Quantitative Methods in the Humanities and Social Sciences

Andrea Dolfini · Rachel J. Crellin
Christian Horn · Marion Uckelmann
Editors

Prehistoric Warfare and Violence

Quantitative and Qualitative Approaches

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Quantitative Methods in the Humanities and Social Sciences

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Chapter 1
Interdisciplinary Approaches to Prehistoric Warfare and Violence: Past, Present, and Future

Andrea Dolfini, Rachel J. Crellin, Christian Horn, and Marion Uckelmann

A Tale of Two Pasts

For the best part of the last century, studies of prehistoric warfare and violence have been framed by two competing meta-narratives. The first argues that intergroup violence is firmly grounded in human ecology and perhaps in the genetic make-up of our species. Following this argument, lethal aggression is considered to be a defining feature of human societies since the emergence of *Homo sapiens*, if not earlier. The second narrative maintains that the small-scale societies typical of our deep past (and much ethnographic recent past) were largely characterised by low levels of conflict. According to this reading, warfare emerged from a dramatic increase in socio-political complexity in later prehistory or out of contact between 'egalitarian' and 'complex' stratified societies in historical times.

Both narratives claim a noble pedigree rooted in the very foundations of Western political philosophy. One traces its ancestry back to Thomas Hobbes (1588–1679), who famously maintained that the natural condition of humanity was 'the war of every man against every man'. In his view, primitive life – that is, life in the absence

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of an established central authority – was 'solitary, poor, nasty, brutish and short' (Hobbes 1996 [1651]). The other is grounded in the work of Jean-Jacques Rousseau (1712–1778), who argued for the fundamentally peaceful nature of Man as he was unencumbered by the 'unnatural' institutions of monogamy and private property (Rousseau 1984 [1755]). For him, war became generalised only when people turned from 'noble savages' into organised social beings – a process which he saw as a straitjacketing of the human nature by artificially imposed customs and laws (Keeley 1996: 7).

Depending on their views on the subject and broader *Weltanschauungen*, students of intergroup violence in prehistoric and preliterate societies have subscribed to one or the other narrative. This has resulted in a neat split of the research community into two factions, which Otterbein (1997, 2004) colourfully labelled 'hawks' and 'doves'. In the field of American archaeology and anthropology, the first camp is populated by believers in the long chronology of war (Allen 2014: 17–18). Some of the 'hawks' perceive lethal aggression to be grounded in the behavioural development of our species during the past 2–5 million years (Gat 2008; Wrangham and Peterson 1996), while others trace it back to the later Pleistocene or early Holocene; the latter frequently ascribe it to various causes including, primarily, competition for resources amongst hunter-gatherers, foragers, or early agriculturalists. All are united in the belief that violent aggression has characterised human societies at every stage of socio-political evolution and can be more prevalent (and deadly) in small-scale acephalous societies than in stratified and state societies (Bowles 2009, 2012; LeBlanc 1999, 2014; LeBlanc and Register 2003; see also Allen 2014; Otterbein 1999).

In contrast, advocates of the short chronology of war argue that non-complex foragers normally exhibit low levels of intergroup conflict, although this may be countered by high levels of intragroup violence such as feuding and homicide (Allen 2014: 19–21; Fry 2006, 2013; Fry and Söderberg 2013; Haas 2001). Kelly (2000), in particular, maintains that warfare was relatively rare until the development of complex segmented societies, which – in his view – are prone to engendering the 'calculus of social substitutability'. This is the notion that the killing of a group member is perceived as a slight to the entire community and may instigate cycles of revenge killings leading to all-out war. Other researchers embrace an even shorter chronology for the emergence of warfare. They highlight that most of the ethnographically documented conflict in small-scale societies dates back to the last two centuries, a time in which such groups were exposed to an unprecedented degree of change due to European encroachment and dramatic population collapse (Ferguson 2006, 2013; Ferguson and Whitehead 1992).

A similar, if somewhat less clear-cut, split into 'hawks' and 'doves' can be discerned in the realm of European prehistoric archaeology. Here, the belief that our ancient past might have been characterised by widespread aggression and conflict can be traced back to the development of culture history in the early twentieth century (Vandkilde 2006, 2013). In a series of seminal books and articles published in the period 1925–1957, Gordon Childe proposed that much of Old World prehistory could be conceptualised in terms of waves of migration, some of which – he pos-

ited – would have entailed bellicose invasion followed by population replacement or admixture (Trigger 2006: 246–7). Childe's broad-brush reconstructions of the social dynamics of early Europe wielded an enormous influence on twentieth-century archaeology. This can be appreciated in the writings of authoritative prehistorians such as Glob and Gimbutas. For them, the spread of the Corded Ware culture in 3rd millennium BC northern/central Europe was to be explained with the invasion of axe-wielding warrior nomads from the Asian steppes, whose novel weapons and horse-riding skills would have enabled them to subjugate the peaceful Neolithic folks of 'Old Europe' (Chapman 1998; Harrison and Heyd 2007; Vandkilde 2013). At the southern end of the continent, similar views were held by Puglisi, who explained the appearance of early metal weapons in Chalcolithic Italy with the arrival of hordes of warrior-shepherds (and metal prospectors) from the eastern Mediterranean (Dolfini 2013; Guidi 1988: 137).

