

Bioarchaeological Contributions to the Study of Violence

Debra L. Martin^{1*} and Ryan P. Harrod²

¹*Department of Anthropology, University of Nevada, Las Vegas, NV 89119*

²*Department of Anthropology, University of Alaska, Anchorage, AK 99508*

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ABSTRACT The bioarchaeological record has an abundance of scientific evidence based on skeletal indicators of trauma to argue for a long history of internal and external group conflict. However, the findings also suggest variability, nuance, and unevenness in the type, use, and meaning of violence across time and space and therefore defy generalizations or easy quantification. Documenting violence-related behaviors provides an overview of the often unique and sometimes patterned cultural use of violence. Violence (lethal and nonlethal) is often associated with social spheres of influence and power connected to daily life such as subsistence intensification, specialization, competition for scarce resources, climate, population density, territorial protection and presence of immigrants, to name just a few. By using fine-grained biocultural analyses that interrogate

trauma data in particular places at particular times in reconstructed archaeological contexts, a more comprehensive view into the histories and experiences of violence emerges. Moreover, identifying culturally specific patterns related to age, sex, and social status provide an increasingly complex picture of early small-scale groups. Some forms of ritual violence also have restorative and regenerative aspects that strengthen community identity. Bioarchaeological data can shed light on the ways that violence becomes part of a given cultural landscape. Viewed in a biocultural context, evidence of osteological trauma provides rich insights into social relationships and the many ways that violence is embedded within those relationships. *Yrbk Phys Anthropol* 000:000–000, 2014. © 2014 Wiley Periodicals, Inc.

HUMANS HAVE A HISTORY OF VIOLENCE AND VIOLENCE HAS A HISTORY¹

This review provides a broad perspective on violence from studies looking at human skeletal remains (e.g., bioarchaeology, paleopathology, and forensic anthropology). Violence is a phenomenon that is found in varying expressions in all cultures stretching back to the Paleolithic (Bocquentin and Bar-Yosef, 2004; Estabrook and Frayer, 2014) and possibly farther (Antón, 2003; Kimbel and Deleuzene, 2009). Having worked in the area of ancient violence for a number of years we approached this review as a way to offer new frameworks for thinking about violence in the past from the perspective of biological or physical anthropology, which like all other fields of study in anthropology, is scientific, comparative, and cross-cultural in approach.

Many researchers use a variety of terms interchangeably such as violence, conflict, and aggression. Our own personal preference is to avoid using the term aggression for humans because it is often used in animal studies and does not imply a connection to culture or to meaning. This is an important distinction because aggression does not always translate into violent behavior. Definitions of violence often imply intentionality, motivation, and culturally defined meaning. What is considered violence in one culture may not be in others. Violence is often socially sanctioned and organized but aggression need not be. Violence can be individual or collective but aggression more often is analyzed at the individual level.

Why is this important? Despite the best efforts of anthropologists and others to undue the years of questioning if violence was solely shaped by nature (genetics) or nurture (cultural practices), or if early humans were instinctively more Hobbesian (violent) or Rousseauian (peaceful), this binary still foreshadows scientific scholarship (Ahlström and Molnar, 2012) and is a major theme in many of the newest popular books that address the topic (e.g., Pinker, 2011; Chagnon, 2013; Diamond, 2013; Wade, 2014). Debates over whether societies are inherently violent or not were especially apparent with the emergence of the “killer ape” hypothesis in the 1950s and 1960s (Dart, 1953; Ardrey, 1961) and the reaction to Napoleon Chagnon’s (1968) work with the Yanomamö. Both of these examples are highlighted because they have been heavily critiqued (see Ferguson, 1995 for a response to Chagnon’s assertion that violence was part of the Yanomamö culture). This tension among anthropologists themselves suggests the slipperiness of naming, studying and identifying violence in contemporary groups and it provides a cautionary note for those working with ancient groups. In a recent blog (<http://www.psychologytoday.com/blog/busting-myths-about-human>

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*Correspondence to: Debra L. Martin, Department of Anthropology, University of Nevada, 4505 S. Maryland Parkway Box 455003, Las Vegas, NV 89154-5003, USA. E-mail: debra.martin@unlv.edu

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¹Ray, Larry (2011) *Violence and Society*. SAGE Publications Ltd, New York, p. 3.

nature/201410/dump-naturenurture) authored by biological anthropologist Augustin Fuentes titled “Dump Nature/Nurture” he writes: “This pattern of pitting biology and evolution versus culture and life experience is a giant mistake. The two realms are not separate from one another and the dichotomy keeps us from getting at better, albeit more complex, answers about why we do what we do.” This is true in studies of human violence that seek to understand and explain complex human behaviors.

Reductionary approaches using nature/nurture binaries are especially apparent in research looking into the origin and evolution of ancient violence using fossil data (e.g., Keeley, 1996; Gat, 2006; Corning, 2007) and primate ethology as an analogue for human behavior (Wrangham and Peterson, 1996; e.g., Boehm, 2011; Wrangham and Glowacki, 2012). And increasingly there are popular notions about the root causes of violence presented in the popular media. Prominent examples include the genetic basis for violence and the “warrior gene” (see Wensley and King, 2008; Gillett and Tamatea, 2012 for a discussion of the problems associated with trying to link a specific gene to violent behavior) and scholarship from other disciplines on the biological basis of violence (e.g., Cordero et al., 2012; Raine, 2013; Pardini et al., 2014).

Counter to the violence-is-in-our-genes narrative is the argument that biology, culture and environment interact to produce a wide range of social behaviors of which violence is one among many others (Shackelford and Weekes-Shackelford, 2012; Fry, 2013b, Fuentes, 2013). Additionally, the scientific evidence is mounting as multiple lines of evidence (DNA, fossil, modeling) are being used to reconstruct early hominin behavior demonstrating that if humans have a natural predilection towards any behavior, it is more likely the flip side of violence, cooperation (Fuentes, 2013:87). As such, it is nearly impossible for scholars interested in the origin and evolution of violence to provide any kind of unifying theory on the occurrence of violence (or the lack of violence) used by humans. There is simply too much variation to be explained by nature/nurture or even by evolutionary theory.

Many theorists are moving towards frameworks that use historical contingency, agency, conflict theory and other social theories that better explain individual case studies and comparative data (Nielsen and Walker, 2009a; Erdal and Erdal, 2012). [This review does not cover war and warfare in the traditional sense of militarized standing armies, which is a much more recent phenomenon in human history (Fuentes, 2013). However, small scale fighting, raiding, and male coalitional fighting is discussed.] Neil Whitehead’s (2005) work on violence indicates that warfare and violence are “expressive human behaviors” that should be studied in the ways that other cultural activities are studied in terms of representation, symbolism, meaning and ideology. The importance of seeing the cultural nature of violence is also highlighted by Douglas Fry who provides an overview of violence and argues that there is “... tremendous cross-cultural variation in aggression ... nonviolent cultures exist, as do a range of more violent ones” (1998). He suggests that viewed temporally, violence and nonviolence can dramatically change over time (Fry, 1998). To support his statement that nonviolent societies exist he cites the Semai in the mountains of Malaysia where researchers found little evidence of violence (Robarchek and Dentan, 1987; Robarchek and Robarchek, 1998). However, the

lack of violence was occasionally disrupted by cases of lethal violence in the form of homicide (Knauff, 1987:458). Nick Thorpe sums up the problem after an exhaustive review of various evolutionary and anthropological approaches to violence by suggesting that “... the greater the degree of variability observed, both within a single society and between different societies, the more difficult it is to fit all [violence] into any overarching structure” (Thorpe, 2003). We agree with Robert Sussman when he concludes that “... ultimately, differences in the expression and frequency of violence among humans will be explained, mainly, by differences in their culture and enculturation, and in their environment, and not in their biology and genetics” (Sussman, 2013).

THE STUDY OF HUMAN SKELETAL REMAINS – BIOARCHAEOLOGY, PALEOPATHOLOGY AND FORENSIC ANTHROPOLOGY

Data from human skeletal remains provide evidence supporting ethnographic research that suggests the culturally constructed nature of violence (see Whitehead, 2004b for ethnographic examples). Preserved skeletonized bodies/body parts can be analyzed as biological specimens, as artifacts, and as symbols. The body is biomechanically and culturally shaped, historically situated, and subject to varying social processes (Joyce, 2005; Sofaer, 2006; Geller, 2009). Reading traumatic injuries on the bones, whether the researcher is a bioarchaeologist, paleopathologist, or forensic anthropologist, can offer insights into violent encounters and provide a unique contribution to understanding the meaning of violence among past human groups (Walker, 2001; Martin and Harrod, 2012b).

Although the focus of this review is on human remains in the bioarchaeological record, it is informed by theories and methods used by anthropologists to better understand and explain human behavior. The field of bioarchaeology traditionally focuses on modern humans from the last 15,000 years or so (late Paleolithic, Mesolithic) with more emphasis on 10,000 years ago (Neolithic) to historic times simply because there are many more human remains from the Neolithic onward. Recent scholarship in bioarchaeology is proving that violence is a culturally mediated form of complex behavior similar to other complex behaviors like religion or politics. What is emerging in the bioarchaeological literature on violence is consistent with ideas from the other social sciences. Larry Ray succinctly sums this up when he writes that “... violence has been ubiquitous in human history but like all other forms of human behavior it has been socially and culturally organized and varies greatly in its nature and extent over time and between societies” (Ray, 2011). Case studies in edited volumes such as *The Bioarchaeology of Violence* (Martin et al., 2012a) and *The Routledge Handbook of the Bioarchaeology of Human Conflict* (Smith, 2014) aptly demonstrate that violence is found in a wide variety of forms and expressions, and it appears to be historically contingent and specific to time and place.

The development of the biocultural approach in biological anthropology has greatly benefitted bioarchaeology by providing an integrating framework for inclusion of cultural and environmental context (see Martin et al., 2013 for an in depth review of the biocultural framework applied to bioarchaeological studies). The study of human remains (largely in the form of skeletonized bodies and body parts) is of value because it provides

time depth on morbidity and mortality as well as information on biocultural interactions that complements other subdisciplines (Zuckerman and Armelagos, 2011). [This review only deals with skeletonized human remains. While mummified human remains are sometimes available for study, the vast majority of the studies world-wide are based on bones and teeth]. Armelagos and coworkers provide a concise overview of the ways that bioarchaeology fits within the broader anthropological mission (Armelagos, 2003; Zuckerman and Armelagos, 2011).

What has developed is a body of scholarship in bioarchaeology that examines the interaction between ancient biology, environment, cultural innovation, and change over time. Researchers using this paradigm demonstrate that violence is best understood as a form of social behavior (Boehm, 2013; Kelly, 2013). Research into the origin and long history of violence in human groups relies on biological evidence of trauma but equally on reconstructing the cultural milieu and social relationships using a variety of sources such as ethnology, the Human Relations Area Files (HRAF) and other sources (Keeley, 1996; Martin and Frayer, 1997; Guilaine and Zammit, 2005; Gat, 2006; Potts and Hayden, 2008).

Biological anthropologists studying human skeletal remains have crafted and fine-tuned a large arsenal of methods to extract information from human skeletal remains (Larsen, 1997; Martin and Frayer, 1997; Larsen, 2001; Walker, 2001; Larsen and Walker, 2010; Gowland and Thompson, 2013; Wedel and Galloway, 2013; Martin and Anderson, 2014) but the interpretation of that information from the bones can only be undertaken using theoretical frameworks that offer a way to organize and think about the information. The heart of this review focuses on selected findings and interpretations offered by bioarchaeological studies on the social role and cultural meaning of different forms of violence in ancient small-scale human groups. We end the review with where we see research involving human remains progressing, and offer some new directions and approaches to the study of violence.

Defining the concept of violence

Violence is both easy and difficult to define. The easiest and most common definition of violence is that it is behavior involving physical force intended to hurt, damage or kill someone or something (http://www.oxforddictionaries.com/us/definition/american_english/violence). Social scientists often add to this basic definition that it can cause not only bodily harm but also psychological, sexual or emotional harm as well (Stanko, 2001) but physical violence is often the *de facto* definition used by many researchers. Research on violence among human groups is a focus of a number of different disciplines including criminal justice, psychology, sociology, philosophy, public health, and history. Many of these disciplines attempt to understand and explain the history of violence in terms of current social and political contexts. Henrich et al. (2010) convincingly demonstrate that most behavioral science theory is built upon research that examines a narrow sample of modern human cultural variation. The result of this approach is a partial and often blurry snapshot of violence that offers little in the way of explanatory power. Much of the research using contemporary societies is of limited value in that it often fails to explain violence on any appreciable level (Fry,

2013a). The consequence of this is often an explanation for violence as aberrant behavior that deviates from the norm; anthropological studies, in contrast, view violence as part of the repertoire of human behavior that can become normalized with an underlying cultural logic to it.

Thus, it is problematic that the key phrase common to most definitions of violence only focuses on intentional physical force, which implies direct person-on-person activities. Counting the number of individuals within populations and time periods that died violent deaths is one way to quantify and compare levels of physical violence within and between groups. For example, Pinker (2011) wrote over 700 pages on the history of human violence but in the book he provides no working definition of what violence is. When pressed, he provided that it was physical force with the intent to do bodily harm. He was asked in an online Q and A if inequality and various injustices were a form of violence and he replied “no”—that those were “bad things”, but not all bad things are the same as physical violence (<http://stevenpinker.com/pages/frequently-asked-questions-about-better-angels-our-nature-why-violence-has-declined>). His notion of violence is that it is physical and direct, and it can be documented by counting the number of lethal encounters. At the heart of his argument is the idea that humans on the whole are becoming less physically violent and more able to mediate social problems through other means. Much of his proof for this is frequency data that purports to show that the percentage of those who died at the hands of others have decreased in two ways, from ancient to modern times, and from WWI to the present. While there may be some truth to the declining percentage of deaths due to military and wartime combat, this is a very narrow way of viewing violence and is quite misleading (see critique by Ferguson, 2013).

Forensic anthropologists have shown that homicide and other forms of lethal traumatic injury are not always easy to identify and doing so requires precise analyses that rule out all possibilities until there is only one diagnosis (Berryman and Symes, 1998; Tomczak and Buikstra, 1999; Galloway, 1999b; Moraitis and Spiliopoulou, 2006; Calce and Rogers, 2007; Kremer and Sauvageau, 2009; Guyomarc’h et al., 2010; Spencer, 2012). The importance of understanding the limitations of identifying violence-related death in any setting, past or present, is that most of the data Pinker (2011) relies on comes from historic documentation and often the cause of death is inferred. An example of how historical records can be misleading is illustrated by the reanalysis of the skeletonized remains of the Kiel brothers who died in Las Vegas in October of 1900 (Brooks and Brooks, 1984; Crandall et al., 2014; Crandall and Harrod, in press). The importance of these two individuals is that when they died the coroner at the time ruled it to be a murder-suicide that resulted from a fight between the two brothers. Nearly a century later forensic anthropologist Sheilagh Brooks and archaeologist Richard Brooks conducted a re-analysis and demonstrated that both brothers had been murdered (Brooks and Brooks, 1984). While this case only changes the homicide count from the historic record by 1, it demonstrates how subjective cause of death analyses can be. Without autopsy and forensic records, it is problematic to rely on historic and archival reports that do not provide detailed information on the cause of death (Burton and Underwood, 2007; Palmer, 2012).

Anthropologists on the whole utilize a broader and more inclusive approach to the notion of what constitutes human violence. Physical violence is considered by many to be just the tip of the iceberg, with the major deleterious effects coming from structural violence that would include nonlethal violence (evidenced by physically healed injuries) and inequality and other “bad things” that happen to people especially if those bad things are patterned and affecting certain people and not others (Galtung and Høivik, 1971; Galtung, 1990; Farmer, 2004, 2009).

Whitehead explains that “... the idea that violent practice might be integral or fundamental to cultural practice and competency is ... difficult to accept ...” because often violence is seen as the “... absence of order and meaning, a total negation of the very idea of culture” (Whitehead, 2004a). However, when violence is viewed as part of the social fabric of human cultures, the suffering of humans at the hands of others is in fact patterned, purposeful and operationalized just as any other social system (e.g., politics, religion, economics, and subsistence). In a review of 59 articles published between 1980 and 2012 in the *American Anthropologist* that dealt with violence [recently published as a free online virtual issue; [http://onlinelibrary.wiley.com/journal/10.1111/\(ISSN\)1548-1433/homepage/virtual_issue_-_violence__anthropologists_engaging_violence_1980-2012__articles.htm](http://onlinelibrary.wiley.com/journal/10.1111/(ISSN)1548-1433/homepage/virtual_issue_-_violence__anthropologists_engaging_violence_1980-2012__articles.htm)], Dominguez (2012) divided the studies into nine categories based on different approaches to analyzing violence. A partial listing of these studies on violence include foci on torture and trauma, violations in human rights, institutionalized violence, ritualized violence, theatres of violence, social reproduction of violence, war and warfare, as well as the cultural meanings of murder, homicide, suicide, and genocide. Collectively, these anthropological studies into violence provide a persuasive tableau where violence is an intricate and deeply embedded part of everyday life, historical processes, and social relations. Violence in the research of most anthropologists constitutes the study of a cultural system that has an underlying logic to it and that operates within social relationships and institutionalized structures (Dominguez, 2012). Yet, not all violence is sanctioned or normalized, such as murder, homicide, cartel violence, or suicide. The problem is that these kinds of violence often show strong patterns and although deemed illegal or immoral, are not prevented but rather are reproduced over generations (see Reza et al., 2001; Ember and Ember, 2004). Illegal and legal forms of violence are often linked or tethered in the contemporary world (Ember and Ember, 1997) and are equally difficult to untangle for the ancient world (Erdal and Erdal, 2012).

