does not match an attritional or catastrophic age profile. The adults were relatively young, slightly younger on average than those in MTW (most are 20–25 years old), while the elderly as well as newborn children are

missing and very young children remain statistically under-represented. Again, the absence of infants and older adults might be explained by separate burial locations; but the sheer number of young adults and the selection of particular body elements argue for an unusual source for this grave. The same methods were used to identify sex in the EM grave as in the MTW grave; here, there was a stronger skew in the ratio towards females (ca. 68% female to 32% male).

The greater degree of disarticulation in the EM mass grave might be interpreted as evidence that it was a cemetery clean-up or other collection of bones from individuals who had died naturally over some time. However, the limited range of body elements present and the age profile dominated by young adults argue against these interpretations. The limited range of specific elements also implies a different activity set than that represented by the death, decay, transport, and disposal trajectory reconstructed for the MTW mass grave. The selection of body parts indicates that the EM pile was the result of targeted processing of other bodies. A possible source is the MTW mass grave itself, which could have been re-exposed through pits or trenching in areas we did not excavate; however, the different age profiles make this reconstruction unlikely. The evidence thus points to a second violent event as the possible cause of deaths, but the EM remains may represent mainly a group of traditional non-combatants. It should be noted that only one of the skulls in EM shows possible evidence of a healed earlier injury.

The frequency of linear enamel hypoplasia in the teeth from EM was high. This feature was also present in the mass grave in MTW but was significantly more common in EM, particularly in the teeth of the younger individuals. Cranial porosities (including cribra orbitalia) were also more common in EM than in other contexts and may indicate that these individuals in particular suffered anemia, vitamin deficiencies or generalized systemic and dietary stress.

Human bone tools from Area EM

Interpretation of the EM mass grave is further complicated by the fact that some of the femora and tibiae were made into tools, and there is evidence of polish from handling on other bones and on skull fragments. These human bone tools are unique in Mesopotamia. Forty-two human bone tools were recovered, of which 19 were mostly complete and 23 were fragmentary. The tools were initially shaped by twisting and snapping the bone roughly in half, creating angular pointed ends on each half. This twisting snap of the bones seems to have been standardized in both technique and strength applied: the angle of the point preserved in unworked or lightly worked examples is very similar (FIG. 10A–D), suggesting a single person or small number of individuals using a repeated or habitual body practice.

The joint ends of each half were then removed, and the shafts were evened by chipping akin to that used in lithic production (visible on FIG. 10A, 10C, 10F). The reaction of the bones to this working, and perpendicular cracking from past changes in humidity, indicate that the bones were defleshed and dried from the elapse of probably several years between the death of the individuals and creation of the tools. After snapping and rough chipping of the "base" end, the pointed end was not altered further before the tool was used. There is a range of degrees of wear visible on the tool points, from fresh and unused through worn examples, with a spatula-like form, high polish and a slightly facetted end (FIG. 10E, 10F). The tools come in two almost standard sizes, averaging 12–13 and 18–21 cm long; in most cases the shaft diameter was left complete (FIG. 10A–D), but some of the larger femora had been split along their length before use (FIG. 10E, 10F). Both sizes fit easily in an adult hand. The tools were found throughout the EM pile, including in its lower layers. The pile, therefore, represents not just the place of manufacture of the tools but also the place of their use and post-use discard, presumably together with the materials on which the tools were used. Our reconstruction of the EM mass grave creation describes a several-stage process, although it must be admitted that evidence for some of the steps is indirect. It begins with death of the individuals in the same or a similar conflict as that of MTW, initial decomposition *in situ*, transport and creation of a mass grave similar to MTW, elapse of some years, re-exposure of the bones and selection of specific elements, and finally tool creation, use, and deposition in Area EM.