Early diffusionist interpretations of social change intersected with another thriving research strand in European prehistory: the study of Late Neolithic and Bronze Age warrior burials. This centres on the analysis of martial paraphernalia as first seen in Corded Ware and Bell Beaker funerary assemblages, and later in the iconic weapon burials of Bronze Age Europe. Lavishly equipped male graves have frequently been taken as prima facie evidence of the emergence of an individualising warrior ideology in the 3rd millennium BC. This, in turn, would have been instrumental to the development of warrior aristocracies during the Bronze Age (Harrison and Heyd 2007; Kristiansen 1987, 1999, in press; Kristiansen and Larsson 2005; Vandkilde 2014, in press; see also several chapters in Otto et al. 2006). The subject has proved to be exceptionally vital. Not only did it long outlive the demise of culture history; it was able to survive several paradigm shifts throughout the twentieth century and enter the new millennium in a theoretically renewed form, which makes it suitable for the investigation of gender, identity, and other issues lying at the forefront of contemporary social archaeology (Robb and Harris 2013: 64–97; Treherne 1995 and reviews in Frieman et al. 2017).

However, despite studying invasion and the material instruments of aggression, most researchers working within either research tradition eschewed explicitly martial interpretations of early European society. For them, prehistoric battle axes, halberds, and swords would rather have conferred power and prestige to their bearers than be used to kill enemies in pitched battles. Following this premise, generations of scholars conjured up visions of prehistoric elite culture in which weapons, stripped of their potential to cause harm, would largely be employed for self-aggrandisement, or as markers of male identity in funerals and hoarding practices. Their practical uses, if any, would be limited to choreographed duels between champions, which were primarily seen as shows of skill and bravado lacking any conspicuous shedding of blood. It was, as Vandkilde perceptively noted, a tale of warriors without war (Vandkilde 2013: 38–9). This peculiar state of affairs finds its *raison d'être* in the cultural milieu characterising Western society in the latter part of the twentieth century. Exhausted by the unprecedented carnage and destruction wrought by two global conflagrations, influenced by the rise of political pacifism and new, non-violent attitudes to rebellion and social change, people all over the

West made a concerted effort to pacify the past in order to seek relief from a war-torn present (Horn and Kristiansen in press; Keeley 1996; Vandkilde 2013).

Considering the bloodless, ritualised nature of prehistoric violence envisaged by many a post-war researcher, it is perhaps unsurprising that the rift between 'hawks' and 'doves' was far more blurred in European archaeology than in American cultural anthropology. This allowed alternative visions of a combat-free, egalitarian prehistoric Europe not only to be put forward but to harmoniously coexist in archaeological discourse with studies of weaponry and warriorhood. This parallel research strand can be traced back to British archaeologist Graham Clark and his ecological approach to the study of culture change. This emphasised cultural adaptation and gradual, peaceful transition instead of sudden diffusion and destructive migration (Vandkilde 2013: 39–40). In turn, Clark's scholarship influenced the environmental and 'systemic' explanations later favoured by the 'New Archaeologists', who conspicuously shunned population movement and aggression as triggers for social change. Likewise, the post-processualists and social archaeologists operating in the 1980s and 1990s tended to highlight the importance of symbolic behaviour and the representational role of material culture in social interactions – readings that hardly favoured the interpretation of weapons as instruments of war (Hodder and Hudson 2003; Shanks and Tilley 1987; Trigger 2006: 480–3). The cumulative effect of these research approaches was that, for most scholars active between the 1940s and the 1990s, violence was off the menu.

Attitudes began to change from the 1990s. On the one hand, the end of the post-war global order and the breaking out of new theatres of conflict – some of which lay within Europe itself – created a new consciousness as regards the role of warfare as 'a mere continuation of policy by other means' (von Clausewitz 1956 [1832]: 23). On the other hand, mounting dissatisfaction with prevalent narratives of well-balanced, 'love-thy-neighbour' prehistoric and indigenous societies prompted a wave of fresh enquiries into intergroup violence in human evolution and history (Allen 2014: 15; Guilaine and Zammit 2005; Horn and Kristiansen in press; Vandkilde 2013). This fledgling trend coalesced into a mature field of enquiry with the publication of Keeley's *War before Civilization* (1996), a watershed monograph which triggered a new wave of archaeological and anthropological research that continues, unabated, to this day.

Keeley's book can be seen as a disciplinary 'turning-of-the-tide', whose principal merit was to prompt an unprecedented amount of debate about conflict and aggression in prehistoric and preliterate societies. The recent history of research in American archaeology and anthropology has been reviewed above (but see Otterbein 1999 for an alternative narrative). With regard to European prehistoric studies, the rapid pace of development that followed Keeley's monograph has caused research priorities to shift dramatically in the space of just two decades. While early enquiries were mainly concerned with presenting the evidence and making the case for past intergroup violence (e.g. Carman and Harding 2013; Guilaine and Zammit 2005; Jockenhövel 2004–2005; Osgood 1998; Osgood and Monks 2000; Thorpe 2003), later investigations sought to achieve more sophisticated readings of the nature and social significance of sanctioned aggression and conflict (e.g. Armit et al.

2006 and following articles; Harding 2007; Peter-Röcher 2007; Horn and Kristiansen in press; Meller and Schefzik 2015; Molloy 2007a, 2017; Otto et al. 2006; Ralph 2013; Schulting 2013; Schulting and Fibiger 2012; Uckelmann and Mödlinger 2011). Importantly, the last decade has also witnessed the publication of a wide array of specialist studies discussing skeletal injuries and trauma, the manufacture and uses of prehistoric weapons and armour, the imagery of interpersonal and intergroup violence, and the archaeology of fortifications and defended sites. These are too numerous to be cited here. One could appreciate the vigour of the subject upon considering that entirely new research strands have hatched recently in the wake of fresh discoveries and scientific enquiries. This is the case, for example, with battlefield and battlescape archaeology, a thriving field of research in historical archaeology which was extended back into prehistory by the discovery of a likely Bronze Age battlefield in the Tollense Valley, Germany (Jantzen et al. 2011; Lidke et al. 2015; Brinker et al. 2015, Chap. 3, this volume).