Historical patterns and cultural context are crucial for obtaining an understanding of how and when violence is used by groups. In addition to this, the life history of individuals has to be fleshed out to the extent that it can be. This is accomplished by looking at the syndemic nature of violence. Ostrach and Singer (2013) clearly showed that during periods of warfare there were nutritional and health impacts that are not directly related to physical trauma. While the wars they were researching are state- and nation-level conflicts, we suggest that these same factors are present in small-scale conflicts as well. Thus, to understand the full effect that episodes of violence have on groups in the past it is important to examine traumatic injuries in conjunction with other factors such as age, sex, and health status.

Studying the history of violence in this complex web of human relationships is more challenging than counting

war dead, but therein lie the answer to the question: Why are humans violent? Reading the anthropological studies compiled by Dominguez (2012), one learns that bodily harm due to lack of food, sleep, clothing and shelter can be as real and as traumatic as a sword to the chest or a blow to the head. The fear of physical violence is what often keeps individuals from attempting to change the system or buck the culture (Galtung, 1990). Thus, a more difficult to examine but realistic definition of violence is needed. Our work on the topic of violence examines the ways that it can be both a detrimental and beneficial behavior within communities, and how its expression and meaning vary by context (Martin and Frayer, 1997; Martin and Harrod, 2012a; Martin et al., 2012a). While violence can be the use of power to physically injure or kill, Whitehead (2004a) has shown that there are other times when violence can be a regenerative force that leads to things like cultural renewal or regeneration. Contextualized, theorized, and compared strategically, these data can reveal much more about individual and group behaviors and helps answer the question: If violence is the solution, what was the problem?

Often peace is defined as the absence of warfare and violence, but we have written elsewhere that there is often a misnomer about what “peace” actually is in normal discourse (Harrod and Martin, 2014a). There are cases where peace is maintained through institutions and activities that enforce social control, and some of these forms of social control can produce traumatic injuries. Reconsideration of many so-called peaceful societies has shown that violence and oppressive forms of social control were often present. The most often cited example is Pax Romana (Zimmermann, 2006; Carman, 2013; James, 2013), but other examples include Pax Priista (Padilla, 2008), Pax Chaco (LeBlanc, 1999; Pérez, 2012a; Harrod, 2012a), and Pax Wari (Tung, 2007) to name a few.

BIOARCHAEOLOGICAL APPROACHES TO VIOLENCE

Biological anthropologists analyzing human skeletal remains to understand violence in its fullest and richest formulations rely on the biocultural approach and the integration of three research strategies that link data at three different levels. These include: (1) the analysis of evidential data from the skeletal remains, (2) the analysis of contextual data from reconstructions of mortuary features, material culture, environment, subsistence, political and economic structures and other aspects of the culture from which the remains are from, and (3) the use of social theory based on ethnographic work that provides an effective way of formulating and evaluating hypotheses (Fig. 1). These approaches are discussed in some depth in the following sections.

A bioarchaeological approach that incorporates archaeological and ethnographic information provides an antidote to the spatially and temporally confined studies of violence from other disciplines. It can shine a light on the nature of what violence is and how long it has existed in both our biological and cultural evolutionary history. Bioarchaeology has the potential to bridge the gap between the past and the present with scientific data that is empirical, robust, and quantifiable (Martin et al., 2012b). Bioarchaeologists engaged in research on

violence in ancient groups have much to offer in terms of being able to demonstrate the interrelatedness of violence with other aspects of culture in ways that are not possible through other disciplinary lenses.

SKELETAL DATA: EVIDENCE FROM HUMAN REMAINS

Violence both lethal and nonlethal often leaves anomalies and changes on bones that can be partially or wholly interpreted (Lovell, 1997, 2008; Galloway, 1999b; Walker,

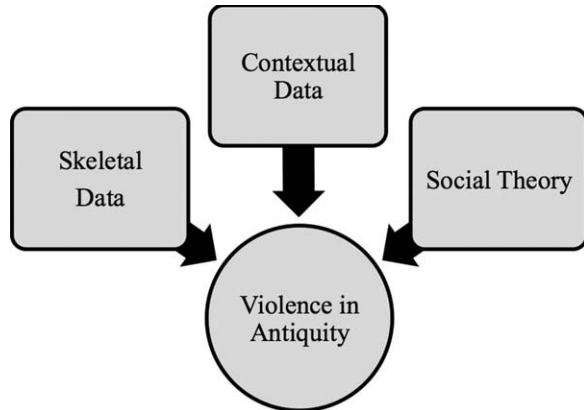


Fig. 1. Bioarchaeology of violence integrates three levels of analysis into a framework that includes skeletal evidence, mortuary and archaeological context, and social theory.

2001; Wedel and Galloway, 2013). However, there are a number of other reference materials that are useful for interpreting traumatic injuries on human skeletal remains (Reichs, 1998; Haglund and Sorg, 2002; Bass, 2005; Katzenberg and Saunders, 2008; Byers, 2010; Burns, 2012; DiGangi and Moore, 2012; White et al., 2012). It is crucial to understand that while bioarchaeologists use forensic methods, forensic anthropologists have been vocal about the care with which bioarchaeologists must interpret traumatic injuries that result from violent encounters (Jackes, 2004; Kremer et al., 2008; Kremer and Sauvageau, 2009; Guyomarc'h et al., 2010). Interpreting what is observable on ancient human skeletal remains is based on having a very detailed understanding of how the body reacts to different kinds of external forces utilizing a largely biomechanical (i.e., stress and strain) approach.

At its most basic level, mechanical loads that affect hard connective tissue (or bone) usually fall into one of five categories—compression, tension, shear, torsion and bending. Depending on the direction and force of the impact as well as the morphology of the bone, different types of fractures result (Manoli, 1984; Hannon, 2006; Fig. 2). The value of understanding the various fracture types is that certain forms and locations are more diagnostic of violence, while others are commonly seen in accident-related trauma. The most common injuries are those that occur as an accident or as a result of an unforeseen occupational hazard. These injuries result from slips and falls, crushing from falling objects, and collisions with obstructions in the environment. In contrast, we define violence-related trauma as injuries

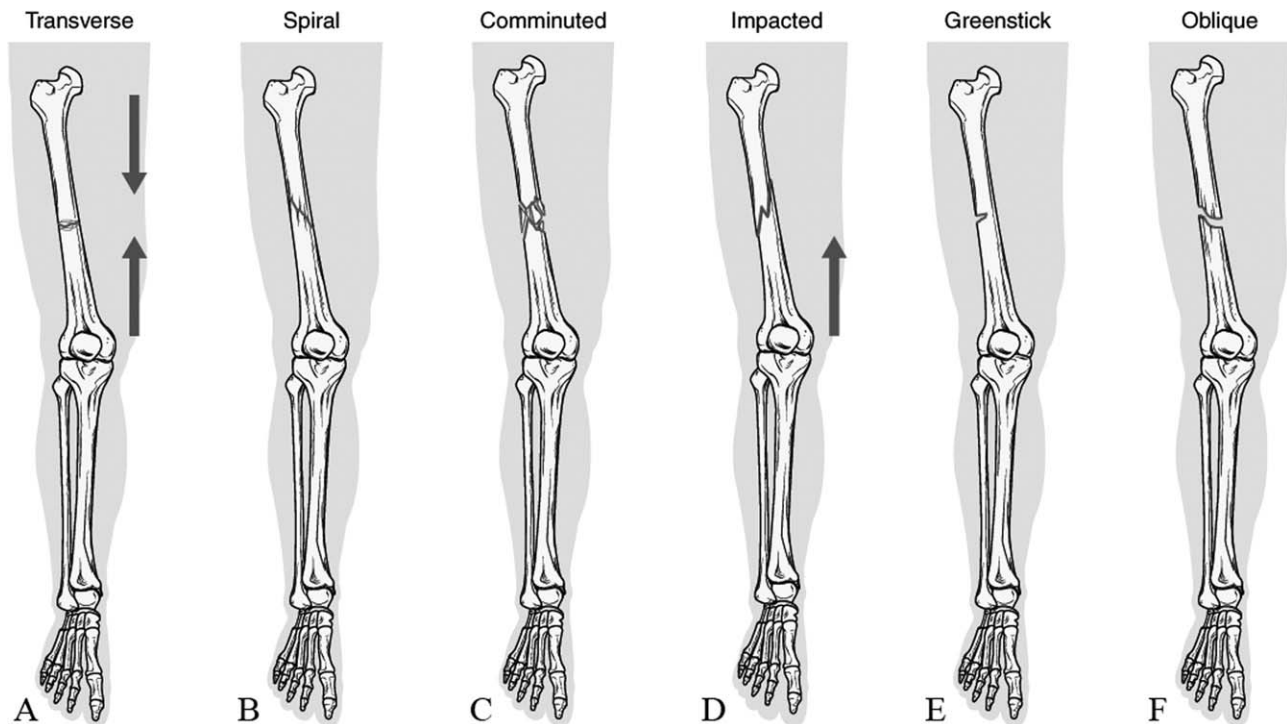


Fig. 2. Illustrates some of the major types of fractures. **A:** Transverse fracture; **B:** Spiral fracture; **C:** Comminuted fracture; **D:** Impacted fracture; **E:** Greenstick fracture; **F:** Oblique fracture. Modified from an image created by OpenStax College CC-BY-3.0 (http://cnx.org/contents/14fb4ad7-39a1-4eee-ab6e-3ef2482e3e22@6.27/Anatomy_&_Physiology), courtesy of Wikimedia Commons (http://commons.wikimedia.org/wiki/File:612_Types_of_Fractures.jpg).

caused by interpersonal conflict such as being hit during face-to-face combat or as a result of household disputes and intergroup animosity and conflict (i.e., feuds and raiding). Violence-related injuries (VRI) are generally classified into two broad categories that include intra-group and intergroup violence. Intragroup violence includes trauma sustained through being hit or beaten during fights with rivals, spouses, and co-wives, as well as being disciplined by parents, siblings, and other members of the family or community. Intergroup violence involves injuries more likely to be associated with warfare-related activities.

The location of the injury and the type of injury is useful for distinguishing among the categories of violence (Hong-wei et al., 2012; Malik et al., 2013; Rupani et al., 2013). Nancy Lovell (1997) provides a thorough overview of the different ways bones can break or fracture. While there are a number of different types of fractures that affect the postcranial bones, fractures to the skull, both the cranium and mandible, are important because they are a good indicator of violence. Looking at the cranial vault first, Thomas (1984) describes four basic types of fractures: linear, depressed, comminuted, and penetrating. The difference between these fractures is a result of the energy being transmitted to the skull, the location of the impact, and the shape of the object striking the bone (Berryman and Haun, 1996). Both linear fractures and comminuted fractures of the cranium are caused by impact with wider objects, whereas depressed and penetrating fractures are a result of narrow objects (Galloway, 1999a). An example of a linear fracture would be a slip and fall where an individual hit the back of their head on an elevated surface (e.g., a curb). In contrast, an example of a depressed fracture would be getting hit in the head with a tubular object (e.g., pipe or baseball bat). In addition to cranial vault fractures there are also fractures specific to the face (e.g., Le Fort, maxillary, zygomatic, and orbital fractures; Jones, 1997; Le et al., 2001; Erdmann et al., 2008), and the mandible or lower jaw (e.g., parasymphyseal, subcondylar fractures; Lewis and Perusea, 1959; Olson et al., 1982; Boole et al., 2001; Ogura et al., 2012).

Specific to violence, Phillip Walker (1989) notes that though cranial depression fractures can be a consequence of accidents they are more likely to be the result of interpersonal conflict. More recent research provides criteria for distinguishing accidental and VRIs to the head by focusing on trauma above the hat brim line, multiple trauma on various areas of the cranium, and those trauma that affect the facial region (Hussain et al., 1994; Brink et al., 1998; Maxeiner and Ehrlich, 2000; Lee et al., 2007; Kremer et al., 2008; Brink, 2009; Guyomarc'h et al., 2010). Thus, one method for avoiding over ascribing trauma to violence is to focus on cranial depression fractures on the head that are likely to be from blunt force trauma. Yet, even these can be problematic as depressions can be the result of pathological conditions (Spencer, 2014). The result is that all potential traumatic injuries have to be evaluated in context and researchers should be open to multiple interpretations for what the change to the bone may reflect.

Fractures of the postcranial skeleton can be of interest when analyzing violence. When assessed in combination with cranial trauma it can provide support for or refute the likelihood that the injury was related to violence (Larsen, 1997). For example, there are certain classic

fractures that are often thought to indicate violence (e.g., parry fracture), but there is debate over whether or not these fractures are always associated with violence (Judd, 2008). The term "parry" is used to describe a fracture of the ulna near the mid shaft or toward the distal end without the involvement of the radius (Jurmain, 1999:219; Judd, 2008:1659). It got this name because it was originally believed people were trying to block or "parry" blows to the head with their arms (Smith, 1996). The problem according to Margaret Judd (2008) is that the fracture can also be a consequence of accidental injury (e.g., a fall on an outstretched hand). However, when there is a "parry" fracture along with a cranial depression fracture or comminuted fracture, it supports the notion that the individual may have been at risk for increased or repeated violence. Yet, interpretation of the mechanism of injury is still limited as it is impossible to establish the timing of when each injury occurred unless they both happened at or around the time of death.

Finally, any study of violence in the past must not only analyze trauma but other information about the individual and the culture that reveals patterns of violence. For example, in addition to simply counting fractures, it is important to also look at pathological conditions (Mann and Hunt, 2005). Markers of disease on the bone include a wide range of things that can be related to genetics, age, activity, or health. This last category is important to consider when looking at socially-sanctioned or structural violence, where individuals are put at higher risk of injury or disease as a result of social inequality. Types of injuries associated with this category are hip dislocations, fractures due to osteoporosis, osteoarthritis causing pain in the lower back, as well as repetitive injuries (e.g., a slipped disc and Schmorl's nodes) or a torn ligaments (e.g., osteochondral fractures). It is important to realize that many of these mechanisms of injury can be occurring simultaneously within the same individual. A person may be a victim of violence, work in a dangerous environment, and be exposed to high risk of pathological conditions.

CONTEXTUAL DATA: EVIDENCE FROM MORTUARY AND ARCHAEOLOGICAL RECONSTRUCTION

Other aspects of the bioarchaeological approach include a strong commitment to contextualizing violence within larger spheres of influence as well as taking cross-cultural comparisons into consideration. This is examined in the collection of case studies published in the *International Journal of Paleopathology* as a Special Issue on violence in past cultures (Martin and Harrod, 2012b). Pamela Stone (2012) analyzed the skeletal deformations caused by corsets and foot-binding, highlighting the ways that women were subordinated and harmed based on the cultural ideology supporting male patriarchal social institutions that enforced these ideals. She framed this as a form of violence against women that affected millions of women in the 1800s. This combined approach using clinical, medical, skeletal and documentary sources provides a rich context with which to better understand why these cultural practices exist and what the implications were for a subgroup (in this case, all females).

Another example of contextualized research is that of de la Cova (2012) who conducted a study of skeletal

trauma in a 19th century cadaver collection housed at the National Museum of Natural History called the Terry Collection. Utilizing skeletal evidence as well as historical documents she was able to show that much of the violence she found was associated with interpersonal and structural violence related to practices in early Mental Institutions, and not due to domestic abuse as had been surmised in an earlier analysis. The assumption of many scholars was that this collection of human remains with known age at death and sex could be used to refine aging and sexing methods. However, de la Cova, in putting these individuals within the broader cultural and historical context, demonstrated that these people suffered under a variety of social burdens related to their “race,” class and gender. In this way, she was able to begin to reconstruct the axes around which forms of structural violence were based.

Contextualizing human remains where there are no written records depends on meticulous reconstruction of the archaeological record. In examining skeletonized bodies from the ancient Near East, Yilmaz Erdal, and Ömur Erdal (2012) examined organized violence in the Neolithic and Bronze Age Anatolia (modern day Turkey). Using multiple lines of evidence derived from the archaeological record, they demonstrated changes over time in mass burials, weaponry, and lethal trauma. Taken together, this evidence indicated when and where organized violence was used to exert power and gain access to resources. Using skeletal evidence, mortuary context, and detailed archaeological reconstruction of the material culture, they were able to produce a more nuanced understanding of the times and places that violence was used and the likely causes of those increases in violence.

A final example of how context proved instrumental in the analysis of violence, Robbins et al. (2012) presented data on poor health and trauma for an Indus Valley group that was considered to have been peaceful. However, the bioarchaeological data presented evidence for both direct and structural violence based on social differentiation and gender inequality during the entire occupation. Combining skeletal, mortuary and archaeological evidence together, a more complete understanding of the Harappan culture was made possible. It overturned the earlier assumptions made about the ancient inhabitants of India as passive and peaceful. In this case study, the cultural and environmental context provided important evidence and enhanced the ways that indicators of poor health and trauma from the skeletal remains were interpreted.

Thus archaeological context is crucial for providing additional lines of evidence to the skeletal data. The mortuary context itself may be one of the most important of all to provide in studies on violence (see Pearson, 2005 for examples; Thorpe, 2005). All humans have culturally specific ways of dealing with the dead (Tarlow and Stutz, 2013). Mortuary context provides an additional data set that can be used to interpret skeletal remains (Rakita et al., 2008). While it is always good practice to include analysis of the mortuary context, it is not always possible. Mike Parker Pearson (1999) provides a comprehensive approach to mortuary contexts on a global scale and he covers funerary rituals, cultural views of the afterlife, and many cross-cultural examples demonstrating the diversity and meaning of mortuary behavior in a variety of settings.