In addition to the long bone tools, 17 examples of cranial fragments from within the EM pile bear scratches and polish. There is a possibility that some of these modifications may have occurred during transport or post-depositional processes; however, at least four fragments bear heavy polish and/or deliberate directional abrasions, suggesting that skulls with less regular markings had simply been less intensively handled. The polish and scratches are concentrated on the frontal and occipital bones and probably derived from a combination of handling and resting on the ground or a slightly abrasive surface. It is difficult to determine the aim of this skull processing from the fragments remaining, but the co-incidence of the human bone tools provides a suggestion. The wear implies that the tools had been used for some manufacturing activity, but the objects created with these tools are actually unlikely to be represented in the EM discard pile, since they would have been created and then

Figure 10 Human bone tools from Area EM.

transported away for use. We propose that the tools were used to create or process trophy skulls. The abraded and polished skull fragments left behind could be the mistakes, skulls on which processing work had begun but which shattered during the task and were discarded.

Post-Burial Practices and Additional Mass Graves

The construction of the overlying mound of Tell Majnuna is the final unusual aspect to the mass graves. Our 16 trenches dissected the mound at its maximum diameter, and modern bulldozer trenches and two sets of unused house foundations also provided information on its internal stratigraphy. There were unrelated and minimal traces of architecture of the late 1st millennium B.C. near the surface, but there is no evidence of construction nor of layered and gradually-accumulating occupational deposits of the Late Chalcolithic period in any trench. Instead, the entire 2–3 ha and more than 7 m depth of the mound were created by large-scale rubbish dumping events. A third mass grave, dated to approximately 3700 B.C. by associated ceramics and stratigraphy, was located near the mound center (Area EME 3; FIG. 4). It was discovered in a deep sounding and could only be partly excavated. There were at least 14 individuals, in a similar depositional pattern and with a comparable degree of semi-articulation to the grave in MTW, but its full extent and scale could not be determined. A bag-shaped pile of disarticulated bones, perhaps from a clean-up operation, was found not far from Area EM (EMS on FIG. 4). And there was a final mass grave of ca. 3600 B.C., when the eastern edge of the mound was used for the simultaneous and careless burial of at least 35 individual bodies (Area EME 1–2; FIG. 4).

Ceramic assemblages from trenches across the mound reveal the temporal elapse of approximately two centuries, during which the dumping happened episodically. Within each dumping episode, the height of the mound increased, in some cases by more than a meter, and the mound grew horizontally; clear tip lines across the mound slope down from southwest to northeast, indicating the direction of dumping. At the southwest, immediately above the first two mass graves, the primary material was ashy loose soil. This material persisted across the center of the mound, but the deposits became less ashy from the mound center and further northeast. Especially at the north and northeast edges (Area MTE), in the final depositional events, a sherd-rich source had been mined and there was a greater density of sherds than soil.

The full range of typical Late Chalcolithic 3 ceramic forms is represented. Large plates and cooking casseroles that dominate these rubbish deposits are common in domestic contexts elsewhere at the site, but the sherds in the Majnuna deposits tended to be larger. This implies that the sherds were

gathered soon after breakage and before trampling could break them down further. The quantities of sherds are also far beyond what one would expect of normal household use and breakage. It is probable that the sherds were collected from communal neighborhood dumps and perhaps industrial or administrative areas where large numbers of vessels would have been used and frequently broken and discarded.

Interpretation: Mass Graves, Warfare, and Corpse Abuse

Burial practices in Mesopotamia in almost every millennium from the 6th through the 1st consist mainly of near-immediate burial and single, articulated interments in purpose-made pits. Secondary burials, cremations, and burials of two or three individuals who died simultaneously are known but uncommon; communal tombs used for individual burials sequentially over several generations are present, particularly in the 2nd millennium B.C., but are a minority. However, the burial practices of the 4th millennium B.C. are among the least known for the region. Very few adult burials of this era have been recovered in either northern or southern Mesopotamia, although single, primary infant burials are found more frequently, for example in vessels and small pits in the industrial zone of Area TW at Brak. However, the similarity of single, primary adult burials in both the preceding and following millennia offers the possibility of general continuity of practice across the 4th millennium B.C.