While such a proliferation of specialist studies is a welcome sign of disciplinary maturity, it has also had the less welcome consequence of splitting the subject into a number of separate subfields of research. This hinders communication and engagement across disciplinary boundaries. In particular, a gap can often be detected between the approaches grounded in the humanities and social sciences (e.g. the investigation of Bronze Age warrior burials) and those based on the archaeological sciences, which apply an ever-growing assortment of analytical and experimental methods to the study of the material, bodily, and landscape dimensions of prehistoric warfare and violence. As with archaeological science in general, its rapid advancement and the specialist, even esoteric, nature of certain analytical techniques may be perceived by 'traditional' archaeologists as taxing entry barriers to the subject. Despite recent attempts to overcome this problem (e.g. Molloy 2007a; Ralph 2013), inter- and cross-disciplinary explorations of prehistoric warfare and violence are still thin on the ground.

How the Book Is Organised

Such considerations prompted us to organise a session on *Quantitative and Qualitative Approaches to Prehistoric Warfare* at the 21st annual meeting of the European Association of Archaeologists (Glasgow, 3rd September 2015). This book arises from, but is not limited to, the papers presented at the Glasgow Conference. Its aim is to break the mould of entrenched subject boundaries and promote interdisciplinary debate in the study of prehistoric warfare and violence. In particular, the book seeks to promote the investigation of early conflict and aggression through integrated quantitative and qualitative research approaches. The former are grounded in several domains of archaeological science including human osteology, paleopathology, archaeometallurgy, use-wear analysis, artefact morphometry, digital imaging, and experimental archaeology. The latter are rooted in various research traditions which can loosely be grouped under the 'social archaeology' umbrella.

The chapters are organised into four thematic sections inviting cross-disciplinary and cross-period interaction: (1) skeletal markers of violence and weapon training, (2) conflict in prehistoric rock art, (3) the material culture of conflict, and (4) intergroup violence in archaeological discourse. Original essays are presented in each section by a diverse international authorship encompassing early career and senior researchers alike. The case studies being discussed have a broad chronological and geographic scope, spanning, as they do, from the early Neolithic to the Late Iron Age and from Western Europe to Eastern Asia. The volume is concluded by a thoughtful reflection on contemporary approaches to the study of warfare and conflict in prehistoric societies.

Part I discusses osteological evidence relating to raiding, warfare, and weapon training in prehistoric contexts; it comprises three chapters.

In Chap. 2, Meyer and co-workers review the evidence for collective violence at several *Linearbandkeramik* (hereafter LBK) mass-interment sites from central Europe. Their re-examination of the collective burials from Talheim, Asparn/Schletz, Wiederstedt, and Schöneck-Kilianstädten, which have become household names in Neolithic studies, is integrated by the recent discovery of yet another LBK mass grave at Halberstadt, Germany (Meyer et al. 2015, in press). Here, the patterns of deposition typical of deviant burials from the period (e.g. the unceremonious tossing of the dead into a shallow pit without grave goods) are complemented by new aspects, such as the unusual sex and age profile of the deceased, who are all males between 16 and 40 years of age. Their skulls show instances of *perimortem* trauma to the occipital bone, suggesting that these individuals were hit on the head from behind, perhaps in a chillingly controlled manner. Moreover, isotopic fingerprinting indicates that they did not belong to the region. The unusual nature of the evidence prompts the authors to suggest that this is not an 'ordinary' massacre site, in which a near-complete village community was wiped out, but the outcome of a failed attack by a raiding party of outsiders, followed by the deliberate execution of the captives. Overall, the chapter provides a prime example of the sophisticated contextual interpretations that can be arrived at by cross-referencing, and critically appraising, the considerable body of osteological and palaeopathological data now available for Neolithic Europe.

In Chap. 3, Brinker and her team examine the osteological and weapon evidence from the Tollense Valley extended site, Germany. The site hardly needs introduction: hailed as the first Bronze Age battlefield ever to be unearthed in Europe, the main locale and surrounding riverine landscape have yielded record numbers of human remains, many of which display *perimortem* injuries (Brinker et al. 2015; Jantzen et al. 2011; Lidke et al. 2015). The unusual scale of the skeletal evidence is compounded by the dominance of young adult males in the sample, while the many weapons from the site, some of which are still embedded in the bone, provide circumstantial indications as to how the deceased would have met their ends. The case for a single-event battle scenario is further strengthened by several radiocarbon dates clustering in a narrow chronological range circa 1300–1250 BC (Jantzen et al. 2011: 427–8; Lidke et al. in press). Whereas the interdisciplinary research strategy deployed by the authors has clarified many aspects of the mighty clash of armies

that seemingly took place at Tollense in the late 2nd millennium BC, other questions remain unanswered. These include the characterisation of the injury patterns from the skeletal material as well as the identification of the weapons that caused them.

Discriminating between the penetrating lesions caused by projectile and non-ranged weapons is particularly difficult as both leave similar marks on the bone (O'Driscoll and Thompson 2014). Since penetrating lesions are the commonest type of injury identified at the site, their correct characterisation holds the key to understanding the nature and mechanics of a Bronze Age battle. The team addresses this problem using an integrated research approach which combines weapon tests on animal bone targets, 3D imaging, 3D reconstructions, and digital injury simulation. In several instances, they are able to distinguish between ranged and handheld weapons based on the distinctive shapes and features of the injuries. Furthermore, the method gives them insights into the angle at which the weapons struck the bone, thus adding valuable detail as to how the confrontation might have unfolded. Inferences of this kind significantly advance our ability to reconstruct the realities of prehistoric conflict away from catch-all labels and ethnographically derived interpretations. Perhaps more importantly, they also show the potential of ad hoc investigations which repurpose established analytical methods to address fresh research questions.