Bioarchaeological methods using skeletal data, mortuary context and archaeological reconstruction provide a

means to answer questions about historical patterns of violence going back thousands of years. This is important because the longer chronological and multiscalar information on violence can reveal information about the novelty or origin of various forms of violence that can only be understood with this kind of an approach (Murphy, 2008). For example, Walker (1997) conducted a large scale comparative study that looked at the cultural patterning of two phenomenon, head wounds specific to “wife beating” and broken noses specific to the origin and spread of boxing. The systematic collection of data from collections from all over the world provided unique insight into the diversity of patterns associated with domestic abuse and with boxing as a form of entertainment. He predicted that “... only through the identifying and analyzing the full range of human behavioral variation can we hope to understand the complex interactions between demographic variables, environmental change and cultural-historical processes that shape our aggressive tendencies” (Walker, 1997).

Walker’s (2001) summary of bioarchaeological approaches to violence suggests that the analysis of violence should not begin and end at the discovery of a concussed cranium or a lodged arrowhead. Starting with evidence from the bones he demonstrated the necessity of integrating bone data with contextual data to produce an interpretation that extends far beyond description. This is possible because reconstructing context is part of the research design and not something added on later.

SOCIAL THEORY: FRAMEWORKS FOR INTERPRETING THE EVIDENCE ON VIOLENCE

The use of social theory provides a way to get at the how and why questions relevant to the kinds of data collected by bioarchaeologists. The importance of using some kind of social theory as a guiding framework to move from descriptive data to interpretations that have broader significance cannot be understated. Martin Smith provides a compelling case for the necessity of a theoretical framework in bioarchaeology. He has used theory successfully to interpret evidence found on bones during the Neolithic period in Europe (2009) and he first described the phenomenon of the so-called “bloody” Neolithic: “There is a need for some form of theoretical structure ... within which to convert the observationally static facts of the archaeological record to statements of (past) dynamics ... The question is how do we make inferences that take us from the level of breaks and embedded stone fragments in pieces of bone to begin to move towards an understanding of the character of conflict during relatively remote periods in prehistory? Without such a framework, interpretations cannot move beyond the basic observation that prehistoric people sometimes hit or shot each other, which tells us very little about the society of a given period” (Smith, 2014).

It is the combination of standardized methods, robust empirical data, and social theory that is useful in going beyond simple descriptions of the data. Interpretation of data derived from ethnographic, historic, archaeological, or bioarchaeological sources, in the hands of anthropologists, is often informed by a range of theories about violence and the ways that it underlies social processes. Social theory facilitates being able to situate scientific (empirical) data within a larger body of findings, ideas and explanations about human behavior. In this

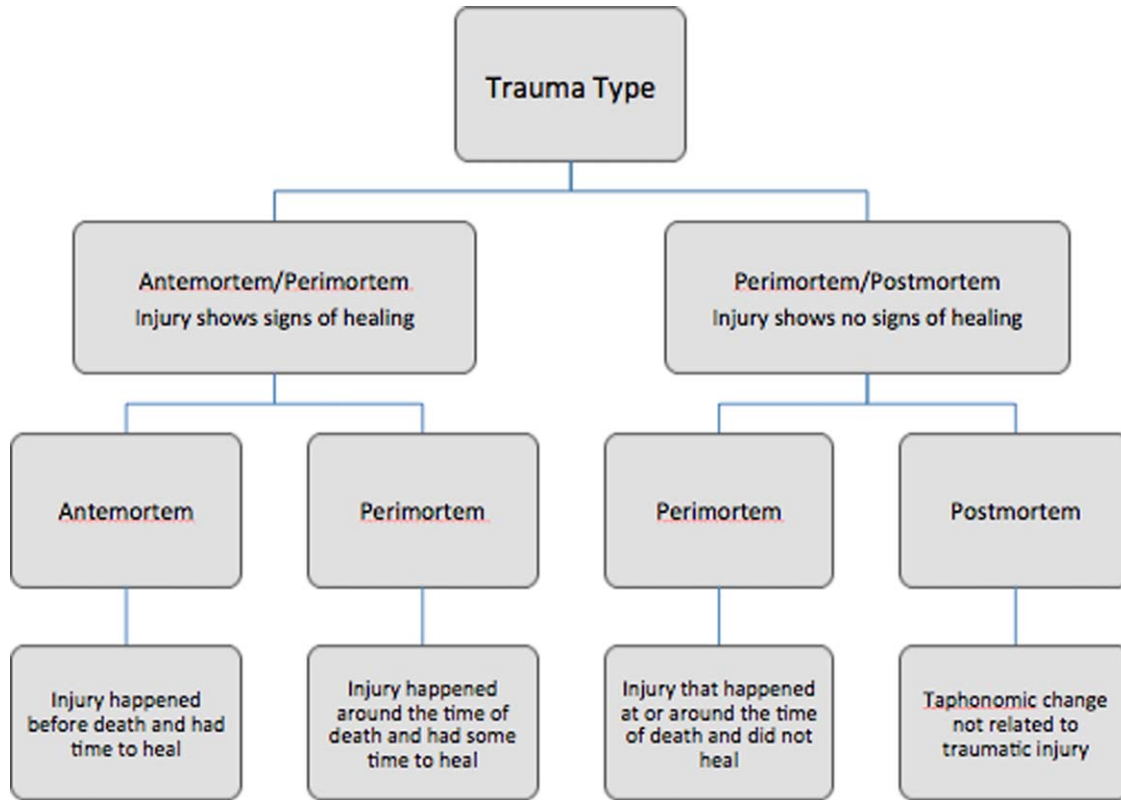


Fig. 3. Flow chart for enhancing the ability to distinguish violence on skeletal remains from natural depositional damage that occurs when material is buried for long periods of time. (From Walker, *Annual Review of Anthropology*, 2001, 30, 573-596.).

approach, violence is not viewed as a single thing but rather as a constellation of motivations.

The use of a socially informed theoretical framework has proven valuable to a growing number of bioarchaeological studies that seek to provide more detailed answers to why violence is appearing in the form that it is and in the time period that it is. In our experience, it is by far one of the best theoretical approaches to documenting and interpreting culturally sanctioned violence. Without some kind of social theory about how violence works at the individual and collective level, it would be difficult to do anything more than report the presence of violent death or trauma on the skeletal remains. It is the use of contextual data along with social theory that permits going beyond description of violence to interpreting its meaning (Klaus, 2012; Pérez, 2012a). We have a strong preference for this theoretical orientation because it is broad enough to incorporate questions about the different axes that underpin culturally sanctioned violence such as cultural ideologies about gender, identity, ethnicity and social status (Farmer, 2004).

Theory aids in anchoring a study on violence by narrowing its focus to something manageable, and theory also provides a framework within which to expand the interpretive power of the findings. Theories concerning violence have been formulated within many different intellectual traditions including the natural and social sciences. As well, anthropologists have generated a great deal of theory about violence and those theories often draw on a wide range of evolutionary and behavioral studies. These include conflict theory, practice theory, agency theory, gender theory, evolutionary theory, and

political-economic theory, to name a few. We have elsewhere provided an in-depth discussion of the wide range of social theory employed by archaeologists and those will not be reviewed here (see Martin et al., 2013) although various theories will be discussed as they relate to the case studies illustrating violence in antiquity.

CHALLENGES TO INTERPRETATIONS OF VIOLENCE AND VIOLENT DEATH

It takes many years of training and experience to be able to do the kinds of bioarchaeological work detailed above. The literature is filled with cautionary tales about misinterpretation of trauma on human remains. It is often difficult to distinguish between acts of violence, ancestor veneration, ritual processing, burial rites, and natural taphonomy (Pérez, 2012b). When human remains are disarticulated and fragmentary (which a great majority of them are), distinguishing cut marks from naturally occurring scratches can be very difficult. However, standardized methods in taphonomy (many borrowed from zooarchaeology) and forensic anthropology provide detailed techniques for recording and analyzing morphological changes on bone (White, 1992).

Understanding the motivation for how the dead are treated is often tricky business. Duncan (2005) has taken a close look at how researchers distinguish veneration (considered a loving or supportive activity to aid the dead) from violation (considered a negative or detrimental activity towards the dead) and he provides a number of ways to get around this problem. These

include examination of any ritual objects associated with the burial, providing a detailed analysis of the context of the burial, and to use ethnographic and historical documents, which may provide models for differentiating veneration from violation.

Another challenge is to be able to differentiate antemortem (or, premortem) and perimortem from postmortem changes to the bones. Once a fracture is identified it is crucial to establish when that fracture occurred. Antemortem or premortem fractures are those that occur before an individual died and had time to heal, perimortem fractures are those injuries that occurred right around the time of death and show no signs of healing, while postmortem fractures includes all damage to the bone that occurs long after the individual is dead (Ubelaker and Adams, 1995; Sauer, 1998; Skelton, 2011). Douglas Ubelaker and BJ Adams (1995) provide a number of case studies whereby using an analysis of the direction of force and the point of impact aided in interpreting when and how breakage occurred. Sauer (1998) likewise has presented experimental, forensic, and archaeological techniques to provide a range of techniques that help to distinguish among breakage patterns.

Other challenges include differentiating between homicide and murder and unusual mortuary practices. Tayles (2003) reported on a case study that illustrated how to differentiate between murder and mortuary behavior in material from Bronze Age Thailand. She found what looked like a fatal (perimortem) cranial trauma in an elderly woman that may have been an ancient murder victim. However, with careful analysis of the mortuary context, and comparison with other burials, it was deduced that she was interred in a considerate burial context with jewels and other offerings. A detailed reconstruction of the sharp force trauma seen on the skull and mandible suggested that the woman was upright when the blow occurred and there appears to be no healing at the edges. Her head was placed inside of a large pot as if to conceal the blow to the head. The authors suggested that in this case, there is evidence to support that this was the cause of death and the honorary placement of the body after death add intrigue to what appears to be an isolated case of the murder of a beloved elderly woman. The point of this case is to illustrate that bioarchaeologists make inferences when reconstructing violence in the past, and without careful consideration of the context it is possible to overlook the nuanced nature of violence. That is why using multiple lines of evidence is so important. Setting up hypotheses that can be accepted or rejected by the kinds of data bioarchaeology has access to also can aid in circumventing ambiguity.

An example of how to control for the complexities and challenges presented to bioarchaeologists is provided in the model of integration of context and data in bioarchaeology by Walker (2001) in his often-cited review of violence in past populations. A wide range of information in the formulation of an interpretation of injury and trauma from skeletal remains must be considered. (Fig. 3). Following this kind of flowchart prompts the analyst to consider a factors that otherwise might be skipped or glossed over when making decisions about violence. As we discuss later, taphonomy is also crucial in the study of violence.

VIOLENCE IN EARLY CULTURES

There has been an explosion of bioarchaeological works (journal articles, book chapters, books, and edited volumes) that focus on violence in the ancient world.

Independently each of these projects shed light on one or more aspects of violence, such as a specific form of violent behavior (e.g., warfare or torture), or a particular culture or region (e.g., American Southwest or Neolithic Europe). The bioarchaeological literature is now quite extensive and so this review cannot hope to present any kind of synthesis or exhaustive overview. However, with selected focus on particularly revealing studies, a case is made for the importance of these kinds of studies to facilitate a broader understanding of violence across varied cultures.

This is not the first attempt to pull together a comprehensive overview. As discussed earlier, Walker (2001) did just this in an article entitled, "A Bioarchaeological Perspective on the History of Violence." While this seminal work remains a keystone for bioarchaeologists studying violence, the amount of new research published since that review is extensive and would defy synthesis on a grand scale. Edited volumes such as *The Routledge Handbook of the Bioarchaeology of Human Conflict* (Knüsel and Smith, 2014), *Bioarchaeological and Forensic Perspectives on Violence* (Martin and Anderson, 2014), *Bioarchaeology of Violence* (Martin et al., 2012a) and *Sticks, Stones and Broken Bones: Neolithic Violence in European Perspective* (Schulting and Fibiger, 2012) provide a wealth of case studies on violence in antiquity.

Given the overlap in motivations behind violent activities, it can be hard to differentiate intragroup and intergroup conflict based solely on evidence for trauma from the human remains. Although these are separate categories in the following, it is clear that there is overlap between intragroup and intergroup violence in some places. The selected studies discussed here reveal the nuanced way that researchers integrate a diverse set of data generated from a number of techniques, starting with the trauma and changes to the bone and continuing on to the location and details regarding the burial context. In this area of study, there may be other telltale signs to help distinguish locals from nonlocals, peasants from elites, combatants from noncombatants and warriors from homicide victims. Training, experience and expertise are mandatory simply because the challenges in this line of investigation are so thorny and complicated. We selected the studies and divided them into three major categories (intergroup violence, intragroup violence, and structural violence). These studies demonstrate current thinking on types of ancient violence and they also demonstrate "best practices" in the field of bioarchaeology.

INTERGROUP VIOLENCE: WARFARE AND RAIDING

The study of ancient warfare is not straightforward because researchers have used the term to mean feuding, hand-on-hand combat, raiding, small-scale conflicts, standing armies in early city-states, and modern militarized war (Lambert, 2002). In small-scale societies, violence tends to include highly ritualized fighting, raiding for resources and women, and feuds between rival groups. The distinction between small-scale warfare and nation-level warfare is important because the motivations behind why people fight are often very different (Ferguson, 1995, 2004). Cultures engaged in small-scale conflict often share a number of the same characteristics typically used to identify societies that are engaged in warfare-level conflicts, such as dedicated warriors and

established fortifications. However, small-scale conflicts do not necessarily require these characteristics. Feuding, for example, has been defined as an extended period of back and forth killings, one death at a time (Black, 1983). Feuds tend to occur when the groups are similar in size and resources, when they are relatively homogeneous in ethnicity and when they are isolated from one another (Black, 2004). Feuding at one time was thought to be a reciprocal activity, but newer research has shown this is not always the case. Hugh Firth (2012) demonstrated that in medieval Europe, blood feuds and vengeance killings were behaviors that provided a competitive edge and superiority to some groups over others.

Early forms of warfare, raiding, and feuding were likely present in early hunter-gatherers and there is much debate about its frequency and meaning (Keeley, 1996; Gat, 2006). Ferguson (1997) argues that for there to be true warfare in early groups they would require being sedentary, having resources within their boundaries and demonstrating political centralization. Others (Lambert, 2002; Guilaine and Zammit, 2005; Gat, 2006; Kelly, 2013) have argued that war was in fact a feature of politically decentralized mobile foragers. Despite violence being present in the past, it has been argued that cooperation often trumps conflict in problem solving in small scale societies (Mead, 1937; Fuentes, 2004; Hrdy, 2009; Ferguson, 2011; Fuentes, 2013), so it is unlikely that evolutionary forces acted to shape a particular predilection for violence. Paul Roscoe has even argued that there is ample data to demonstrate that humans instinctively show a disinclination and aversion to conspecific killing (Roscoe, 2007). Robert Kelly (2013) makes a good case that it is not that useful to ask whether early foragers were peaceful or warlike because from all available evidence it seems that violence is used in some groups to solve perceived problems that they face. A better way to frame the question is to examine how violence is used to solve perceived problems.

Intergroup violence (violence between two or more different groups) is generally referred to as collective violence and this includes activities such as warfare, raiding, feuding, and ambushes (Durrant, 2011). What all of these activities have in common is that they involve the establishment of coalitions of males who cooperate in the planning of warfare, raids, and ambushes. Recent scholarship on violence among chimpanzee social groups has shown that this is similar to what is seen among chimpanzee males who can come together and cooperate in violent attacks on neighboring males. In human groups, these coalitions are not established solely for violence because male coalitions are also the foundation of hunting and fishing parties (Wrangham and Peterson, 1996; Wrangham, 1999; Kelly, 2005; Gat, 2006; Corning, 2007; Roscoe, 2007; Crofoot and Wrangham, 2009; Durrant, 2011; Wrangham and Glowacki, 2012). Male coalitions act as a mechanism for bringing males together to conduct raids, as well as to protect their own community against attack from other groups (Kelly, 2005). Some researchers have used a theory called "parochial altruism" which posits that males who cooperate with in-group members but act with hostility to out-group members may have a selective advantage (Choi and Bowles, 2007; Durrant, 2011; Bowles and Gintis, 2013).

While this broad narrative generally describes interpersonal violence in the form of small-scale warfare, feuds, raids and skirmishes (see for numerous archaeological examples of warfare and early violence Arkush

and Allen, 2006; Nielsen and Walker, 2009b; Ralph, 2013), the bioarchaeological data adds a great deal of information and provides ways to distinguish and show nuance in how early warfare and raiding worked in different settings. The following case studies provide an indication of how this kind of violence is documented and interpreted.

Research by Richard Paine et al. (2007) on an Iron Age (circa 5th century) necropolis of a Samnite group in southern Italy found bioarchaeological evidence of the role of male coalitional violence in intergroup conflict. Looking at a sample of 229 individuals, they found that perimortem (lethal) head injuries were primarily on males recovered from the site. Trauma from blows to the head were on 25 out 149 males (16.8%) and on 2 of the 59 females (3.4%; Paine et al., 2007). They also found that based on the location and severity of the trauma there were no patterns, with trauma found in varying locations on all parts of the skull. The authors deduced that this violence was not ritual warfare because the wounds were not systematic as found in some highly ritualized forms of fighting (see Walker, 1989 described below). Due to the lethal nature of the injuries and the lack of a clear pattern it appears that males sustained injuries as a result of conflict with rivals in neighboring regions. The variable nature of the head wounds suggests surprise ambushes using expedient weapons (swords, blades, axes). The authors provide compelling quantitative and contextual evidence to demonstrate that these farmer-warriors were likely killed or injured while defending their agricultural resources (Paine et al., 2007).