Near Eastern comparanda for the MTW and EM mass graves are rare. The few other mass graves known differ in key characteristics from the Brak examples. A mixture of disarticulated animal and human bones was recovered from a pit at Domuztepe, southeast Turkey, dated to the much earlier Halaf period, ca. 5500 B.C. (Kansa and Campbell 2004; Kansa *et al.* 2009). The Domuztepe assemblage of approximately 40 individuals represents a wider range of ages, and interpretation has varied from communal re-burial of individuals who died peacefully across some years to a mass grave resulting from organized violence. However, the association of human and animal bones there provides a useful parallel for the linked feasting and burial reconstructed for MTW at Brak, and the evidence of possible cannibalism (Kansa *et al.* 2009) is potentially related to the symbolic tool-making in Brak Area EM. A group of 19 mostly young male individuals was recovered at Titrish Hüyük, southeast Turkey, in a late Early Bronze Age context (Algaze *et al.* 2001: 69–70). The dead were disarticulated and arranged within a plaster feature in a house, with skulls surrounding a pile of long bones; trauma to the skulls in particular supports an interpretation of massacre (Erdal 2010). The disarticulation, lack of smaller elements, and special arrangement provide useful parallels for the Majnuna graves. Finally, evidence of mass death associated with the siege and destruction of the Neo-Assyrian Empire in 612 B.C. comes from the gates at Nineveh (northern Iraq), particularly the Adad and Halzi gates (Stronach and Lumsden 1992), while the Urartian sack of Hasanlu (Iran) in 800 B.C. also resulted in a massacre (Muscarella 1989). But the skeletons in these latter cases were left where they died (although many of the Hasanlu bodies were looted and mutilated), rather than being gathered and moved to a mass grave.

The non-attritional and non-catastrophic age curves dominated by young and essentially healthy adults, together with the simultaneity of deaths in each group, point to the MTW and EM mass graves being the outcome of warfare. Warfare here is interpreted broadly, to involve both deaths of combatants in battle and the massacre of general populations embroiled in conflict. Both MTW and EM graves contain remains of individuals not traditionally thought of as active combatants: women and children. The temptation is to assume that these were non-combatants who were accidentally killed within a larger, uncontrolled conflict without a well-defined battlefield. The assumption that women and children were not involved in battle is supported by Mesopotamian textual and artistic evidence from the 3rd millennium B.C. onward. However, these later sources describe and depict formal battles of territorial expansion. Civil wars and conflicts between unequal forces are especially liable to subvert expected sex and age categories among combatants; guerrilla movements in Colombia and internal conflicts in Sri Lanka and Northern Ireland have involved female combatants (Alison 2009), and the Sierra Leone and Congolese civil wars have used child soldiers. Thus it is possible that the sex and age mixtures seen in MTW and EM might reflect mixed combatants killed in action as well as massacred bystanders.

The unusual delay and exposure after death, the haphazard collection of remains that ignored smaller bones of hands and feet (although these may also have been affected by carnivore activity), and the mingling of bodies in piles show an extraordinary disregard for the retention of the individual body as a discrete entity, at odds with customary burial practices in the ancient Near East. The unconventional disposal within layers of rubbish further supports an interpretation that the dead were considered in similar light to animal carcasses. Their manner of disposal is analogous to that of kitchen refuse, disarticulated and separated from living spaces. This disregard implies that the dead were enemies, conceptually different to those performing the burials and considered unworthy of

normal burial and the preservation of their individual identities. This proposal is supported by the creation of tools and trophies, effectively corpse abuse, represented in the EM mass grave.