Chapter 4, by Gentile and co-workers, tackles a much-debated issue in the archaeology of weapon burials: to what extent do the martial identities laid out in the grave reflect the actual participation of the deceased in martial practices? In other words, are the 'glorious dead' of countless prehistoric weapon burials real or imagined warriors? The authors approach the problem from the vantage point offered by early Samnite burials from central Italy. These fearsome mountain tribes of old are best known for sternly resisting Roman encroachment during the late 1st millennium BC (Bispham 2007; Scopacasa 2015). Yet their warlike reputation has deeper roots, as shown by their custom of depositing panoplies of weapons in male burials throughout the Iron Age period, 800–500 BC.

The analysis presented in the chapter builds upon previous osteological research by part of the team (Sparacello and Coppa 2014; Sparacello et al. 2015). This research showed that high degrees of asymmetry in the mechanical strength of the humeri (upper arm bones) can be used as a proxy for weapon training from a young age. Equipped with this neat biomechanical marker, the team proceeds to investigate the degree of humeral asymmetry and laterality in a large sample of Iron Age Samnite burials. They then cross-reference the osteological data with the typology and layout of weapons in the male burial sample. Intriguingly, the exercise reveals that weapons were often placed in the graves of individuals that had not undertaken intensive military training and, quite possibly, had never taken part in any armed fracas during their lives. This provides strong scientific backing to proposals that weapons may be utilised in prehistoric funerals to mark social identity regardless of the actual participation of the deceased in warfare (Brück and Fontijn 2013; Georganas in press).

Part II is concerned with the representation of violence and conflict in prehistoric rock art. The subject has long attracted specialist interest, mainly in the regions

where weaponry and combat iconography are concentrated. Anthropomorphic and non-anthropomorphic stelae and bedrock panels depicting warriors and their panoplies have also provided a strong focus for pan-European research on the subject (e.g. Harrison 2004; Robb 2009). The four chapters contained in this section provide valuable new data and interpretations building on this body of scholarship.

Chapter 5, by Lopez-Montalvo, discusses the chronology and interpretation of the depictions of violence in Spanish Levantine rock art. The article cuts through to the heart of a long-standing debate concerning the origins and early developments of this remarkable pictorial tradition, which has thus far resisted direct scientific dating (López-Montalvo et al. 2014). Three main hypotheses have been put forward to explain its origins: (1) the rock art was produced by indigenous Mesolithic foragers as a response to the 8.2 ka BP (*c*.6200 BC) global cooling event; (2) it resulted from the first encounters between indigenous Mesolithic foragers and incoming Neolithic settlers in the mid-6th millennium BC; or (3) it is rooted in the social dynamics of fully settled Neolithic populations in the subsequent millennia. Drawing on rock art panels representing interpersonal and intergroup violence, the author builds a multipronged argument to refute the first and second hypotheses. She argues instead that considering hitherto overlooked superimpositions of paintings, the developmental sequence of the Levantine stylistic horizon, the complex military tactics portrayed on the panels, and the overall archaeology of the region, this outburst of representational art can only be explained in the context of a full-fledged agrarian society. While the debate over the chronology of Levantine rock art is likely to continue until the paintings can be dated directly, the article does show how the careful interpretation of combat scenes can shed new light on issues of social organisation in prehistoric contexts.

The next three chapters discuss southern Scandinavian rock art; they tackle the subject from differing theoretical and methodological standpoints. In Chap. 6, Horn deploys the concept of pragmamorphism – or the infusion of body parts with the qualities of objects (Derman 2012) – to interpret a group of ambiguous images in which human bodies merge with boats and weapons. He argues that these are not accidental superimpositions or mere upgrades of the original depictions by later carvers. Based on an in-depth re-examination of the engravings, he maintains that these images must be understood as conscious attempts to imbue human beings with the defining characteristics of certain iconic objects, such as the sword's capability to cut through the flesh or the boat's speed. The hyper-masculinity and overt sexualisation of many such images tinge Horn's interpretation with disturbing overtones, which he invites us to incorporate into our readings of the past – unpalatable as they might be to modern sensibilities.

In Chap. 7, Bertilsson re-examines Bronze Age rock carvings of spears, some of which are wielded by unusually large human figures. Using Structure from Motion (SfM), an image-based 3D modelling technique, he is able to discern several phases of carvings of the spear images, some being significantly older than hitherto acknowledged. Crucially, the new 3D documentation shows that the human figures, where present, were carved long after the earliest spear images. This allows him to shift the focus of the analysis from the human beings to the spears themselves,

which, it would now appear, are the most salient objects on the panels. To explain their centrality and long biographies, Bertilsson argues that the carved spears might be interpreted as the precursors of Odin's own spear 'Gungnir', dating from a time preceding the emergence of anthropomorphic deities in the Nordic pantheon. The article shows how sophisticated contextual readings can be arrived at when scientific methods of analysis are driven by clear research questions.

Chapter 8, by Ling and co-workers, investigates the relationship between rock art, secret societies, long-distance exchange, and warfare during the Nordic Bronze Age. Southern Scandinavian rock carvings frequently depict weapon-wielding warriors standing in or near watercraft. As argued by the authors, this motif arose at a time when coastal communities participated in long-distance exchange for the procurement of metal. Grounding their interpretation in ethnohistorical and ethnographic data, they argue that the metal trade was made possible by the establishment of secret societies and fraternities of warriors. Not only were members of these societies tasked with protecting the valuable merchandise by force, if necessary; they would make the very existence of the trade possible, for this – the authors submit – was predicated upon access to a body of restricted esoteric knowledge, which would be revealed to the initiated during ceremonies involving the carving of petroglyphs.