Another example is provided by the research conducted by Lawrence Owens (2007) who analyzed patterns of craniofacial trauma among 62 precontact sites in the Canary Island archipelago. Evaluating 896 individuals the author found a population prevalence of (16%) and when separated by sex, found that violence was higher among males (25%), almost twice as high as in females (13%), suggesting that men were more likely to engage in conflict but that women were not excluded. Their trauma data showed that blows to the head were largely nonlethal (showing some healing), contained in the cranial (versus facial) portion of the skull, and with more trauma on the left side of the skull. Together these data strongly suggest intentional interpersonal fighting in the form of raiding and/or skirmishes using weapons such as slingshots, staves, and stones, which could subdue and knock opponents out but would not necessarily kill them. Using historical and archaeological data to provide context, violence was documented at so many different sites across the Canary Islands that intergroup conflict was likely ubiquitous and perhaps served as a ritualized activity that was fairly low risk since most of the head wounds were healed.

Martin Smith (2014) provides a very useful overview of the contextualizing violence in the "bloody" Neolithic with evidence from Britain. Although the human remains are often commingled, fragmentary and poorly preserved, he summarized VRIs from a relatively large sample drawn from 21 archaeological sites and found that 65% of the injuries (healed and unhealed) were due to blunt force trauma, another 12% were due to high impact trauma, and 18% had arrow wounds. Only 5% of the sample could not be identified as to type of injury. Interpreting the injuries included drawing upon a range of contextual information from archaeological

reconstruction using site-based evidence for early forms of endemic warfare within regions of Britain. Moving from data on individual injuries to societal patterns using conflict theory, Smith provides a series of hypotheses that account for the evidence. His interpretation uses multiple lines of evidence along with the bone data to show the complexities and nuance that precipitated the ubiquity of violence in the Neolithic period. Smith concludes that "... rather than a situation where large aggregations of people routinely engaged in massed combat, the overall picture suggested by the skeletal evidence is of small war parties acting against similarly small targets, possible consisting of lone individuals or at least only very small groups" (Smith, 2014). Using meticulously collected data from the skeletal remains combined with detailed contextual information on the sites from where the bodies were recovered, Smith frames this interpretation using ethnographically derived theories about conflict, social distance, and resources.

A final example is illustrative of how hypotheses are generated to explain the data on violence. Walker (1989) carried out a study on violence based on human remains from precontact southern California (circa 600–1400AD). Healed cranial depression fractures were analyzed for a series of large cemetery sites in the Channel Island region. For the 598 individuals from the island, 19% had signs of well-healed cranial depression fractures with twice as many males as females sustaining wounds. However, the wounds on the females were equal in location, severity, size and shape as compared with those of the males.

These groups were mariners and foragers living in large and aggregated villages. The identical distribution of nonlethal head wounds on males and females was surprising. Combined with other aspects of the archaeological context and ethnohistoric documents, Walker ruled out warfare or raiding as an explanation. The hypothesis that garnered the most support from the multiple lines of evidence used was that the healed head wounds were the result of ritualized fighting that was performed by adult members of both sexes. Based on grave goods and location of the burials of males and females with nonlethal wounds, they were likely high status individuals.

Looking at a broader sample size that represented many time periods spanning 4000 BC to AD 1800 as well as island and inland dweller, he found that head wounds increased over time and that they were more common during times of low productivity and shrinking food resources associated with periods of climate and weather changes. He felt that the function of the ritualized violence was that it was used as a leveling mechanism and a way to bring groups together to redistribute resources. High status individuals could act out highly ritualized and staged fights designed to be a performance.

Although Walker (1989) provided a compelling hypothesis for the violence as ritualized fighting among higher status males and some females, a different hypothesis was offered by Lambert (1997) who suggested that the violence among the women could have been either spousal abuse or competition among higher status females. In this case, female-on-female violence would be the cause. While the data to support spousal abuse or female-on-female violence is less parsimonious than Walker's explanation of ritualized fighting among high status individuals, it remains to be further tested with

other lines of evidence. The most compelling piece of data supporting Walker is the identical nature, distribution, size, and shape of the head wounds among the males and females. Spousal abuse and female-on-female violence would not be expected to produce similar kinds of head wounds on the males and females. As in all scientific studies, until data can be obtained that rule out competing hypotheses, it is good practice to keep all of the plausible hypotheses in mind.

These examples reveal some of the challenges of what to label the type of violence in each of these settings. While head wounds (both lethal and nonlethal) can be evidence of warfare and/or raiding, in each of the case studies above, there were other lines of evidence that provided a more parsimonious explanation for the patterns in the data. Making any kinds of generalizations about when and where warfare and raiding originated or evolved in human groups is not possible. However, examining cultural and environmental aspects and incorporating ethnographic analogy to enhance each study can provide insights into a range of plausible hypotheses that could be supported with the skeletal data.

To further explore the ways that bioarchaeology both contributes to but also complicates the discussion, two major categories subsumed under warfare and raiding are further discussed below that include bioarchaeological studies on captives and slaves, and massacres and genocide. These provide a more nuanced look at the outcomes of warfare and raiding in certain situations. For example, some forms of warfare and raiding are conducted against other groups solely for the purpose of killing the adult males and taking women and children as captives (Cameron, 2013). Various ideologies and culturally constructed motivations underlie this form of violence, but there is ample evidence that captivity and slavery were practiced in a wide variety of temporal and spatial settings in the ancient world (Patterson, 1982; Cameron, 2013). Massacres and genocide are also subsumed under warfare and raiding and represent very specific motivations to exterminate whole villages at particular moments in a group's history (Willey and Emerson, 1993; Zimmerer, 2007). These activities (taking captives, enslaving enemies, massacring whole communities and committing genocide) are shown to be more complicated and difficult to generalize when bioarchaeological data are part of the discussion.

Captives and slaves

For much of the world's history, from foraging to city-state level societies, females and children have been abducted in raids conducted that often leave the males of the community dead, and the females and children taken as captives (Patterson, 1982). Violence against females in the form of raiding and captivity and enslavement is a common practice that has been documented in many early pre-state populations (see Cameron, 2008 for an extensive review). While the African slave trade in colonial America is becoming increasingly better documented with the excavation of slave cemeteries and the mining of ethnohistoric sources (Singleton, 1995; Blakey, 2001), captivity and enslavement is not only a product of colonial expansion. Its variety of forms and expression in indigenous small-scale societies is increasingly being documented by both archaeologists and bioarchaeologists as seen in the case studies in the edited volume entitled

TABLE 1. Activities related to captivity and slavery matched with possible signatures of these activities that may be observable on human skeletal remains

Captivity and slavery skeletal correlates	
Possible underlying violent tactics used	Implication for skeletal growth, development and maintenance
Raiding and capture	<ul style="list-style-type: none"> • Healed cranial depression fractures • Healed broken ribs and long bones
Commodification and trade	<ul style="list-style-type: none"> • High numbers of reproductive-aged women • Increase in number of subadults
Submission and beatings	<ul style="list-style-type: none"> • Cranial and postcranial fractures • Injury recidivism, co-occurrence of trauma and pathology, cranial, and postcranial lesions
Hard labor and long work hours	<ul style="list-style-type: none"> • Enthesal changes, ossified ligaments, and asymmetries • Work and trauma related osteoarthritis • Postcranial fractures (accident/occupation related)
Punishment	<ul style="list-style-type: none"> • Nonspecific infections • Evidence of torture • Young age-at-death
“Social death” and outsider status	<ul style="list-style-type: none"> • Cultural modification present or absent (head shape and cradle boarding) • Irregular burial context • No grave offerings, unusual grave goods
Denied access to food resources	<ul style="list-style-type: none"> • Nutritional stress (cribra orbitalia and porotic hyperostosis) • Short-for-age and shorter attained adult stature
Inadequate habitation areas with poor sanitation	<ul style="list-style-type: none"> • Nonspecific infections (staph and strep) • Tuberculosis, treponematosis

Adapted from Martin (2008b), Martin et al. (2010) and Harrod and Martin (2014b).

Invisible Citizens, Captives, and their Consequences (Cameron, 2008).

The definitions of terms such as captive and slave are sometimes used interchangeably, but they are both usually the goal of warfare tactics that include raiding. Captives and slaves are associated by some scholars as being part of different ideologies about personhood and value, and conflating the two terms may be problematic. For example, captives often are seen as commodities that can be exchanged and circulated (Brooks, 2002). The term slave is often seen an individual that is useful for the economic gain he or she brings through doing the hard labor associated with economic systems that value the products of such labor (Hubbell, 2001; Hershenzon, 2011). Catherine Cameron (2011) discusses these kinds of differences and further shows that slaves can be born into slavery with an automatic identity and status, whereas captives are always defined as those who are brought unwillingly into the group as children or adults. For the purposes of bioarchaeological reconstruction of these at-risk and usually lower status groups, distinguishing among these two may not be as important as establishing the kind of exploitation that is taking place and how it fits in with the ideology of the captor’s and captive’s natal group. And, equally important is to clarify the kinds of violence used to produce and reproduce these systems of exploitation and exchange.

Using Patterson’s (1982) comparative study of slavery in the ancient world, and bioarchaeological studies conducted on groups where slavery was highly visible (Barrett and Blakey, 2011; Okumura, 2011; Shuler, 2011; Cybulski, 2014), Table 1 presents the hypothesized links between violent actions associated captivity and slavery on the left, and what the likely osteological “signature” and burial context might be. For example, slavery along the Northwest Coast of North American has been operating for a very long time (Ruby and Brown, 1993). According to Ames (2001), slavery developed either between 1500-500 BC or AD 500–1000 depending on how one interprets the available evidence. Slavery seems to have originated in the north among the Tsimshian,

Tlingit, Haida, and Kwakiutl or more appropriately the Kwakwaka’wakw. The increase in raiding is supported by an increase in violence-related trauma from 1500 BC to AD 500 in the northern region (Cybulski, 1994, 2014). As groups accumulated a large number of slaves, they began to trade them with their neighbors in the south.

It is for this reason that the slave trade seems to be the most extensively practiced among the Chinook (Ruby and Brown, 1993). Arguably slaves are one of the most important trade resources found among the Northwest chiefdoms, thus they constituted a large part of the potlatch exchange. However, according to Ruby and Brown (1993) slaves were not only given away at potlatches but also killed to show that the headman was so prosperous that he could spare such valuable trade commodities. Raiding was so ubiquitous in this region because it was largely fueled by a desire for economic gain combined with an ideology that supported revenge after successful raids by the group being raided. Maschner and Reedy-Maschner (1998) coined the phrase “raid-retreat-defend (repeat)” to capture the production and reproduction of warfare in this region over many generations.

Although valuable in terms of trade, slaves were the lowest class of people among the Northwest cultures and skeletal and mortuary data have documented a wide range of ailments. The majority of slaves appear have been largely females captured during raids. The skeletons of sacrificed captives had injuries and the lives of captives and slaves were likely fraught with hard labor, poor food, and frequent beatings (Cybulski, 1994, 2014).

Looking at populations in the Northeast portion of the United States, Wilkinson and coworkers collected nonlethal head wound data from groups at the site of Riviere aux Vase in Michigan that were ancestral to the modern Iroquois (Wilkinson and Van Wagenen, 1993; Wilkinson, 1997). Dating to around AD 1000, these groups represent primarily foraging and horticultural communities with seasonal settlements. Weapons used for raiding are found archaeologically and described in the ethnohistoric literature as an important part of capturing females.

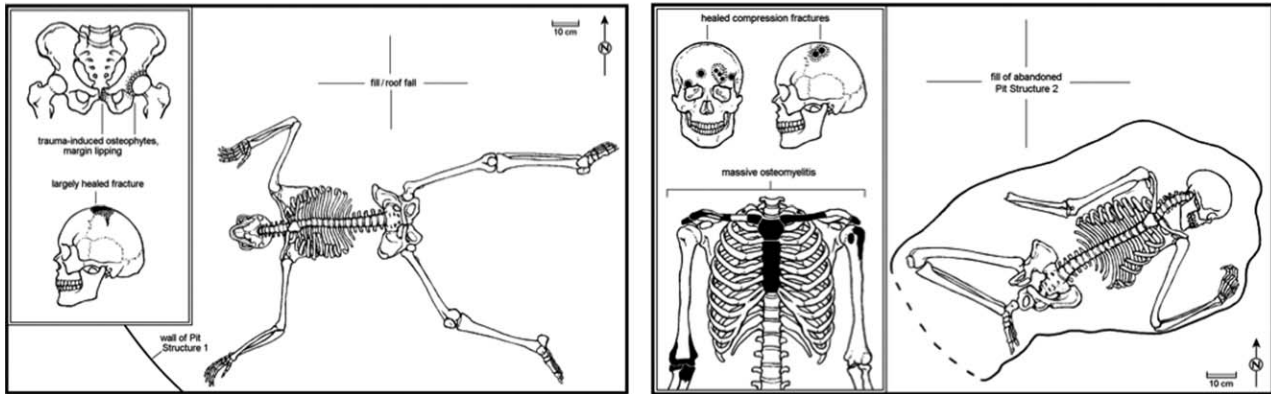


Fig. 4. Two of the La Plata females (both between ages of 30 and 35) showing areas of blunt force trauma on the crania along with post-cranial pathologies and mortuary context (From Martin and Akins, Unequal treatment in life as in death: Trauma and mortuary behavior at la plata (AD 1000-1300), 2001, 223–248). Image courtesy of Robert Turner, Office of Archaeological Studies, Department of Cultural Affairs, Santa Fe, New Mexico. Taken from Martin et al. (2013) with permission of Springer Publishing Company.

The composite for male and female nonlethal head wounds in burials from the excavated cemetery shows that males sustained blows primarily to the forehead, whereas females experienced blunt force trauma in all areas of the head. In the large communal cemetery, there were 3 times more females with healed head wounds than males.

Richard Wilkinson (1997) used the combined data on cranial trauma from the skeletons, ethnohistoric documentation and archaeological context to argue that there was a well-established pattern of female captives introduced into the group who were kept submissive by punishment and the use of nonlethal violence. Those females who eventually made accommodation to their captors may have experienced acceptance into the group via becoming co-wives or family members. Female captives who were adopted and socially accepted into the group at the time of death were interred with relatively high status grave items and their mortuary context was similar to that of non-beaten women of the group. Thus, through a process of violent beatings, women were taken as captives and if they adapted and accommodated to their captors, they may have had longer and better lives, and even higher status, than they might have had in their natal group prior to being taken captive. In this case, non-lethal violence was used to coerce females into accepting their fate as captives, and once they did so, they were afforded the opportunity to become high status females in the group. Wilkerson uses multiple lines of evidence to construct this interpretation of raiding and female captivity that provides nuance and counter-intuitive ways of thinking about the violence that underscores raiding and the possibility for upward mobility for captives who survive the process.

For the American Southwest circa AD 1100–1200, demographic and sex ratio data were used by Kathryn Kramer and Timothy Kohler to argue that ancient Pueblo people used small scale warfare and raiding for women as part of a strategy to compete with other groups for resources that would increase their capacity to increase their productivity and population sizes (Kramer, 2002; Kohler and Kramer Turner, 2006). Osteological evidence supporting this came from a study of nonlethal blunt force trauma and healed broken bones from a large multivillage community in the La Plata River Valley (northern New Mexico). Based on a small

sample of skeletal remains, analysis of trauma showed very distinctive patterns with 60% (6 out of 10) of the females exhibiting healed cranial fractures compared with 23% (3 out of 13) for the males. Females also showed evidence of post-cranial injuries (50% of them) compared with the male frequency of 21% (Martin, 1997; Martin, 2008a,b). The females with trauma showed fractures in a broad distribution on their heads, from broken noses to trauma on the sides and backs of the head, the forehead, and even one female with a massive blow to the top of her head.

The mortuary contexts for the females with and without cranial trauma were compared and only females without cranial trauma were in prepared shallow pits, semi-flexed and with grave offerings. All of the females with healed head wounds were found thrown into abandoned pit structures without grave goods (Martin and Akins, 2001) (Fig. 4). Females with trauma exhibited more pathology as a group (when compared with age-matched males and females without trauma) that included periosteal reactions/infection, early age of onset for osteoarthritis and porotic hyperostosis/anemia (Martin et al., 2010). Although these women survived what appears to be multiple forms of blunt force trauma, they may have been also exploited as workers in the fields of maize supported by the floodplains of the La Plata River Valley. They also had more severe cases of overdeveloped entheses (inflamed areas of muscle attachment) suggesting they were habitually doing heavy and laborious activities on a daily basis (Martin et al., 2010).

In this case study, the osteological findings included trauma and injury normally associated with violence in the form of beatings, and these were also associated with indicators of poor health (more infections, arthritis and nutritional deficiencies) and a mortuary context that suggested outsider status. The words that best describe this subgroup of females are that they were “beaten down and worked to the bone” (Martin et al., 2010).

In a study on violence that includes a range of possible activities such as ritual bondage, slavery and sacrifice, Miranda Aldhouse-Green (2005) examined all aspects of slavery in the pre-Roman Iron Age and early Roman periods in Northern Europe by including evidence for the ways that slaves were restrained. She provides a compelling discussion on this ritualized form of

communication about what it means to be a slave, calling it the “grammar of treatment” (Aldhouse-Green, 2005). The treatment of slaves (restraints, abuse and humiliation) is for public consumption whereby the identity of slaves was communicated to the populace. Aldhouse-Green connects these rituals to the regional cosmology in which sacrifice and the killing of slaves in bogs was tied to cannibalism, social hierarchy and the treatment of the disabled.