Human bone is structurally less strong than animal bone and is not well suited for creation of tools. Its utility decreases as it ages and collagen is lost, further weakening an already fragile material. Human bone is unlikely to have been a preferred material for functional tools, especially given the great availability of more robust animal bones and the presence of tools made from animal bones in other Late Chalcolithic contexts (e.g., Area TW). The use of human bones should thus be viewed as a primarily symbolic act. The artifacts created remain elusive, but the polished and abraded skull fragments in association with the tools suggest that they were used to deflesh and empty trophy skulls. Similar human bone tools have been recovered from Pueblo period sites in the U.S. Southwest (A.D. 900–1300), with admittedly disputed evidence of cannibalism (Billman *et al.* 2000; Flinn *et al.* 1976; Kantner 1999; LeBlanc 1999; Marlar *et al.* 2000; Potter and Chuipka 2010; Turner and Turner 1999). While the EM bones bear some indicators of cannibalism (particularly the mixing of individuals and selection of elements), the length of time between death and manipulation makes this practice unlikely. Key aspects of cannibalistic activity, such as burning and butchery marks, are also missing from our graves. The EM tools are related to cannibalism, in that the human body was viewed as a resource for exploitation and was subjected to post-death processing and modification. Exploitation of human bones for creation of tools and trophies, although stopping short of actual consumption, is within the same ideational category as symbolic cannibalism. Elsewhere, skulls and other parts of dead ancestors and especially of dead enemies have been made into display items or simply gathered as trophies (see Chacon and Dye 2007 for a detailed summary of trophy-making in the Old and New Worlds and examples from United States and South America, plus more recently e.g., prehistoric California: Andrushko *et al.* 2005, 2010; and Nasca and Inka examples; Knudson *et al.* 2009). This practice occurs most commonly at times of social or environmental change or stress and is associated with deaths by violence (indicated by mass graves and peri-mortem injuries); the purpose may be to provide symbols of status, to advertise group victory, to celebrate personal military success, and/or to further humiliate defeated enemies. The use of separated crania as symbolic artifacts is well-known from the Neolithic of the Levant (plastered skulls at Jericho) and Anatolia (skull caches at Çayönü). These instances are held to be elements of ancestor veneration, but they could equally be evidence of trophy-taking in conflict. Collection and display of trophy heads and other enemy body parts appear in Neo-Assyrian historical annals and palace reliefs illustrating the aftermath of battles, but so far the practice has not been identified archaeologically.

Finally, the creation of the rubbish mound over and around the graves was a deliberate act, either commemorative or celebratory. The depth of each deposit and internal steep tip-lines indicate that the mound was designed to be visible; the rubbish was piled high rather than being spread and diffused. Later Mesopotamian textual traditions (3rd and 1st millennia B.C.) speak of the construction of burial mounds above the slain of battles, and the Tell Majnuna mound may indeed be at an early step towards this later tradition. This construction is an unusual creative, rather than destructive, act associated with warfare. There is a haunting modern analogy to be found in the Fresh Kills landfill site (Staten Island, New York). Originally a salt marsh, followed by clay-pits, fringe settlements, and famously a landfill for city rubbish beginning in 1948, Fresh Kills became the repository for much of the ruins of the World Trade Center in 2001–2002 and thus has become most recently a memorial and gravesite. The current development of the site into a "Lifescape" park acknowledges the site's multiple layers and roles, embracing the (now covered) trash mounds and their varied and evocative contents. In a similar way, the Majnuna mound was an actively-constructed and ever-changing feature of the settlement edge for at least five generations or more. Its status as commemorative monument over the initial burials would have waxed and waned as time passed and rubbish or additional graves were added.

The identity of the dead and location of the violent event are unknown. The pre-burial exposure of the bodies makes it unlikely that the battle took place within the core of the settlement itself, or a more rapid clean-up would be expected, but mass graves in all wars from prehistoric to modern are never far from battlefields, for logistic and commemorative reasons. We place the location of the battle somewhere in the northern Outer Town between Majnuna and the city's core or in the fields beyond. The nature of the dead is more uncertain; their treatment implies they were conceptually enemies, either external or internal. It is difficult to imagine an outside force attacking a settlement as physically imposing, politically organized, and highly populated as Brak; nomadic populations would not have had a large enough fighting force, and adjacent settlements are dwarfed by Brak's scale. In addition, Brak may have had linked settlements in its hinterland, the inhabitants of which would have given the alarm and/or attacked the rear of any intrusive force. The best probability is an internal conflict among the inhabitants of the city and its dependent hinterland. Trophy-taking, such as is suggested above for the

EM evidence, is most common in external wars (Chacon and Dye 2007). Creation of such trophies, however, together with the disregard for corpses, would have been a useful control device in any internal conflict derived from power or status asymmetry (Potter and Chuipka 2010).