Part III explores the material culture of conflict through combined archaeological and scientific methods of analysis.

Drawing on her decade-long research on the subject (Mödlinger 2017), Mödlinger provides a critical overview of European Bronze Age body armour in Chap. 9. Firstly, she clarifies the chronological and technological evolution of bronze helmets, greaves, and cuirasses. Secondly, she investigates aspects of manufacturing technology by means of chemical and metallographic analysis, informed observation, and experimental archaeology. Finally, she puts forward insightful remarks concerning the uses and life histories of these objects based on wear analysis. Such a seamless archaeological-scientific approach to research results in a fresh appraisal of this class of objects. Overall, the importance of Mödlinger's work lies in bringing body armour research on a par with studies of early metal weapons – objects that have enjoyed a much longer history of interdisciplinary research. This will undoubtedly lead to more balanced and holistic appraisals of Bronze Age warriorhood in years to come.

In Chap. 10, Molloy lends his considerable subject knowledge to the exploration of the life histories of Bronze Age weaponry from the Balkans. His approach originally integrates compositional and metallographic analysis, wear analysis, experimental archaeology, and a function-oriented critical review of typology. The outcome is an insightful discussion of the social mechanisms by which ideas about style and function were exchanged and materialised, away from the 'tyranny of ethnography' (Haas and Piscetelli 2013). This is made all the more interesting by his regional focus on the Balkans, a node of communication and exchange lying at the crossroads between central Europe and the eastern Mediterranean.

Whereas Molloy's article is in many respects the outcome of decades of investigations into Bronze Age weaponry, Cao's chapter stands at the opposite pole of the

research spectrum for being the first ever exploration of the manufacture, use, deposition, and post-depositional history of copper-alloy weapons from late Shang China (*c*.1200–1050 BC) by means of wear analysis (Chap. 11). Despite the pioneering character of the enquiry and the small sample size, her research succeeds in showing that metalwork wear analysis can profitably be applied to the study of early Chinese bronzes. Significantly, it also shows the ability of this analytical technique to challenge and redefine entrenched research agendas. As Cao argues throughout the chapter, metalwork wear analysis is especially adept at questioning dichotomised readings of 'function' and 'style' and enables nuanced explorations of the complex life histories of ancient bronzes (see also Dolfini and Crellin 2016).

In Chap. 12, Birch explores a single weapon type from the famous Late Iron Age 'war booty' sites of southern Scandinavia: the Havor lance. This is a distinctive iron/steel spear point that has traditionally been considered a standardised product (Ilkjær 1990). Building upon recent research on the subject (Birch and Martinón-Torre in press), Birch investigates whether this is the case. His multidisciplinary approach to the problem involves traditional metric analysis, innovative geometric morphometric analysis (GMM), metallography, and X-radiography. The research reveals that the Havor lances were made using a remarkably uniform construction technique, which the author dubs the 'spiral-form' method. This is in accordance with previous metric and morphometric observations suggesting the lance to be a highly standardised weapon product. However, metallography also reveals that the analysed specimens have non-uniform alloy compositions and microstructures. Such a glaring discrepancy between the appearance and the make-up of the lances presents us with a complex scenario whereby all weapons would be manufactured by one, or very few, workshops, but the iron stocks used in their making would come from disparate sources in modern-day Denmark and southern Norway. As Birch argues, this highlights hidden tensions between the craftspeople's desire to create a highly uniform product and the vagaries of iron procurement in late prehistoric Scandinavia.

Part IV discusses past social understandings of prehistoric armour and weapons, contemporary approaches to their investigation, and the interpretations stemming from both.

In Chap. 13, Crellin and co-workers appraise experimental weapon studies based on their recently concluded 'Bronze Age Combat Project'. Replica weapon testing is proving increasingly popular as a method for investigating ancient fighting practices (e.g. Anderson 2011; Atzeni 2016; Dean 2017; Dyer and Fibiger 2017; Molloy 2007b, 2009; O'Flaherty 2007; O'Flaherty et al. 2011). As the authors maintain, however, the development of this research approach has not been accompanied by a sufficient amount of critical reflection concerning its advantages and shortcomings. They identify current overreliance on historic combat styles as a particularly acute problem, which curbs the ability of researchers to explore prehistoric fighting styles that may be radically different from historic ones, as well as weapons lacking modern counterparts (e.g. Bronze Age halberds; Horn 2014: 174–182). By critically

scrutinising their own approaches to weapon testing, the authors try to disentangle the multiple context-specific factors affecting experimental weapon research and chart a new, if tentative, pathway bridging controlled laboratory tests and 'fluid' body-centred field experiments.

In Chap. 14, Lehoërff provides a thoughtful reflection on the concept of value in archaeological discourse. She investigates value from the standpoint of Bronze Age metal cuirasses from French hoards, with which she has a long acquaintance. In the chapter, Lehoërff postulates a formalised three-agent relationship between bronzesmiths, combatants, and commissioners, which would determine armour production choices in Late Bronze Age Europe. Based on archaeological and metallurgical considerations, she posits that the amount of specialist skill and sheer labour involved in their manufacture reveals that prehistoric communities would have invested these objects with social, as well as technological, value. This interpretation would be further supported by the extended life cycles of many a cuirass, encompassing use on the battlefield, curation, and ritualised deposition in hoards. Such observations let her conclude that Bronze Age cuirasses would have materialised deep-seated ideas of value, which informed high-end technological craftwork and the martial ethos surrounding it.