The notion of slavery is often used to describe the phenomenon where individuals are held captive and forced to work long hours in the service of others. Given the emphasis on labor, this type of slavery may have become much more pronounced with the advent of agriculture and sedentary lifestyles. Timothy Taylor (2005) suggests that in studying violence, bioarchaeologists must move beyond trying to prove evidence of trauma and slavery in the past to instead seek to first document it and classify it closely, leaving the interpretations to come after a thorough integration of the osteological data with the cultural context. As example, it was only through the analysis of mortuary context and ethnohistoric texts that Wilkinson (1997) was able to show that captive women in the ancient Iroquoian cultures did experience violence at first, but if they made accommodations to their captivity, they had opportunities to be integrated into the local culture and to obtain status and wealth. The use of slaves and captives is highly variable from providing domestic, sexual, and personal services, to providing labor (Taylor, 2005). Looking for the social roles and effects of slavery and captivity within the larger political, economic, and religious spheres will take a coordinated effort to link the data from the bones with the complex milieu within which they lived and died.

Massacres and genocide

Massacres and genocide are somewhat different from warfare and raiding but often they are carried out within periods of sustained intragroup antagonism. Because there are massacre sites in historic and contemporary times, this is a form of violence that has a very long history with humans, and that is ripe for continued research to identify the processes and historical antecedents of massacre events. Massacres are typically defined as a brutal slaughter of a group of people that often includes all ages and both sexes. It has also been called mass murder or indiscriminant killing on a large scale. While cannibalism and trophy-taking may be part of the activities associated with massacres, we discuss these separately below.

The definition of genocide starts with the same definition as massacre but it includes the addition of the motivation to exterminate large numbers of people identified as belonging to a particular ethnic, religious, or “racial” group. Ethnocide is defined as the extermination of the culture of an ethnic group and although some bioarchaeologist and archaeologists have adopted the use of this term, it may or may not include the extreme violence associated with massacre and genocide, but may be a longer term process of forced assimilation using a range of violent practices to bring it about.

Genocide has a particular and legalistic definition as defined by the United National Convention on the Prevention and Punishment of the Crime of Genocide in 1948. Some have argued that it would be impossible to see genocide in the archaeological record although there

are bioarchaeological studies that have used the term to describe the killing of large numbers of people. Massacres and genocide are difficult to distinguish even in modern times. The mass murders that were carried out throughout Bosnia were considered massacres, except for the killing that was done in Srebrenica which the United Nations deemed was genocide (Semelin, 2007). Archaeologically, both places would appear similar with mass graves containing men, women and children. However, the view as it was happening was that because of the sheer number and magnitude of killings there, the United Nations ruled that at Srebrenica it was genocide (Semelin, 2007). Thus, the differences may not be necessary to project into the precolonial past for small scale populations because the motivation and outcome for both may be indistinguishable. In bioarchaeological contexts, it is not possible to “see” genocide in the way the term is used today.

Of all violent and destructive processes, massacres are the most dramatic. As a political tool, they are often used by perpetrators to either subjugate or eradicate a group defined as having cultural characteristics that separate them in some way from the aggressors. Research into massacres in historic and contemporary times demonstrate that they are never random events but rather are part of a chain of events that are patterned and that have an internal logic. Massacres “... are shaped by situational, emotional dynamics and a field of confrontational tensions/fear” (Klusemann, 2012). Massacres must be seen as a process and not as an end result or isolated incident. Studies of massacres in recent history have shown that local resistance and third-party intervention can often be successful to thwarting the attacks so the study of massacres in their fullest historical and cultural context may help provide additional insights into how to prevent them.

One of the earliest archaeological sites argued to be representative of a massacre is Jebel Sahaba in the Sudan (Wendorf, 1968). The site is important because it is approximately 13,000 years old, with men, women, and children present and projectile points embedded in some of the remains (Wendorf, 1968; Antoine et al., 2013). Another early site is Schletz in Austria, where two different groups of researchers examined human remains and provided a picture of what might have happened there (Teschler-Nicola et al., 1999; Wild et al., 2004). The event occurred during the late LBK period (circa 5500-4500 BC) based on two radiocarbon dates of 5053-4797 BC and 5149-4939 BC (Teschler-Nicola et al., 1999). LBK is an archaeologically defined cultural tradition called Linearbandkeramik that represents a European cultural tradition that developed during the early Neolithic (Golitzko and Keeley, 2007). The site was heavily fortified and human remains near ditches showed signs of perimortem trauma. Using radiocarbon dating on the bones the authors were able to rule out general warfare and the accumulation of war dead over time as a cause because all of the individuals with trauma were contemporaneous. Furthermore, similar dates from other massacre sites in Europe (such as Talheim) happened around the same time.

Talheim (also referred to as the Talheim Death Pit) is a well-studied massacre site from Germany that dates to the same period as the Schletz site from the early Neolithic period in Europe. Wahl and Trautmann (2012) provide a detailed overview of the bioarchaeological data derived from the 34 individuals found in a mass grave.

Individuals at the bottom of the pit were still articulated while those on the upper layer were fairly well commingled due to natural taphonomic actions. There were 16 children, 7 females and 9 males suggesting an extended family or several small families. Almost all of the victims were killed via blunt and sharp force trauma to the head. There were no stratigraphic soil layers between the vertical rows of bodies indicating all bodies were likely placed in this grave at the same time (Wahl and Trautmann, 2012).

At another early Neolithic site in Germany, Herxheim, over 300 individuals were represented primarily by skull caps. This commingled and fragmentary bone pit also contained nonlocal imported pottery. This evidence combined with other bioarchaeological and archaeological data collected by Bruno Boulestin et al. (2009) pointed to ritual behavior that likely included cannibalism. The assemblage was accumulated over a long period of time, and so represents ritual activities that were conducted perhaps with body parts collected from other massacre or grave sites in the region. However, research by Orschiedt and Haidle (2012) take issue with the behavior of cannibalism being part of this complex death assemblage. Their re-analysis shows that nonlethal trauma was on a very small number of the cranial remains, and that the evidence more points to deliberate disarticulation, fragmentation and systematic shaping and processing of the cranial remains including defleshing (2012). The public debate that is on-going between Boulestin et al. (2009) and Orschiedt and Haidle (2012) is a good example of the need for using the scientific method and construction of testable hypotheses. Until a hypothesis can be absolutely refuted, it should remain as an alternative to other hypotheses that appear to be supported by the data.

The picture that is emerging from these sites and others showing extreme violence and massacres is a strong counter to early farmers as living in relatively peaceful hamlets throughout Europe. Tensions between groups may have created a situation of kill or be killed. Preemptive strikes were lobbied that assured that there would be no retaliation due to the extermination of small and large groups. The weapon of choice was likely the adze, a tool that was used in these early farming groups in tilling. This implies that it was farmers killing farmers (Price and Bentley, 2006). Because there are sometimes a lower number of females than males in the massacre pits, some have suggested that women were abducted instead of killed. An alternative to this scenario is that invaders who were not agricultural entered into the region and were the perpetrators of the violence (Golitzko and Keeley, 2007).

In other regions of the world, massacres are seen to occur under very different circumstances. Erdal (2012) examined trauma to skeletal remains from a site in Anatolia. Previous research on trauma in this region is scarce, which has led researchers to suggest that interpersonal violence, intergroup conflict and warfare were uncommon. While this may be true prior to the Neolithic period in this region, this study revealed that after the Neolithic there is evidence for violence. Specifically, this study examined 19 individuals who were recovered from a secondary burial. These skeletons displayed a high frequency of cranial injuries, which were analyzed for their location, frequency, type, and age and sex distribution in order to identify patterns of trauma. The remains lacked articulation and certain bones (such as os coxae and

phalanges) were commingled. Most of the remains had evidence of perimortem trauma. In addition, the site itself had evidence of heavy fortification. This suggested to the author that the violence seen on these individuals was from a neighboring group that the population was trying to protect itself from. DNA analysis conducted on the remains showed that the individuals recovered from the commingled burial were members of the population living at the site rather than from an outside group. Traumatic lesions seen on the 19 cranium came from two different weapon types. These included wounds made by a sharp edge and wounds made by a projectile weapon. Stepping back and viewing the site in a larger regional perspective, the fortifications in the area and the number of adult males implicated in the mass grave suggests that raiding parties may have been going after scarce resources.

The violence identified by the researcher in this study is likely intergroup violence and warfare due to an increase in environmental and resource stressors. This supports Carol Ember and Melvin Ember's (1997) findings that warfare and violence increase as the fear and perception of losing access to resources increase. It is important for bioarchaeologists to understand the patterns associated with warfare to assist in identifying causes of violence and patterns of trauma among a population. What makes massacre a compelling explanation in Erdal's (2012) study is that there was a significant amount of perimortem trauma on the majority of the skeletal remains, there were individuals from all ages and both sexes, it was a mass grave, and the local community was fortified to keep enemies out.

There are more examples of massacres in the bioarchaeological literature from the American Southwest (Billman et al., 2000; Kuckelman et al., 2002; Potter and Chuipka, 2010), from the South Dakota site of Crow Creek (Willey and Emerson, 1993), from Turkey (Erdal, 2012) and from England at Towton (Fiorato et al., 2007). While the term genocide is used today, it is a phenomenon that will likely remain invisible in the archaeological record, while, massacres remain easier to identify due to their demographic and skeletal characteristics. However, there is still a degree of caution that must be a concern when looking at these types of collections. Reanalysis over time of important collections is important because new techniques and a better understanding of how bone reflects both cultural and natural modifications are constantly updated. A good example of this is the analysis and reanalysis of the human remains from the King site, a Native American community from the 16th century. Blakely and Mathews (1990) analyzed the human remains and found that 20% (out of about 160 burials) exhibited sharp force trauma that they attributed to steel weapons used by the Spanish. A decade later, George Milner and a team of bioarchaeologists (2000) published their study showing that they could not find any evidence of sharp force trauma from Spanish weapons on the same bones. They found no evidence to support the hypotheses presented by Blakely and Mathews (1990) involving the massacre of a group of Native Americans. Milner et al. (2000) make the case that all of the changes on the bones were not human-made sharp force trauma, but were due to taphonomic processes having to do with carnivore damage and poor preservation.

While both studies relied on ethnographic documents from the Spanish (who were in the area in the 1500s), the interpretations were different because of the more

judicious application of taphonomic principles and forensic techniques of analysis. Broader and more integrative studies of massacres in the past using comparative and temporal frameworks will provide increasingly better information on when and why cultures choose that strategy of violence over others.

INTRAGROUP VIOLENCE: DOMESTIC AND COMMUNITY SETTINGS

Intragroup violence or conflict within a particular culture is also known as interpersonal violence and it is defined as “violence between family members and intimates, and violence between acquaintances and strangers that is not intended to further the aims of any formally defined group or cause” (Waters et al., 2004). It is very challenging to accurately identify the perpetrator and their relation to the victim in the archaeological record. In bioarchaeology, interpersonal violence is used to describe violent acts between individuals that are not likely to represent intergroup violence or have occurred as a result of accidental or occupational activities. Although violence within a group can be between any member of the community (e.g., domestic or wife abuse and child abuse), the motivation behind male-on-male interpersonal violence is arguably different. While it can vary, it typically involves competition for females, status, prestige, and resources or it is the result of seeking retaliation or revenge (Wrangham and Peterson, 1996; Gat, 2006). Using careful demographic and skeletal indicators of injury and trauma, violence against women and violence against children present some avenues of analysis that aid in exploring intragroup violence.

Gendered violence

Above we discussed how nonlethal violence in controlling and capturing women is well documented in the example of captives and slaves, but women at risk for violence are not always outsiders. Depending on the social and cultural structure of the society, they can also be members of the cultural group. One of the most salient examples of intragroup violence is intimate partner violence (IPV) or domestic abuse. Based on clinical literature and regional and national crime statistics, IPV is an epidemic in our society today. Using multiple indicators such as trauma on human remains, archaeological reconstruction of the mortuary and habitation contexts, ethnohistoric resources, and if possible isotopic analysis, one can distinguish victims of violence from perpetrators within the same community (Tung and Knudson, 2010, 2011; Duncan, 2012).

The problem with identifying domestic abuse in the bioarchaeological record is that it is impossible to know when and where the injuries occurred and who the perpetrator was. With domestic abuse we are forced to rely solely on patterning of injuries. Shannon Novak et al. have conducted research with clinical populations to identify what the patterning of trauma would look like for a victim of IPV (Novak, 2006; Allen et al., 2007), and an attempt was made to explain the nature of this type of violence in an evolutionary, ecological, and historical context (Novak et al., 2007; Novak and Hatch, 2009).

The value of this research is that it provides a framework from which researchers can attempt to identify evidence of violence in a domestic context in the past. The problem, however, is that archaeological data and broken bones do not always provide sufficient evidence to definitively identify IPV as opposed to other forms of vio-

lence against women (e.g., raiding and captive-taking). For example, Walker published his findings from a historic population that he thought had evidence of domestic violence (Walker, 1997). The problem with Walker’s research was that a later reanalysis of the remains with additional archival research by Carlina de la Cova (2010) revealed that the violence was due to institutionalization in a state run facility and not domestic abuse. The result of the reanalysis is that it further affirms the difficulty of identifying intimate partner abuse in the past.

LoBugio Basgall (2008) suggests that typically IPV is suggested as one possible cause of traumatic injuries found among women within a particular bioarchaeological sample of human skeletal remains, but it is rarely the only form of violence offered to explain the injuries (see for example, Hollimon, 1990; Wilkinson and Van Wagenen, 1993; Lambert, 1997; Martin, 1997; Walker, 1997; Wilkinson, 1997; Redfern, 2008; Martin et al., 2010). Rebecca Redfern (2008) offers a good bioarchaeological case-study looking at traumatic injuries among women in Britain during the Iron Age. She considers the various motivations for why these women may have been victims of violence which includes political violence, domestic violence, and women as warriors. Looking at a number of different skeletal samples from numerous sites, she found that violence against women was highly variable and that women were not passive participants during the encounters.

IPV in the past as today likely involves more than just male perpetrators. MC McHugh and Hanson Frieze (2006) cite several clinical studies that found women also engaged in violence within relationships. Violence by women is not only directed toward men however. McHugh and Frieze (2006) argue that it is important to realize that women interact differently with one another in different situations. For example, in looking at modern same-sex couples, the clinical data clearly shows that women are also at risk for violence in these relationships (Elliot, 1996; Renzetti, 1997; Burke and Follingstad, 1999; Walters, 2009; Ard and Makadon, 2011). IPV is just one form of household violence where women can be the aggressors. Other examples of violence among women who live in a shared domestic setting include mother-in-law and daughter-in-law conflicts and dowry-related murder (van Willigen and Channa, 1991; Gangoli and Rew, 2011; Raj et al., 2011) and co-wives in polygynous marriage (Madhavan, 2002; Jankowiak et al., 2005; Harrod et al., 2012).

The reason females may use non-lethal violence is that it may affirm one’s social position within the group, create a power relationship among competing females, or reinforce social norms (Underwood, 2003). Examples of how women may use violence to their benefit are found cross culturally, and ethnographic examples include women in Morocco where “[a] capable woman with a forceful personality could take over the management of a large household and consequently become the hub of a large and important network of relationships. Women who attain such positions tend to be clever, tough, and extremely political” (Rassam, 1980).

A good bioarchaeological example of violence among women is seen among the Australian Aborigines (Webb, 1995). Looking at fracture patterns by region Webb found that in on the east coast women had traumatic injuries that were nearly at the same level as men (Webb, 1995). Understanding violence against women and violence

perpetrated by women is challenging and there are often different and complex variables at work that are culturally sanctioned and part of everyday behaviors. Although this form of violence may go back many thousands of years, it has been difficult to establish in the archaeological record although a few studies are beginning to emerge (Warner et al., 2005; Martin et al., 2010).

Violence against children

Child abuse is one of the most challenging areas for the study of violence in the past. Gaither (2012) offers an explanation for why studying child abuse in the past is problematic, "... past populations may have considered what is called physical child abuse (in the modern medicolegal context) normal, and even beneficial—a "spare the rod, spoil the child approach," researchers are reluctant to more closely examine this type of physical violence given that cultural views on the subject are often difficult to establish." Child abuse, more commonly referred to as child maltreatment today, involves the neglect and harm of children by adults responsible for their caretaking. In our society, this would typically be the mother and the father but perhaps in the past this included many other people in the society (O'Connell et al., 1999; Hrdy, 2009). Like other forms of violence, ethnographic research on child abuse suggests that it is not a universally accepted concept but varies by culture to culture (Korbin, 1981; Korbin, 1990).

Child abuse like any other form of interpersonal violence has a specific set of signatures that can be read on the bones. The objective of most of the bioarchaeological research on violence and children is to answer two major questions: (1) Is child abuse recognizable in the bioarchaeological record? (2) What are the consequences for children who survive violence? Bioarchaeologists need to understand the clinical and forensic literature on modern cases of child abuse. Radiology, medical pathology, and forensics have played an important role in developing an understanding of child abuse, as these sciences have provided a number of signatures to accurately identify child abuse in the past.

A review of this literature indicates that there are three important characteristics of trauma that need to be considered in order to identify child abuse: mechanism, type, and pattern. Mechanism of injury refers to cause of the trauma such as accidental versus VRIs (Billmire and Myers, 1985; Bilo et al., 2010), type represents the location of fractures in reference to the child's age (Kempe et al., 1985; King et al., 1988; Boaz et al., 2011), and the frequency of trauma that the child has been exposed to during their lifetime that provides evidence of repeated assault (Kempe et al. 1985). According to Paul Kleinman (1998) "[a] fall is also the most common event offered as an explanation for significant inflicted injury in childhood." However, falls tend to have very little consequence if the child falls from a height of <3 feet (Nimityongskul and Anderson 1987). Regarding head trauma related to falls, Brogdon (1998) illustrates that falls from low heights, such as "baby chairs or tables, sofas, and beds rarely cause a linear fracture and this is usually not associated with intracranial damage." Similar to falls, the excuse that the child ran into something is not likely to result in severe injury due to the relative low force behind the impact.