Conclusion: Urbanism, Social and Environmental Stress, and Violent Conflict

Past warfare and interpersonal violence have seen innumerable studies in the last two decades, spurred on by thought-provoking syntheses and intractable Hobbes-versus-Rousseau philosophical approaches of modern scholars (e.g., Haas 1999; Keeley 1996; Kelly 2000). There is clear evidence for interpersonal violence by the Palaeolithic (Walker 2001), but we must nevertheless search for a particular motive or motives in each case. At Brak, there is a strong temporal correlation between the mass graves and the expansion of the settlement and increase in its internal occupation density, social pluralism and economic complexity. In Area TW, starting around 4200 B.C., we see the increasing scale of buildings and elaboration of industrial production, including decorative or ceremonial items that could be material expressions of asymmetries in social identity, status, and power. Political, ideological, and religious controls are evidenced by elite spaces such as the public building in Area TW and the Eye Temple and by an expanding artistic vocabulary presenting leaders and their close proxies, lions, on container sealings (McMahon 2009). Property rights to land and material things become complicated and exclusionary with the growth of state structures (Earle 2000) and denial of ownership can increase the attributed value of things and individuals' desire for them. Both the increasing complexity of heterarchy and expanding distance within wealth and power hierarchies may have provoked intra-community conflict that broke out into violence.

We must address indications that the dead in MTW and especially EM had experienced at least two episodes of malnutrition and stress. There is evidence that a large-scale rapid climate change event, involving cooling and increased aridity, may have occurred around 4000–3200 B.C. (6.0–5.2 kya) and might have reduced the carrying capacity of the landscape around Brak just at the moment of its urban expansion (Bar-Matthews *et al.* 1997, 2003; Chew 2007; Elmoslimany 1990; Mayewski *et al.* 2004; Weninger *et al.* 2009). The possible actual and relative food shortage resulting from this event could have had an impact upon the full population of the city and region and held the potential to incite conflict over access to crucial dwindling resources. Alternatively, the visible expansion of economic and administrative hierarchies in the mid-Late Chalcolithic may have created excessive demands on the agricultural system, resulting in famine conditions, again for almost the whole urban population. Or, dietary stress could have been non-systemic and artificial, falling on individuals of a specific class or profession through oppression by an administrative authority. Growing heterarchy, diverging hierarchy, resource demands, and the precise date and reach of climatic change are thus all interwoven with the Brak conflicts.

Our reconstruction of the mass graves involves violent conflict among inhabitants of Tell Brak, a war related to internal social developments, rather than an external war of expansion. We recognize that this reconstruction of civil war is speculative. It is plausible that the graves may contain foreign enemies from a local battle, although the unique size of Brak makes an external attack unlikely. Slaughter of captured prisoners from a distant battle is possible but less likely. That scenario would involve bringing the prisoners to the site, an extra step for which there is no evidence, followed by slaughter, exposure, and eventual mass burial. Such a Foucauldian spectacle would display power, but its performance would not seem necessary within Brak itself in a scenario of external battle. Isotopic analyses, which could indicate diet and thus 'foreign-ness,' have thus far proven inconclusive; aDNA analyses comparing these individuals to contemporary local infant skeletons in Area TW, a method successfully used to compare populations in the Titrish Hüyük Early Bronze Age cist and mass graves (Matney *et al.* 2010), have not yet been attempted. The temporal co-occurrence of battles and urban growth, with all the social and economic changes this growth implicates, should not be taken as an indication that one caused the other, but they are inter-related. Finally, we return to Carneiro's (1970) theory of warfare's role in state origins. The Brak case does not involve his environmental circumscription, since the northern Mesopotamian plains present few physical limits on resources or space. Brak could, however, provide evidence for "social circumscription," a social inertia and even centripetal force created by the new institutions and economic efficiencies of urbanism. This social conscription might have confined and limited behavior, preventing adaptive strategies such as fission, even as it created internal unrest and resentment.

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