In Chap. 15, Aranda Jiménez provides new ammunition to a long-standing dispute concerning the nature of Early Bronze Age Argaric society, southeast Spain. This pitches historical materialists, who consider Argaric culture as the epitome of prehistoric socio-political complexity in the western Mediterranean (Chapman 2003; Lull et al. 2011, 2014), against researchers of differing theoretical inclinations, who tend to highlight the symbolic rather than political dimensions of material culture (Aranda Jiménez et al. 2015). The author firmly places himself in the latter camp. In the article, he argues that an impartial examination of Argaric fortifications, weaponry, and skeletal trauma hints at a picture which is at variance with prevailing narratives of warlike Early Bronze Age elites. For him, Argaric violence was exercised in a context of ritualised or highly regulated resolution of conflict, characterised by few or no fatalities. While his controversial proposal is unlikely to bring the regional dispute to an end, it does provide a valuable contribution to current debates regarding the nature of prehistoric violence and its role in the development of complex societies (Campbell 2014).

The volume is concluded by Schulting, who discusses the application of scientific methods of analysis to conflict studies (Chap. 16). He places the emphasis on recent advances in the field of biomolecular archaeology applied to human remains, most notably isotopic analyses, ancient DNA, and radiocarbon dating. He argues that, if applied reflexively and integrated with one another, these techniques have the potential to address crucial questions regarding the nature and social context of prehistoric lethal aggression including the identity and origins of the victims. As he points out, however, in and of themselves, methodological advances are not going to improve our understanding of the human past. This can only be achieved by grounding archaeological and osteological investigations within theoretically informed enquiries and broad, interdisciplinary research agendas.

Towards a Multipolar Future for the Study of Warfare and Violence?

In recent years, research into intergroup violence in prehistoric and preliterate societies has moved away from polarised approaches, which pitched against one another believers and non-believers in its antiquity and role in human evolution, towards a generalised consensus as to its presence in nearly all human societies. Although its nature, role, and significance are still hotly debated, lethal aggression is now firmly back on the agenda of social enquiries in both archaeology and anthropology. At the same time, however, the subject has splintered into at least five specialist research strands, namely, the study of trauma and injury on human skeletal remains; representations of conflict and weaponry in various media such as rock art and stelae; armour and weapon studies; the architecture of conflict including hillforts, fortifications, and defended sites; and the analysis of intergroup violence as documented in ethnographic, ethnohistorical, and historical sources (Armit et al. 2006; Thorpe 2013). To these, we can perhaps add the fledgling field of prehistoric battlefield and battlescape archaeology, recently triggered by the discovery of the Tollense Valley extended site (see above).

As we have argued above, such an embarrassment of riches is to be welcomed as a sure sign of disciplinary maturity; yet it has also caused specialist fields of enquiry to grow more entrenched and has hindered communication across disciplinary boundaries. Faced with a bipolar past and a fragmented presence, what can researchers of prehistoric warfare and violence hope for the future? The papers published in this volume help us to discern what lies ahead. They point, in particular, to an emergent multipolar future, in which approaches grounded in specific research areas are to be fertilised by methods, data, and questions developed in related fields. This is especially true of 'traditional' qualitative approaches (grounded in the humanities and social sciences) and 'novel' scientific advances (grounded in quantitative methods of analysis), which seem inescapably set to interact with one another not just more frequently but also more deeply and meaningfully than has hitherto been the case.

Considering the research presented in this book, three interrelated lines of development can be fathomed. The first is the creation of bespoke, surgically targeted approaches to the enquiry. As the questions driving the research become increasingly sophisticated, and the scientific methods of analysis available to us grow ever richer, a tendency is emerging towards carefully calibrated, tailor-made research approaches, which utilise multiple scientific and non-scientific techniques of analysis to address specific problems. Examples of this strategy abound throughout the book. Suffice it to mention here the combination of weapon tests on animal bone targets, 3D imaging, 3D reconstructions, and digital injury simulation pursued by Brinker and her team to discriminate between ranged and handheld penetrating injuries from the Tollense Valley skeletal material (Chap. 3); or the multipronged approach favoured by Birch, which involves the use of traditional metric analysis, innovative geometric morphometric analysis, metallography, and X-radiography.

As discussed in Chap. 12, he deploys these techniques to test unsubstantiated hypotheses concerning the standardised manufacture of a particular type of lance head in later Iron Age Scandinavia. This is no idle question, as it holds the key to addressing broader problems concerning the *chaîne opératoire* of iron production, and who controlled it, in a rapidly evolving society.

The second is the elaboration of fresh fields of analysis and research questions bestowing new enquiring capabilities on the subject. The last 20 years have seen studies of prehistoric warfare and violence, especially in European archaeology, move away from simplistic research agendas towards more sophisticated realms of social and scientific analysis. The cutting-edge research presented throughout the book indicates that the continuing journey has been highly beneficial. Scholars are no longer satisfied with making the case for the presence/absence of violence in a given society, or interpret it based on ethnohistorical categories (Is it raiding? Is it feuding? Or can we label it warfare?). They now want to dig deeper into the evidence in order to understand the nature of lethal aggression, its social significance, and the practices by which it was enacted, as revealed by human and material agents. How many people participated in a Bronze Age battle, and how were they armed? How did they fight with these weapons? And how can we reinterpret weapon burials away from well-trodden readings of warrior aristocracies and elite culture? These are but some of the questions explored in the book, and it seems likely that their number and sophistication will steadily increase in years to come.