In contrast, injuries related to abuse are quite different because violence-related trauma on children presents a

distinctive type and pattern of fracture and are dissimilar to injury that would have resulted from an accident. Understanding the pattern of trauma is arguably the most important element in identifying child abuse because evidence of recurring injury clearly indicates the child is involved in a cycle of abuse. Additionally, while it may be argued that a single injury that can be attributed to abuse based on the inferred mechanism is evidence of child abuse, repeated injury leaves little doubt. Trauma to the head is especially important to understand because it is the primary cause of death in child abuse related trauma (Reece, 1994; Colbourne, 2004).

Many head injuries are not severe enough to lead to death, thus many children live through multiple episodes of violence (Reece, 1994; Colbourne, 2004). Obviously not all fractures of the skull can be equated with child abuse. Accidental injuries include certain types of trauma to the head such as occipital impression fractures (King et al., 1988; Brogdon, 1998; Kleinman, 1998; Boyden and Levison, 2000; Bilo et al., 2010; Boaz et al., 2011). Ribs, like the head, are also a very useful measure of child abuse since violence-related fractures of the ribs are very distinctive (Brickley, 2005). There are certain rib fractures that may be more indicative of child abuse, such as those fractured on the posterior surface that are a result of an adult grasping and squeezing a child from the front (Brogdon, 1998). Other parts of the body that when injured seem to indicate that there was a history of abuse for that child are those traumas in which the anatomical features were not likely to get injured accidentally. These injuries include the acromion process of the scapula, the spinous process of the vertebrae, the sternum, bucket handle fractures of the epiphyses of long bones, and the pelvis (King et al., 1988; Brogdon, 1998; Boaz et al., 2011). The terms "corner fracture" and "bucket handle fracture" are used to describe injuries on the metaphysis of the long bones that are highly indicative of child abuse (Kleinman, 2008). One limitation of these fractures for bioarchaeologists however, is that they heal over and other conditions such as rickets and osteogenesis imperfecta can leave similar markers on the bone (Kleinman, 2008).

Beyond a particular fracture type, patterns of child abuse include several key features: (1) multiple injuries over the course of the lifetime of a young child; (2) fractures to the same bones of specific areas of the body; and, (3) evidence of a fracture that does not heal because of repeated injury to the same location (Kleinman, 1987; King et al., 1988; Reece, 1994; Brogdon, 1998; Kleinman, 1998; Bilo et al., 2010; Boaz et al., 2011). Evidence of healed injuries among children are key to the identification of child abuse, therefore it is important to understand how healing differs among children. According to Symes (2005) there are differential rates of healing among children of different ages and this is important because very young children may appear to have a long history of trauma based on evidence of repeated injury, when the chronology of abuse may in fact be much shorter. A general pattern of healing has been identified by researchers who provide different classification stages during the earliest stages of development (O'Connor and Cohen, 1998; Prosser et al., 2012). Looking specifically at rib fractures, one more obvious sign of child abuse is the presence of large callus formations on them, because these deposits of bone indicate that the fractured rib was fractured again or at least continually aggravated and not allowed to heal (Brogdon, 1998).

Looking at a specific bioarchaeological study focused on child abuse by Gaither (2012), children that exhibited the classic characteristics of child abuse were likely not the victims of domestic violence. Using osteological markers in combination with a detailed reconstruction of the archaeological and mortuary context, the burial patterns suggest that the trauma injuries these children suffered was more likely due to political violence as a result of Spanish Conflict. Child abuse like IPV is difficult to identify in the past because other forms of violence can often produce a similar pattern. The consequence is that Phil Walker came to the conclusion after surveying a number of bioarchaeological reports that there does not appear to have been a high rate of child abuse in the past, suggesting it may in fact be a more modern phenomenon (Walker, 1994; Walker et al., 1997). Walker et al. (1997) found that when violence against children did take place in the past it was related to labor, as most of the historical descriptions of child beating refer to older, school-age children, or children forced to work in factories, and not the young infants who are the principal victims of child abuse today.

The high prevalence of domestic and child abuse today challenges anthropologists to find novel ways to identify these behaviors in the past. The importance of understanding this type of violence is that the injuries to these women and children are not temporary but instead have cognitive, psychological, and health-related consequences that can last throughout their lifetime.

VIOLENCE OPERATING WITHIN SOCIAL STRUCTURES

Critical medical anthropology has contributed a great deal to framing violence in particular ways that bioarchaeologists (primarily in the US) are finding useful (Klaus, 2012; Pérez, 2012a). Violence that is intricately part of the political, economic, or religious structures of a society is referred to as structural violence. Paul Farmer, who's pioneering work in some of the most dangerous and violent places on the earth, has written the following about the way he sees linkages between violence and other forms of poor health: "Social factors including gender, ethnicity ("race"), and socioeconomic status may each play a role in rendering individuals and groups vulnerable to extreme human suffering . . . simultaneous consideration of various social "axes" is imperative in efforts to discern a political economy of brutality" (Farmer, 2003).

As discussed earlier, these forms of culturally produced and culturally sanctioned forms of violence are deeply embedded in cultural systems, are considered to be part of everyday life, and are generally not questioned by group members. Culturally sanctioned violence in ancient, historic and modern groups as already discussed include ritualized activities such as warfare, raiding, captive-taking/slavery, combative spectator sports, torture and sacrifice of enemies, revenge killings, domestic violence, and sectarian violence.

Structural violence and inequality

The recipients (or victims) of culturally sanctioned violence are often those who do not have access to the resources, decision-making, and capital that others in the group do. This kind of inequality is at the heart of political-economic approaches to violence and to theories about the origin and function of violence (Klaus, 2012).

Structural violence can be thought of as tactics that create harm for some individuals because of social, political or economic processes within the culture. With institutionalized violence, direct physical violence also tends to become institutionalized, repetitive and ritualistic (Galtung, 1990). Studies seeking to get at the underlying social processes that support and maintain structural violence within and between groups find evidence that link direct and structural violence (Pérez, 2012a).

For example, Geber (2012) examined patterns of trauma on two skeletal populations from medieval Ireland. While archaeological evidence for medieval weaponry from Ireland is not common, iconography depicts several standard weapons for warriors in this time. These weapons include short swords, spears, and small shields, javelins and pikes, and throwing axes, slingshots, and knives. There is no evidence of armor being worn in battle. The population was comprised of 232 adults from two sites, Mount Gamble and Owenbristy. Of these, 16 individuals showed perimortem trauma. For the Mount Gamble sample, the neck region was the most common area for trauma, followed by the torso, and the lower limbs. The Owenbristy sample showed more evidence for decapitations with the neck being the most common area affected, followed by the head and torso, the upper limbs, and the lower limbs. Overall, trauma was more prevalent in the Owenbristy sample than the Mount Gamble sample.

Notably, the type of weapons used to inflict trauma on these individuals varied by location, suggesting that the populations were exposed to violence under different circumstances. Geber's analysis pointed to structural violence playing an important element in medieval Ireland, and it demonstrated variation in the patterns of trauma that was related to the social and political structures and alliances within the populations. The use of iconography and ethnographic data aided to fill in the gaps represented in the archaeological record regarding the weaponry used during this time period.

Bioarchaeological studies on structural violence must start with identifying any part of a cultural system that thwarts access to necessary resources or uses direct violence to keep some individuals in a state of marginalization, fear, poor health and/or subordination (Fig. 5). In bioarchaeology, examining violence using a structural violence framework is best carried out when it is part of the methodology. Haagen Klaus (2012) presents a useful case study from Peru on how this kind of theory-method-data integration can be carried out. Using temporally sequenced human remains retrieved from a pre-colonial and colonial era site, he examined a range of indicators of trauma, injury and poor health. He also used ethnohistoric documents to better understand the colonization tactics used. He showed that underlying the colonization process in Peru was the desire for the extraction of human and natural resources. This involved forcing all of the indigenous people to become Catholics who then by definition had to pay taxes, work hard, and be obedient to the church. The colonizers used well documented practices to bring this about. These included religious intolerance, marginalization of the local people, forced labor and multiple forms of physical, psychosocial, and sexual violence.

Klaus systematically collected data on trauma (healed and unhealed fractures and blunt and sharp force trauma) and on general health (developmental dental defects and oral health, subadult growth, adult stature,

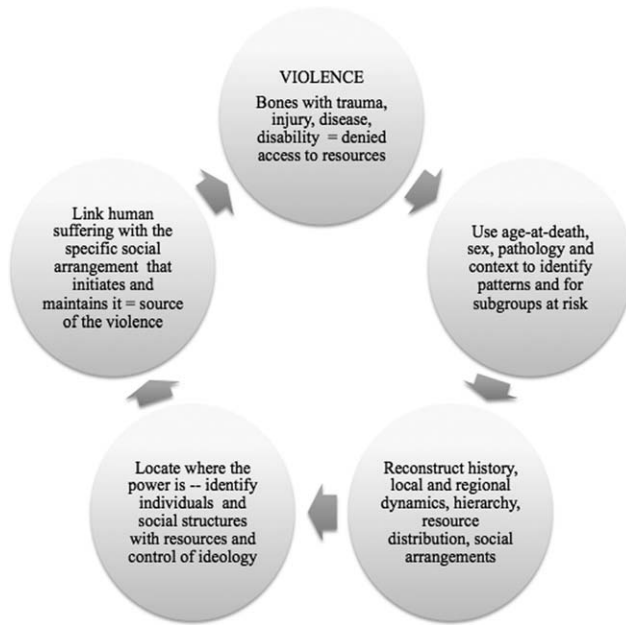


Fig. 5. Chart demonstrating the possible pathways to link skeletal remains to structural violence.

anemia, infections, osteoarthritis, and age-at-death) to compare health profiles at the individual and population level for precolonial and postcolonial burials. Surprisingly, he did not find any significant differences in direct violence in the form of trauma in either the precolonial or postcolonial groups. What he did find in the postcolonial group was that under the new rules and cultural pressures from the colonizers, there were statistically significant increases in nutritional problems, infections, and osteoarthritis for the adults. Hard labor in the local gypsum mines, living in close quarters, eating contaminated food (all parts of a systematic structural system of violence) were the likely cause of these increases in chronic health problems. Postcolonial children in the cemeteries did not show increases in poor health over their precolonial counterparts and Klaus suggests that this might have been because children died early and younger before accumulating the signs of stress that show up on their bones.

What this example of a bioarchaeological approach to identifying structural violence demonstrates is that direct violence in the form of trauma may not be the underlying strategy. In the colonial Peruvian case, it was a more systematic denial of access to clean water, good living quarters, and adequate food combined with forced hard labor that created the system of embedded violence. The low level of trauma in the precolonial and postcolonial groups would have been misinterpreted as there being no violence used by the colonizers if Klaus had not integrated archaeological and bioarchaeological data with ethnohistoric documents.

Having historic documentation and a chronological distribution of skeletal remains aided in being able to demonstrate how violence can take many forms when it is institutionalized. How can structural violence be “seen” when there is no ethnohistoric or archival data? The evidence for captives in the American Southwest at La Plata and Kin Bineola (circa AD 1100) demonstrate the likely patterned and widespread cultural activity of

raiding for women and children (Martin, 1997; Kohler and Kramer Turner, 2006; Martin et al., 2010; Harrod and Martin, in press). Raiding for young women and children in neighboring groups can serve a number of cultural functions, from increasing male status to providing additional laborers to the community. This form of violence would need to be culturally sanctioned and publically supported and/or celebrated in order for it to be practiced over many generations (Martin et al., 2010). It is likely that raiding and the abduction of women and children in the Southwest was practiced long before contact, and during contact it persisted but was exploited and subverted by the Spanish entering into these regions (Brooks, 2002).

Structural violence may be much more difficult to investigate in the archaeological record, but the model provided in Figure 5 minimally charts a pathway for examining data sets that may reveal its presence in the cultural system. Qualitative and quantitative data from the skeletal material is the beginning point, and the other layers of context that can be provided by archaeological and ethnohistoric sources may provide ways to accept or reject hypotheses about the embeddedness of violence in the group being investigated.

Ritual, performance, and symbolism

Violence overlaps with and is often part of the underlying social structures that promote inequality and differential access to resources. Cultures normalize, promote, and even celebrate structural violence. At the same time violence can be regenerative to communities and can also be a way to formalize group identity. Forms of ritualized violence include a wide range of activities such as trophy taking, head-hunting, human sacrifice, public and ritualized torture of enemies, cannibalism, and other forms of public activities that are used symbolically to reify the group identity and the power structure (Martin et al., 2013). The archaeological record and available ethnographies can shed light on and rectify problems within the skeletal analysis.

Head hunting/trophy takin

Head hunting and trophy taking is one common form of ritual violence that is found worldwide (see Chacon and Dye, 2007 for archaeological examples). There are also ethnographic accounts of head hunting and trophy taking that show the importance of the practice to cultural ideology (Haddon, 1901; Hodson, 1909; Durham, 1923). In terms of bioarchaeology, a recent book edited by Michelle Bonogofsky (2011) provides case-studies of how the human head can be a symbolic and ritual artifact within a community. Bioarchaeologists working in South America have continued to demonstrate that the human head in a variety of forms was a crucial aspect of social and political interactions (Proulx, 1999; Forgey and Williams, 2005; Tung, 2008; Tung and Knudson, 2008; Tung and Knudson, 2010; Duncan, 2012).

On the other side of the world, Mercedes Okumura and Yun Ysi Siew (2013) also identified headhunting practices. Looking at populations in Borneo, they found that making heads into trophies was highly significant to the culture (Okumura and Siew, 2013). While the exact motivation for headhunting in this area is not known for certain, suggested reasons include an “accumulation of energy,” fertility of crops, religious reasons, or to gain political or economic prestige. The

cultural significance of headhunting is still important in Borneo, and is symbolically reenacted each year despite no longer participating in the actual activity. The skeletal remains examined consisted of 112 individuals represented by the cranium, the mandible, or both. The sample was comprised of young adult males with some females as well. The Murut ethnic groups were the most targeted for trophy heads and represent the largest percentage in the collection. Evidence of sharp force trauma was seen on more than half of the individuals as well as evidence of decapitation. The majority of these skulls showed some evidence of burning and a significant number show evidence of drilled perforations (likely to put a string through). Osteological evidence and ethnographic data suggest that these skulls were part of trophy taking, rather than as a method of ancestor veneration.

Scalping

Similar to taking trophy heads, scalping is generally considered a ritual act that may be associated with interregional or interethnic violence. The act of scalping an enemy also has a long tradition evidenced by both ethnohistoric accounts (Owsley and Berryman, 1975; Axtell and Sturtevant, 1980) and bioarchaeological evidence (Neumann, 1940; Allen et al., 1985; Toyne, 2011; Baustian et al., 2012). The scalp appears to represent a symbol of conquest and revenge, as well as being a spiritual token of the deceased's captured power. Marla Toyne (2011) examined evidence of scalping (and healing) on skeletal remains excavated from Kuelap in the highlands of Peru.

This precolonial site has been of particular interest to archaeologists due to its massive stone wall and its defensive architecture. There was also evidence of a stratified society with ceremonial elites living in the village. Skeletal remains were examined and cut mark morphology and pathological lesions were analyzed. A young adult female and older male both showed evidence of scalping along with early stage healing. This suggests that the individual survived for at least a short time. It is likely that death resulted from infection to the exposed underlying bone. The adult male also showed evidence of cut marks and inflammatory response to the outer table of the cranium. Similarly, this individual also had evidence of healing. This individual appears to have survived for a longer period of time than the female. The practice of scalping was so important that it often persisted even after European contact in the form of ritual or ceremonial behavior. For example, Dozier (1970) discusses the importance of symbolically consuming the scalps of fallen warriors in the Women's Scalp Association among the Pueblo people in the U.S. Southwest.

Cannibalism

Cannibalism is found in many different cultures throughout time. Present in a wide variety of settings, its expression is highly varied. The long history of cannibalism is important as it underscores that it is not a simple or easily understandable activity, but that there are multiple cultural factors and practices related to the consumption of human flesh. Cannibalistic behaviors may be related to burial contexts and mortuary practices but cannibalism is also found in domestic contexts. The use of isotopic data may shed light on dietary patterns that include the consumption of human flesh. Cannibalism is present in the archaeological record, both before

European contact and after. Two of the most prominent archaeological examples of cannibalism are the highly processed remains found in the U.S. Southwest (Turner and Turner, 1999) and the famous doomed expedition of the Donner Party in the Sierra Nevada mountain range (Dixon et al., 2010).

Jones et al. (2014) provide a good bioarchaeological case-study that examined the underlying causes and types of cannibalism in prehistoric Fiji. Motivations for cannibalism traditionally include nutritional, ideological, and ritual factors. The authors present the complications of viewing cannibalism as a form of violence because it contains both aspects of violation as well as veneration in many cases. Skeletal remains from midden and burial contexts were examined and compared. The Lau bone collection is housed in a repository in Fiji. Sharp force trauma defects and isotopic data were examined to determine the likelihood of cannibalism within these groups. The isotopes were used to gauge protein consumption within the populations.

Almost all of the individuals exhibited sharp force trauma in the form of cut marks. Patterning of cut marks is suggestive of dismemberment or muscle removal. Additionally, there is evidence of defleshing at the joints. Isotopic data show that the majority of the Lauan diet is plant based with much less protein present. The authors conclude that if cannibalism did occur, it was likely non-nutritive and possibly nonviolent.