The third is the ability of scholars to frame their enquiries using mature social questions and link them meaningfully with other research fields in archaeology. How is violence encultured and socialised? Can we infer the nature of conflict in a given community and, in turn, use our inferences to understand its social organisation? Can we address broader concepts including value, skill, and past ideas of the body by investigating the material culture of violence and its social realities? And can we arrive at a more holistic understanding of prehistoric societies by fertilising data concerning subsistence, mobility, and culture change with the growing amount of evidence of intergroup violence? This doubtless is the most challenging of the three research strands, for its exploration necessitates in-depth engagement with contemporary social theory as well as sustained cross-disciplinary dialogue and interaction. Yet it is also the one bearing the ripest fruits for scholars in both archaeology and anthropology.

We sincerely hope that this book will contribute to the future development of the subject by showing what can be achieved by cross-fertilising state-of-the-art scientific methods of analysis with archaeological and anthropological theory, and use both to address theoretically informed research questions.

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Part I
Skeletal Markers of Violence and Weapon Training

Chapter 2
Patterns of Collective Violence in the Early Neolithic of Central Europe

Christian Meyer, Olaf Kürbis, Veit Dresely, and Kurt W. Alt

Introduction

Violence targeted at the integrity of the human body may affect both individuals and populations and may be intentionally lethal or non-lethal, depending on scale and specific context. Compared to indirect archaeological evidence of violence, like weapons or defensive structures (Christensen 2004), the human skeleton is the sole direct indicator for violent episodes targeted at people that actually occurred in the prehistoric past and which thereby may provide insight into their social meanings (Martin and Harrod 2015). While isolated cases of individual victims of violence are known for several species of fossil hominids (e.g. Zollikofer et al. 2002; Wu et al. 2011; Sala et al. 2015), the archaeological evidence for collective violence, or warfare, defined here as the conscious application of potentially lethal violence by independently acting groups against other such groups, is currently restricted to roughly the last 10,000 years (e.g. Mirazón Lahr et al. 2016). This is likely influenced, in part, by the nature of the archaeological record itself, as the number and density of sites in any given area or time period are not uniformly distributed, and

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sites with preserved human remains become ever sparser with increasing antiquity, thus reducing our chances to uncover solid archaeological evidence for group violence.

In Central Europe, cemeteries or other sites containing high amounts of skeletons only became numerous with the advent of the Early Neolithic and its main cultural group, the *Linearbandkeramik* (hereafter LBK; *c*.5600–4900 BC). This is also the time when victims of violence become much more visible in the osteoarchaeological record. This is especially true of the victims of collective lethal violence, for which the LBK has become almost notorious since the discovery of the first Early Neolithic massacre mass grave at Talheim, Germany (Wahl and König 1987; Wahl and Trautmann 2012). Since then, several other such sites have been found and analysed. In fact, the number of individuals excavated from currently known LBK mass violence sites is such that it now allows quantitative analysis. This may be informative not only about the style of warfare practised at the time, and of the weapons used (Wahl and Strien 2007), but also about the demography of victims as well as warfare-related practices such as torture, dismemberment, and mutilation, in short, about the patterns of collective violence practised by the first farmers of Central Europe.

As shown by numerous ethnographic and archaeological studies of ancient warfare, the conscious decision to attack and violently kill others often has its ultimate roots in real or imagined competition over geographically situated and limited resources. This is especially common at times of climatic instability, when the survival of the group is perceived to be threatened by fluctuating and thereby unpredictable, agricultural productivity (e.g. Maschner and Reedy-Maschner 1998; Otterbein 2004). However, unravelling the context of each act of collective violence becomes all the more challenging with increased antiquity due to the paucity of corroborating information. When considering chronologically remote prehistoric societies, whose environments, worldviews, and perceptions of themselves and others are largely unknown to us, interpretation is difficult and will always remain speculative, at least partly. Nevertheless, robust insights into past societies and the violent events that impacted on them (both as individuals and as members of victimised groups) may be gained by grounding our analyses and interpretations in observable and objectively describable patterns. This chapter attempts such an analysis based on the human skeletal record for collective lethal violence in the Early Neolithic of Central Europe.

Burial and Violence in the Linearbandkeramik

Generally, the identification of patterns of violence is grounded in the reliable recognition of past violence itself. In bioarchaeological terms, this may be evident from either skeletal injuries or the context in which the human skeletal remains of suspected violence victims are found – and occasionally from both (Martin and Harrod 2015). Especially if skeletal remains and burial features are adversely affected by taphonomic damage, opinions are sometimes divided as to what constitutes reliable evidence for lethal violence and what is simply the result of naturally

occurring diagenetic processes (e.g. Mirazón Lahr et al. 2016; Stojanowski et al. 2016). Without going into too much methodological detail here, which would be beyond the scope of the present paper, perimortem skeletal trauma and deviant deposition have to be evaluated as objectively as possible and always within their specific context.

For the LBK, there is a near-perfect overlap between the two, as individuals with lethal perimortem injuries are mostly found as part of larger groups in disorganised mass graves or as scattered remains at conflict sites (Wahl and König 1987; Teschler-Nicola et al. 1999; Meyer et al. 2015a). These depositional contexts differ greatly from the usual single inhumation burials of the LBK, which are mainly characterised by the careful arrangement and patterned orientation of the bodies within dedicated cemetery areas. Furthermore, these graves often contain distinctive grave goods such as pottery, stone tools and weapons, and bone and shell artefacts (e.g. Nieszery 1995). Cremation burials are also known in the LBK, which show significant amounts of care and energy expended in their making (Trautmann 2006). In contrast, all mass graves and massacre sites lack any recognisable evidence for a similarly elaborate treatment of the dead, as bodies were deposited in a disorganised and commingled manner without any recognisable care, if indeed they were gathered in one spot at all. At times, the dead were not deposited in cemeteries but within settlement sites (Meyer et al. 2014). However, the mass graves discussed in this chapter do not fall into this category either due to the higher number of bodies relative to the settlement burials and their seemingly careless disposal. The practice of burying the dead within villages is now understood to be just another type of normative burial in the LBK mortuary "portfolio", which likely aimed at providing the deceased with a respectful funerary treatment (Meyer et al. 2014). Although cemetery and settlement burials seem to differ slightly regarding demography and the number and frequency of durable grave goods (Hofmann 2009), they are overall very similar, and sometimes the distinction between them is blurred, for example, when burials are arranged in a cemetery-like pattern within a settlement site (e.g. Krause 1998; Fritsch et al. 2008).