They also suggest that characteristics for determining cannibalism in a skeletal population should be modeled off of work by David DeGusta (1999, 2000) who showed that highly fragmentary remains in midden contexts, element distribution that is different from expected, lack of evidence of nonhuman modifiers, burning, sharp force trauma, and the presence of peeling and/or cutmarks at the joint were all present in a well documented case of ritualized cannibalism.

In summary, violence can use human bodies as objects in rituals that cement social interactions and reaffirm particular aspects of the cultural ideology. Even after death, the bodies of victims continue to be used to communicate powerful messages to the populace about the structure and nature of who is in power and what that power confers.

ETHICAL CONSIDERATIONS IN STUDYING AND TEACHING VIOLENCE

Conducting research on the remains of the dead (in any context including ancient, historic and modern) presents a range of ethical issues to consider but these become especially compelling in the study and teaching of violence within academia. Alison Galloway (2014) discusses how working exclusively with death and violence can affect the confidence that researchers have in their conclusions because they do not generally have access to the perpetrators or the witnesses, and because so much of the evidence is circumstantial and inferential. In a completely different direction, working with the dead tends to leave mental images (real and imagined) and associations that can take their toll on bioarchaeologists. "Bioarchaeologists who work with victims of violence also capture images. The flesh may be long gone but the ages, the poses, the cut marks or flaws are clearly visible. In these settings the reasoning behind why the people were killed ... cannot be fully known. The investigator is left trying to reconstruct the unfathomable" (Galloway, 2014).

Others have suggested that researchers who study violence often connect more with the victims and are less able to maintain objectivity in their interpretations (Pollock, 2008). In all of these aspects, researchers need to be able to maintain a scientific distance while they process these lasting images of individuals who died at the hands of others. It is also important to mentor graduate students with an eye towards being aware of the ways that years of working with the dead can take its toll.

CONDUCTING RESEARCH ON VIOLENCE

Violence by its very nature is a sensitive topic to discuss, because it not only affects how we think about the dead but also often has lasting impacts on descendants and communities. According to Chacon and Mendoza (2007, 2012) some anthropologists avoid studying violence in indigenous populations because it may reify negative stereotypes that the living descendants may have to endure. "... Some revisionists go so far as to argue that documenting ... warfare and ritual violence only serves to promulgate further violence and aggression against indigenous peoples" (Chacon and Mendoza, 2007).

The study of violence requires that bioarchaeologists actively work to identify as many ethical considerations as possible. Researchers make decisions about what to study and how to study it, and raising the question about why bioarchaeologists choose to study those who were killed, tortured, maimed, scalped or eaten is an important part of the research process itself. Scholars should have a ready answer for why they frame any question about human behavior the way they do, but this becomes especially important in violence studies because they can so easily slide into the realm of generalizations about past people that may be based on problematic data.

Another issue to consider is the relationship between archaeological excavations carried out in places where there is warfare and violence today. Susan Pollack (2008) explored the politics and ethics of doing archaeology in such places and explores whether the presence of archaeologists makes things worse or better for local peoples. Publications about ancient warfare in a region that is experiencing warfare could provide grist for suggesting that some cultures have always been violent thereby justifying the violence taking place today. She summarized the dilemma this poses for archaeologists that is relevant to bioarchaeologists as well: "In broaching these topics, it is important that we not limit ourselves solely to theoretical reflections; rather, we must engage at the level of praxis, by putting theoretical knowledge into practice. The praxis of archaeology involves everything from choosing a site to investigate ... to formulating the questions that guide our research ... the challenges of pursuing a politically aware and ethical archaeology must not be underestimated" (Pollock, 2008).

T.J. Ferguson et al. (2001) describe the pain and anguish that some Native Americans feel when confronted with depictions in the bioarchaeological literature of their ancestors reduced to violent people who practice cannibalism. After a slew of bioarchaeological publications came out in the 1990s describing region-wide cases of cannibalism, mainstream media representations included headlines about the cannibals living in the Americas prior to colonization (McGuire and Van

Dyke, 2008:30–31). Even though there were debates about the nature and extent of cannibalism, the media presented it as a sound bite that suggested all precolonial Native people were cannibals (Armelagos, 2008).

While no code of ethics for bioarchaeologists working in the realm of violence exists, it is important for bioarchaeologists to engage with and reflect upon the larger context within which their research takes place and its potential impact on living descendant populations, local communities, and the world at large (Martin et al., 2013). It is important that bioarchaeologists be able to articulate the relevance of their research. Bioarchaeologists need to think about what the implications of their research are with respect to how their research might impact people living today and the potentially negative ways that their findings might be used by people outside of anthropology (Pérez, 2003).

TEACHING ABOUT VIOLENCE

Alisse Waterston and Antigona Kukaj (2007) provide a thoughtful overview on what it means for anthropologists to teach about social violence in today's world where warfare and genocide define the daily news. The authors suggest that using the "structural violence pedagogy," where students are asked to look closely at inequality and how it is implicated in various forms of violence, is both a useful as well as a potentially problematic approach. The authors state that using anthropological studies on violence "... can lead students to be pessimistic about humankind and its future" (Waterston and Kukaj, 2007).

To subvert the sense of gloom, it is important to balance class readings on violence with those highlighting the successful campaigns of reconciliation, cooperation and prevention that demonstrate that the course of direct and structural violence can be altered. For example, Douglas Fry's (2007) volume on the *Human Potential for Peace* provides archaeological and ethnographic evidence that humans are not innately violent or warlike. He provides readers with ways of seeing how the focus on violence overshadows research on its opposite. Kristine Höglund and Magnus Öberg (2011) provide a series of case studies on the methods and challenges of conducting peace research.

Readings by anthropologists who also participate in social activism around preventing or ameliorating violence can also provide an antidote to student's feelings of hopelessness. A recent themed issue in *Anthropology News* had numerous articles written by scholars who are engaged in promoting alternatives to violence. Aldo Civico (2012) writes about his research in Columbia and the ways that he feels anthropologists can make contributions to mediation and peace building. Heidi Bauer-Clapp and Ryan Harrod (2012) write about their reflections of teaching courses on violence and the challenges of recognizing when students are overwhelmed by the material. They show how bioarchaeologists can give voice to the ancient dead who otherwise may have died in vain, or from whom important lessons about violence are yet to be learned.

There is a growing debate among faculty about using trigger warnings in syllabi for courses that deal with potentially depressing or distressing topics. These are explicit caveats to students taking the class that some of the material may have the power to cause emotional distress or even a post-traumatic stress disorder reaction. With an increasingly diverse student population that

includes veterans of many past and on-going wars, discussion of violence in past, historic and present anthropological contexts could cause extreme distress. Even discussing structural violence, poverty, racism and inequality could raise topics that trigger intense feelings in students. However, some feel that trigger warnings are not necessary if the topics are handled carefully and if the syllabus makes clear what topics will be discussed in the class. Also, there are simply too many possible subtle and not-so-subtle ways that students may become distressed. While we know of no formal publication on this from an anthropologist at this time, it has been discussed informally on blogs and websites by anthropologists for anthropologists.

FUTURE DIRECTIONS

The future of violence research in bioarchaeology is exciting because there has been a rapid development of new approaches to understanding and interpreting violence-related trauma on the bones. One especially useful new approach is the incorporation of isotope analysis used to identify migration by looking at ratios of strontium and oxygen isotopes. Since dental enamel forms in early life and bone continues to remodel it is possible to determine if a person has always lived in the same geographic region. Some researchers have already shown how this type of research can enhance our understanding of captives (Tung and Knudson, 2011; Duncan, 2012).

One other value of isotopic research is that it can reveal more accurate information about diet. Diet is especially important for understanding if there was inequality in a particular society. If some people have better nutrition, it can help to inform about who that person was during their lifetime (Wright, 2006). This information combined with trauma analysis provides a much more holistic picture.

Similar to isotopic analysis, DNA research also has the potential to enhance our understanding of violence in the past by providing information about biodistance, migration, and inter-population gene mixture. The degree of gene flow has the potential to tell us about how those groups interacted.

Another new research trajectory involves working with contemporary foragers and subsistence based communities. Using ethnographic data from living people is a very useful way to aid in the integration of data from the past with interpretations about human behavior that are more generally applicable (Harrod, 2012b). Ethnobiaeology is an approach that encourages researchers analyzing human remains to look to the present to understand the past (Walker et al., 1998). Walker and his colleagues pioneered this approach to informing bioarchaeology by conducting specific kinds of ethnographic research that helped to pin down better interpretations for extant and ancient people. Beginning in 1990, Walker used ethnobiaeology to understand dental changes seen on skeletal remains by analyzing the dentition of an extant population of hunter-gatherers in Central Africa (Walker and Hewlett, 1990) and several extant populations of horticulturalists in the Amazonian Basin (Walker et al., 1998).

Ethnobiaeology may pave the way for the construction of better models for understanding ancient behavior. Recent work among the Turkana pastoralists in East Africa showed the value of this kind of approach (Harrod et al., 2012). By documenting violence on a pop-

ulation that is actively engaged in raiding it was revealed that a pattern of violence-related trauma existed that has helped to inform our interpretation of bioarchaeological signatures of violence. The study was designed to document the cases of healed trauma among the Turkana to provide information that typically is unavailable to bioarchaeologists, and as such is useful for a greater understanding of context.

The primary focus of the study was on the causes and underlying factors that contributed to non-lethal violence in the group, which is often a window into understanding gender and sociopolitical disparities. The questions we most wanted to answer included who was most at risk and how do individuals accrue trauma and wounds throughout the course of their lifetime. The approach to this study was to understand the causes and distribution of injuries through the bioarchaeological interpretation of data obtained from ethnographic interviews, a survey questionnaire, and body-mapping diagrams.

What the Turkana study revealed was that everyday life produces a fair amount of accidental trauma. However, most of it only affects the soft tissue, and as bioarchaeologists, we never see these kinds of stresses and injuries on the human remains. For violence related injuries however, the injuries are more severe often resulting in trauma that does affect the bone. Additionally, when accidental and occupational trauma does affect the bone it is much more likely to involve the body and the extremities, while in contrast violent actions seemed to favor the head. Trauma due to accidents among the Turkana seem to affect soft tissue more often than bone. Male violence directed at females was related to domestic disputes and raiding. Female violence directed at females was common by older co-wives.

In addition, early exposure to violence resulted in injury recidivism in both sexes. They often experience occupational injuries and have a cultural ethos that encourages violence in childrearing practices, among the co-wives, and during periods of raiding and warfare. A survey was designed that solicited information from adult males and females about their healed fractures and head wounds. The results of this research indicated that 68.8% of the males had head trauma related to violence, which was similar to female violence where 64.3% had suffered violent trauma to the head (Harrod et al., 2012). The difference however is that the males tended to have larger cranial depression fractures sustained in raiding and face-to-face fighting. In contrast, the females typically had more shallow depression fractures caused by expedient "weapons" such as stones, cups and herding sticks, and the trauma was sustained as a result of beatings (i.e., domestic abuse). The resulting pattern of non-lethal head wounds for the females and males suggest females have more wounds towards the front of their heads, and males across the whole of the cranium. Furthermore, females with healed cranial depression fractures said that they were beaten often by their husbands and they were beaten by co-wives.

The value of this study is that it suggests that not all trauma found on the body is related to accidents, nor is it all related to violent encounters. Additionally, contextual information on lifestyle, variations in male and female roles, as well as cultural ideology all directly impact the manifestation and role that violence plays in everyday life. Given the diversity in the etiology of traumatic injuries, there is a need for bioarchaeologists to use a more nuanced approach to analyzing trauma. For example,

using the famous example of violence recorded in the documentary “Dead Birds” that chronicles warfare among the Dani of West New Guinea (Gardner, 1963) illustrates how violence may have functioned in the past. The focus of the movie is the ritual warfare that the Dani engage in against their neighbors. In terms of understanding violence, the ritual warfare is vital because the violence involved is typically non-lethal and would leave no traces on the skeletal remains. The organization of the battle is that the two rival groups stand on opposites of an area within the no man’s land and throw spears at one another. Although death does occur, it is more common for people to be superficially wounded. These encounters would likely not show up archaeologically.

CONCLUDING THOUGHTS

Physical and direct violence has been shown in many of the case studies to result in tangible and quantifiable changes to human bony remains in the form of craniofacial fractures, blunt and sharp force trauma to the body, projectile injuries, fractures on the limbs and ribs and other manifestations of being harmed with the aim to subdue, maim, thwart (non-lethal violence), or kill (lethal violence). Beyond the empirical data that can be collected from the human remains themselves, bioarchaeologists can also use the rich data sets from archaeological reconstruction of the local and regional habitation sites and from ethnographic works. Data can be obtained to provide more information on the forces within cultures that systematically deny some of their citizen’s access to necessary resources that would permit them to maintain their health and vitality.

Yet there will remain challenges and ambiguities in the study of ancient violence. Standardizing the way data are collected on an international scale is difficult. Standardizing reporting of skeletal data on injury and trauma is underway (Judd and Redfern, 2012; Passalacqua and Fenton, 2012) but it will take a concerted effort by the bioarchaeological community. More experimental and ethnobioarchaeological studies need to be carried out on all aspects of violence and the skeleton, and on violence and human behavior that result in skeletal trauma. More quantitative studies need to be conducted that look for patterns across many different regions as Walker (1997) did for broken noses and wife beating. Longer chronologies need to be collected on shifting patterns of trauma over time, for example, following violence and trauma from the preclassic Maya through to contemporary Maya. May a new generation of bioarchaeologists interested in violence take up the challenges posed by this kind of research and move it into new frontiers.

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LITERATURE CITED

Ahlström T, Molnar P. 2012. The placement of the feathers: violence among sub-boreal foragers from gotland, central baltic sea. In: Schulting RJ, Fibiger L, editors. *Sticks, stones, and broken bones: neolithic violence in a European perspective*. Oxford: Oxford University Press. p 17–34.

Aldhouse-Green M. 2005. Ritual bondage, violence, slavery and sacrifice in later european history. In: Pearson MP, Thorpe IJN, editors. *Warfare, Violence and Slavery in Prehistory*. Oxford, British Archaeological Papers. p 155–163.

Allen T, Novak SA, Bench LL. 2007. Patterns of injuries: accident of abuse. *Violence Against Women* 13:802–816.

Allen WH, Merbs CF, Birkby WH. 1985. Evidence for prehistoric scalping at nuvakwewaqa (chavez pass) and grasshopper ruin, arizona. In: Merbs CF, Miller RJ, editors. *Health and Disease in the Prehistoric Southwest*. Tempe: Anthropological Research Papers, No. 34, Arizona State University. p 23–42.

Ames KM. 2001. Slaves, chiefs and labour on the northern northwest coast. *World Archaeology* 33(1):1–17.

Antoine DM, Zazzo A, Friedman R. 2013. Revisiting jebel sahaba: new apatite radiocarbon dates for one of the Nile valley’s earliest cemeteries. *Am J Phys Anthropol* 150(S56):68.

Antón SC. 2003. Natural history of *Homo erectus*. *Am J Phys Anthropol* 122(S37):126–170.

Ard KL, Makadon HJ. 2011. Addressing intimate partner violence in lesbian, gay, bisexual, and transgender patients. *J Gen Intern Med* 26:930–933.

Ardrey R. 1961. *African genesis: a personal investigation into the animal origins and nature of man*. New York: Atheneum.

Arkush EN, Allen MW, editors. 2006. *The archaeology of warfare: prehistories of raiding and conquest*. Gainesville: University Press of Florida.

Armelagos GJ. 2003. Bioarchaeology as anthropology. In: Gillespie SD, Nichols DL, editors. *Archaeology is Anthropology*. Washington, D.C.: Archaeological Papers of the American Anthropological Association, No. 13. p 27–41.

Armelagos GJ. 2008. Devouring ourselves. In: Crown PL, Nichols DL, editors. *Social Violence in the Prehispanic American Southwest*. Tucson: University of Arizona Press. p 216–228.

Axtell J, Sturtevant WC. 1980. The unkindest cut, or who invented scalping. *William Mary Q* 37:451–472.

Barrett AR, Blakey ML. 2011. Life histories of enslaved africans in colonial new york. In: Agarwal SC, Glencross BA, editors. *Social Bioarchaeology*. Malden: Wiley-Blackwell. p 212–251.

Bass WM. 2005. *Human osteology: a laboratory and field manual*, fifth edition. Columbia: Missouri Archaeological Society.

Bauer-Clapp HJ, Harrod RP. 2012. Teaching violence: pedagogical approaches and challenges. *Anthropol News* 53:12–15.

Baustian KM, Harrod RP, Osterholtz AJ, Martin DL. 2012. Battered and abused: Analysis of trauma at grasshopper pueblo (AD 1275–1400). *Int J Paleopathol* 2:102–111.

Berryman HE, Haun SJ. 1996. Applying forensic techniques to interpret cranial fracture patterns in an archaeological specimen. *Int J Osteoarchaeol* 6:2–9.

Berryman HE, Symes SA. 1998. Recognizing gunshot and blunt cranial trauma through fracture interpretation. In: Reichs KJ, editor. *Forensic osteology: advances in the identification of human remains*, 2nd ed. Springfield: Charles C. Thomas. p 333–352.

Billman BR, Lambert PM, Leonard BL. 2000. Cannibalism, warfare, and drought in the mesa verde region in the twelfth century AD. *Am Antiquity* 65:1–34.

Billmire ME, Myers PA. 1985. Serious head injury in infants: Accident or abuse? *Pediatrics* 75:340–342.

Bilo RA, Robben SGF, van Rijn RR. 2010. Forensic aspects of paediatric fractures: differentiating accidental trauma from child abuse. New York: Springer.

Black D. 1983. Crime as social control. *Am Sociol Rev* 48:34–45.