If compared with the normative cemetery or settlement burials, be they cremation or inhumation, the mass graves, as a group, may therefore be regarded as deviant burials, which apparently followed devastating and traumatic events (Meyer et al. 2014; Hofmann 2015) including massacres (i.e. the violent killing of one group of people by another within a very short time and during more or less chaotic circumstances; cf. Dwyer and Ryan 2012) and mass execution (i.e. the systematic killing of restrained victims for reasons deemed more pragmatic than ritual; cf. Otterbein 2000; Meyer et al. in press).

Although individuals showing healed skeletal injuries were sometimes interred in traditional cemetery burials, the victims of lethal violence were only rarely included in such burial sites by LBK communities (Petrasch 2006; Bickle and Whittle 2013). A possible reason for such a differential treatment might be that their social units had been destroyed during collective violence events, leaving the disposal of the corpses to others, perhaps even the perpetrators of the violent acts. These "others" would not be expected to invest the same amount of care and effort into the post-mortem

treatment of the deceased, especially if there were larger numbers of them to be disposed of. However, the one LBK mass grave without recognisable perimortem skeletal trauma, namely, Wiederstedt, suggests that disorganised mass graves were possibly also used to quickly dispose of large numbers of deceased from one's own community under special circumstances (see below). This may be the case with victims of epidemic disease, starvation, accidental poisoning, or a variety of other accidents and natural catastrophes, which possibly overtaxed the capacity of the surviving community for arranging a proper burial (Meyer et al. 2014).

It is currently unclear whether violently killed people that were not part of mass fatality events received a special treatment in LBK society, as their overall numbers are still too low for meaningful interpretation (Bickle and Whittle 2013; Fibiger 2014). In isolated cases of cranial trauma, it is also difficult, and sometimes impossible, to differentiate between injuries suffered by accident and injuries resulting from interpersonal violence with a lethal intent.

This short summary of the relationship between violence and burial within the LBK shows that – as far as we currently know – the victims of collective lethal violence were usually deposited simultaneously, as a group, and in a deviant manner vis-à-vis the regular and mostly individual burials found in coeval cemeteries and settlements. Additionally, the precisely contemporaneous nature of the mass fatality population samples allows detailed insights into their demographic structure. This kind of information is especially important as it is not normally preserved in traditional burial sites, which lack the unique "snapshot" element of the mass burials (Bentley et al. 2008; Meyer et al. 2014).

Sites of Collective Violence and/or Deviant Mass Burial

The LBK mass burial sites, which, for the most part, have provided evidence for prehistoric massacres (apparently the most frequent form of lethal perimortem collective violence within LBK communities), are well described in the archaeological literature. For this reason, this chapter solely provides a brief presentation of these sites (Fig. 2.1), focussing in particular on the human skeletal remains and their cranial injuries, which are the sole lesions to be numerous enough to allow for comparative analyses. Further details are available from the literature cited, which include the original site reports as well as key comparative and analytical works. Only the mass grave site of Halberstadt, Germany, will be presented here in more detail, as it is the most recently discovered and analysed LBK mass fatality site and also displays a unique pattern of demography and skeletal injury (Meyer et al. in press). This mass grave will then be compared to the other sites (all listed below in the chronological order of their discovery), and the results of this comparison will be discussed, paying special attention to key similarities and differences in the osteoarchaeological quantitative data.

Fig. 2.1 Map of Germany and Austria showing the LBK sites mentioned in the chapter. The mass fatality sites are depicted by solid circles and capital letters, while the other sites discussed in the chapter are marked by open circles and lower case letters. **A** Talheim, **B** Asparn/Schletz, **C** Wiederstedt, **D** Schöneck-Kilianstädten, **E** Halberstadt, **f** Herxheim, **g** Tiefenellern, **h** Vaihingen/Enz (Image: Christian Meyer)

Talheim, Germany (Fig. 2.1, Site A) (Wahl and König 1987; Wahl and Strien 2007; Wahl and Trautmann 2012)

The first evidence of lethal mass violence from the LBK came with the discovery and analysis of the disorganised mass grave at Talheim in southwestern Germany. At this site, about 34 individuals, including similar numbers of subadults and adults of both sexes, were deposited in a pit near a probable LBK settlement. Slightly over half the skeletons showed perimortem injuries consistent with the typical ground stone weapon tools of the LBK. Most traumatic lesions were found on the parietal bones of the skulls, while the frontal and occipital bones were affected to a much lesser degree and almost equally. Overall, the right side of the skull showed slightly more injuries than the left, which might suggest that the victims were, in part, struck down from behind by right-handed attackers while fleeing. As the left half of the frontal bone is the least affected of the major skull bones, a classic face-to-face confrontation seems to have been unlikely for most individuals. Otherwise, the left frontoparietal region would likely be the one with the most injuries, as indicated by various studies of the distribution of cranial trauma (e.g. Fibiger et al. 2013). In any case, the pattern of cranial injuries encountered at Talheim, with all major cranial vault bones affected repeatedly, suggests that the blows were received during a largely uncontrolled situation, in which both victims and attackers were likely able to move about without significant restraint.