Black D. 2004. The geometry of terrorism. *Sociol Theory* 22:14–25.

Blakely RL, Mathews DS. 1990. Bioarchaeological evidence for a Spanish-native American conflict in the sixteenth-century southeast. *Am Antiquity* 55:718–744.

Blakey ML. 2001. Bioarchaeology of the African diaspora in the Americas: its origin and scope. *Annu Rev Anthropol* 30:387–422.

Boaz K, Lewis ME, Jennings SG, Hibbard RA, Hicks RA. 2011. The prevalence of uncommon fractures in skeletal surveys performed to evaluate for suspected abuse in 930 children:

- should practice guidelines change? *Am J Roentgenol* 197: W159–W163.
- Bocquentin F, Bar-Yosef O. 2004. Early natufian remains: evidence for physical conflict from mt. carmel, israel. *J Hum Evol* 47:19–23.
- Boehm C. 2011. Retaliatory violence in human prehistory. *Br J Criminol* 51:518–534.
- Boehm C. 2013. The biocultural evolution of conflict resolution between groups. In: Fry DP, editor. *War, peace, and human nature: the convergence of evolutionary and cultural views*. Oxford: Oxford University Press. p 315–340.
- Bonogofsky M, editor. 2011. *The bioarchaeology of the human head: decapitation, decoration, and deformation*. Gainesville: University Press of Florida.
- Boole JR, Hottel M, Amoroso P, Yore M. 2001. 5196 mandible fractures among 4381 active duty army soldiers, 1980 to 1998. *Laryngoscope* 111:1691–1696.
- Boulestin B, Zeeb-Lanz A, Jeunesse C, Haack F, Arbogast R, Denaire A. 2009. Mass cannibalism in the linear pottery culture at herxheim (palatinate, germany). *Antiquity* 83:968–982.
- Bowles S, Gintis H. 2013. *A cooperative species: Human reciprocity and its evolution*. Reprint ed. Princeton: Princeton University Press.
- Boyden J, Levison D. 2000. Children as social and economic actors in the development process. In: Anonymous Expert Group on Development Issues (EGDI) Working Paper.
- Brickley MB. 2005. Rib fractures in the archaeological record: a useful source of sociocultural information? *Int J Osteoarchaeol* 16:61–75.
- Brink O. 2009. When violence strikes the head, neck, and face. *J Trauma* 67:147–151.
- Brink O, Vesterby A, Jensen J. 1998. Patterns of injuries due to interpersonal violence. *Injury Int J Care Injured* 29:705–709.
- Brogdon BG. 1998. Child abuse. In: Brogdon BG, editor. *Forensic Radiology*. Boca Raton: CRC Press. p 281–314; 15.
- Brooks JF. 2002. Captives and cousins: slavery, kinship, and community in the southwest borderlands. Chapel Hill: University of North Carolina Press, Published for the Omohundro Institute of Early American History and Culture.
- Brooks ST, Brooks RH. 1984. Problems of burial exhumation, historical, and forensic aspects. In: Rathburn TA, Buikstra JE, editors. *Human Identification: case studies in forensic anthropology*. Springfield: Charles C. Thomas. p 64–86.
- Burke LK, Follingstad DR. 1999. Violence in lesbian and gay relationships: theory, prevalence, and correlational factors. *Clin Psychol Rev* 19:487–512.
- Burns KR. 2012. *Forensic anthropology training manual*, 3rd ed. Upper Saddle River: Pearson Education, Inc.
- Burton JL, Underwood J. 2007. Clinical, educational, and epidemiological value of autopsy. *Lancet* 369:1472–1480.
- Byers SN. 2010. *Introduction to forensic anthropology*, 4th ed. Upper Saddle River: Pearson Education, Inc.
- Calce SE, Rogers TL. 2007. Taphonomic changes to blunt force trauma: a preliminary study. *J Forensic Sci* 52:519–527.
- Cameron CM. 2008. *Invisible citizens: captives and their consequences*. Salt Lake City: The University of Utah Press.
- Cameron CM. 2011. Captives and culture change. *Curr Anthropol* 52:169–209.
- Cameron CM. 2013. How people moved among ancient societies: broadening the view. *Am Anthropol* 115:218–231.
- Carman J. 2013. Past war and european identity: making conflict archaeology useful. In: Ralph S, editor. *The archaeology of violence: interdisciplinary approaches*. Albany: SUNY Press, IEMA Proceedings 2. p 169–179.
- Chacon RJ, Dye DH, editors. 2007. *The taking and displaying of human body parts as trophies by Amerindians*. New York: Springer Science and Business Media.
- Chacon RJ, Mendoza RG. 2007. Ethical considerations and conclusions regarding indigenous warfare and violence in North America. In: Chacon RJ, Mendoza RG, editors. *North American indigenous warfare and ritual violence*. Tucson: University of Arizona Press. p 222–232.
- Chacon RJ, Mendoza RG. 2012. *The ethics of anthropology and Amerindian research: reporting on environmental degradation and warfare*. New York: Springer.
- Chagnon NA. 1968. *Yanomamö: the fierce people*. New York: Holt, Rinehart and Winston.
- Chagnon NA. 2013. *Noble savages: my life among two dangerous tribes—the yanomamö and the anthropologists*. New York: Simon and Schuster Paperbacks.
- Choi J, Bowles S. 2007. The coevolution of parochial altruism and war. *Science* 318:636–640.
- Civico A. 2012. Anthropologists as peacemaker. *Anthropol News* 53:9.
- Colbourne M. 2004. Abusive head trauma. *BC Med J* 46:72–76.
- Cordero MI, Poirier GL, Marquez C, Veenit V, Fontana X, Salehi B, Ansermet F, Sandi C. 2012. Evidence for biological roots in the transgenerational transmission of intimate partner violence. *Transl Psychiatry* 2(e106):1–10.
- Corning PA. 2007. Synergy goes to war: a bioeconomic theory of collective violence. *J Bioeconomics* 9:109–144.
- Crandall JJ, Harrod RP. 2014. Ghostly gunslingers: the post-mortem lives of the Kiel brothers, Nevada's first frontiersmen. *Cambridge Archaeol J*. 24, pp 487–497.
- Crandall JJ, Harrod RP, Anderson CP, Baustian KM. 2014. Interpreting gunshot trauma as context clue: a case study from historic north las vegas, nevada. In: Martin DL, Anderson CP, editors. *Bioarchaeological and Forensic Perspectives on Violence: how violent death is interpreted from skeletal remains*. Cambridge: Cambridge University Press. p 289–308.
- Crofoot MC, Wrangham RW. 2009. Intergroup aggression in primates and humans: the case for a unified theory. In: Kappeler PM, Silk JB, editors. *Mind the gap: tracing the origins of human universals*. Heidelberg: Springer. p 171–196.
- Cybulski JS. 1994. Culture change, demographic history, and health and disease on the northwest coast. In: Larsen CS, Milner GR, editors. *In the wake of contact: biological responses to conquest*. New York: Wiley-Liss. p 75–85.
- Cybulski JS. 2014. Conflict on the northern northwest coast. In: Knüsel C, Smith MJ, editors. *The Routledge Handbook of the Bioarchaeology of Human Conflict*. Abingdon: Routledge. p 415–451.
- Dart RA. 1953. The predatory transition from ape to man. *Int Anthropol Linguist Rev* 1:201–218.
- de la Cova C. 2010. Cultural patterns of trauma among 19th-century-born males in cadaver collections. *Am Anthropol* 112: 589–606.
- de la Cova C. 2012. Patterns of trauma and violence in 19th-century-born African American and Euro-American females. *Int J Paleopathol* 2:61–68.
- DeGusta D. 1999. Fijian cannibalism: osteological evidence from navatu. *Am J Phys Anthropol* 110:215–241.
- DeGusta D. 2000. Fijian cannibalism and mortuary ritual: bioarchaeological evidence from vunda. *Int J Osteoarchaeol* 10: 76–92.
- Diamond J. 2013. *The world until yesterday: what can we learn from traditional societies?* New York: Viking Penguin.
- DiGangi EA, Moore MK, editors. 2012. *Research methods in human skeletal biology*. Oxford: Academic Press.
- Dixon KJ, Novak SA, Robbins G, Schablitsky JM, Scott GR, Tasa GL. 2010. "Men, women, and children starving": Archaeology of the donner family camp. *Am Antiquity* 75:627–656.
- Dominguez VR. 2012. Introduction violence: anthropologists engaging violence, 1980–2012. *Am Anthropol A Virtual Issue*. [http://onlinelibrary.wiley.com/journal/10.1111/\(ISSN\)1548-1433/homepage/virtual_issue_-_violence_anthropologists_engaging_violence_1980-2012_introduct.htm](http://onlinelibrary.wiley.com/journal/10.1111/(ISSN)1548-1433/homepage/virtual_issue_-_violence_anthropologists_engaging_violence_1980-2012_introduct.htm).
- Dozier EP. 1970. *The pueblo Indians of North America*. New York: Holt, Rinehart and Winston, Inc.
- Duncan WN. 2005. *The bioarchaeology of ritual violence in postclassic el petén, guatemala (AD 950–1524)*. Unpublished Ph.D. Dissertation ed. Carbondale: Southern Illinois University.
- Duncan WN. 2012. Biological distance analysis in contexts of ritual violence. In: Martin DL, Harrod RP, V P, editors. *The*

- Bioarchaeology of Violence. Gainesville: University of Florida Press. p 251–275.
- Durham ME. 1923. Head-hunting in the balkans. *Man* 23:19–21.
- Durrant R. 2011. Collective violence: an evolutionary perspective. *Aggress Violent Behav* 16:428–436.
- Elliot P. 1996. Shattering illusions: same-sex domestic violence. *J Gay Lesbian Soc Serv* 4:1–8.
- Ember CR, Ember M. 1997. Violence in the ethnographic record: results of cross-cultural research on war and aggression. In: Martin DL, Frayer DW, editors. *Troubled times: violence and warfare in the past*. Amsterdam: Gordon and Breach. p 1–20.
- Ember CR, Ember M, editors. 2004. *Encyclopedia of medical anthropology: health and illness in the world's cultures*. New York: Kluwer Academic/Plenum Publishers.
- Erdal ÖD. 2012. A possible massacre at early bronze age titriş höyük, anatolia. *Int J Osteoarchaeol* 22:1–21.
- Erdal YS, Erdal ÖD. 2012. Organized violence in anatolia: a retrospective research on the injuries from the neolithic to early bronze age. *Int J Paleopathol* 2:78–92.
- Erdmann D, Follmar KE, DeBrujin M, Bruno AD, Jung SH, Edelman D, Mukundan S, Marcus JR. 2008. A retrospective analysis of facial fracture etiologies. *Ann Plastic Surg* 60:398–403.
- Estabrook VH, Frayer DW. 2014. Trauma in the krapina neandertals: violence in the middle paleolithic? In: Knüsel C, Smith MJ, editors. *The Routledge Handbook of the Bioarchaeology of Human Conflict*. Abingdon: Routledge. p 67–89.
- Farmer P. 2003. *Pathologies of power: health, human rights, and the new war on the poor*. Berkeley: University of California Press.
- Farmer P. 2004. An anthropology of structural violence. *Curr Anthropol* 45:305–325.
- Farmer P. 2009. On suffering and structural violence: a view from below. *Race/Ethnicity: Multidisciplinary Global Contexts* 3:11–28.
- Ferguson RB. 1995. *Yanomami warfare: a political history*. Sante Fe: School of American Research Press.
- Ferguson RB. 1997. Violence and war in prehistory. In: Martin DL, Frayer DW, editors. *Troubled times: violence and warfare in the past*. Amsterdam: Gordon and Breach. p 321–355.
- Ferguson RB. 2004. Tribal warfare. In: Scheper-Hughes N, Bourgois P, editors. *Violence and its alternatives*. Malden: Blackwell Press. p 69–73.
- Ferguson RB. 2011. Born to live: Challenging killer myths. In: Susman RW, Cloninger CR, editors. *Origins of Altruism and Cooperation*. New York: Springer. p 249–270.
- Ferguson RB. 2013. Pinker's list: Exaggerating prehistoric war mortality. In: Fry DP, editor. *War, peace, and human nature: the convergence of evolutionary and cultural views*. Oxford: Oxford University Press. p 112–131.
- Ferguson TJ, Dongoske KE, Kuwanwisiwma LJ. 2001. Hopi perspectives on southwestern mortuary studies. In: Mitchell DR, Brunson-Hadley JL, editors. *Ancient Burial Practices in the American Southwest*. Albuquerque: University of New Mexico Press. p 9–26.
- Fiorato V, Boylston A, Knüsel C, editors. 2007. *Blood red roses: the archaeology of a mass grave from the battle of towton AD 1461*. Oxford: Oxbow Books.
- Firth H. 2012. Coercion, vengeance, feud and accommodation: homicide in medieval iceland. *Early Medieval Eur* 20:139–175.
- Forgey K, Williams SR. 2005. Were nasca trophy heads war trophies or revered ancestors. In: Rakita GFM, Buikstra JE, Beck LA, Williams SR, editors. *Interacting with the dead: perspectives on mortuary archaeology for the new millennium*. Gainesville: University Press of Florida. p 251–276.
- Fry DP. 1998. Anthropological perspectives on aggression: sex differences and cultural variation. *Aggressive Behav* 24:81–95.
- Fry DP, editor. 2007. *Beyond war: the human potential for peace*. New York: Oxford University Press.
- Fry DP. 2013a. War, peace, and human nature: the challenge of achieving scientific objectivity. In: Fry DP, editor. *War, peace, and human nature: the convergence of evolutionary and cultural views*. Oxford: Oxford University Press. p 1–22.
- Fry DP, editor. 2013b. *War, peace, and human nature: the convergence of evolutionary and cultural views*. Oxford: Oxford University Press.
- Fuentes A. 2004. It's not all sex and violence: integrated anthropology and the role of cooperation and social complexity in human evolution. *Am Anthropol* 106:710–718.
- Fuentes A. 2013. Cooperation, conflict and niche construction in the Genus *Homo*. In: Fry DP, editor. *War, peace, and human nature: the convergence of evolutionary and cultural views*. Oxford: Oxford University Press. p 78–94.
- Gaither C. 2012. Cultural conflict and the impact on non-adults at puruchuco-huaquerones in Peru: the case for refinement of the methods used to analyze violence against children in the archeological record. *Int J Paleopathol* 2:69–77.
- Galloway A. 1999a. The biomechanics of fracture production. In: Galloway A, editor. *Broken bones: anthropological analysis of blunt force trauma*. Springfield: Charles C. Thomas. p 35–62.
- Galloway A, editor. 1999b. *Broken bones: anthropological analysis of blunt force trauma*. Springfield: Charles C. Thomas.
- Galloway A. 2014. Living on the sidelines of death: anthropologists and violence. In: Martin DL, Anderson CP, editors. *Bioarchaeological and forensic perspectives on violence: how violent death is interpreted from skeletal remains*. Cambridge: Cambridge University Press. p 311–320.
- Galtung J. 1990. Cultural violence. *J Peace Res* 27:291–305.
- Galtung J, Höivik T. 1971. Structural and direct violence: a note on operationalization. *J Peace Res* 8:73–76.
- Gangoli G, Rew M. 2011. Mothers-in-law against daughters-in-law: domestic violence and legal discourses around mother-in-law violence against daughters-in-law. *Women's Stud Int Forum* 34:420–429.
- Gardner R. 1963. *Dead birds*. United States: Documentary Educational Resources.
- Gat A. 2006. *War in human civilization*. Oxford: Oxford University Press.
- Geber J. 2012. Comparative study of perimortem weapon trauma in two early medieval skeletal populations (AD 400–1200) from Ireland. *Int J Osteoarchaeol* DOI: 10.1002/oa.2281.
- Geller PL. 2009. Identity and difference: complicating gender in archaeology. *Annu Rev Anthropol* 38:65–81.
- Gillett G, Tamatea AJ. 2012. The warrior gene: Epigenetic considerations. *New Genet Soc* 31:41–53.
- Golitzko M, Keeley LH. 2007. Beating ploughshares back in sword: wardare in the *Linearbandkeramik*. *Antiquity* 81:332–342.
- Gowland R, Thompson TJU. 2013. *Human identity and identification*. Cambridge: Cambridge University Press.
- Guilaine J, Zammit J. 2005. *The origins of war: violence in prehistory*. Malden: Blackwell Publishing.
- Guyomarc'h P, Campagna-Vaillancourt M, Kremer C, Sauvageau A. 2010. Discrimination of falls and blows in blunt head trauma: a multi-criteria approach. *J Forensic Sci* 55: 423–427.
- Haddon AC. 1901. *Head hunters: black, white, and brown*. London: Methuen.
- Haglund WD, Sorg MH, editors. 2002. *Advances in forensic taphonomy: method, theory, and archaeological perspectives*. Boca Raton: CRC Press.
- Hannon P, Knapp K, editors. 2006. *The basic principles of biomechanics*. In: Hannon P, Knapp K, editors. *Forensic Biomechanics*. Tucson: Lawyers & Judges Pub. p 39–56.
- Harrod RP. 2012a. Centers of control: Revealing elites among the ancestral pueblo during the “Chaco phenomenon”. *Int J Paleopathol* 2:123–135.
- Harrod RP. 2012b. Ethnobiaarchaeology: new directions in bioarchaeology, special forum. *SAA Archaeol Rec* 12:32–34.
- Harrod RP, Liénard P, Martin DL. 2012. Deciphering violence: the potential of modern ethnography to aid in the

- interpretation of archaeological populations. In: Martin DL, Harrod RP, V P, editors. *The Bioarchaeology of Violence*. Gainesville: University of Florida Press. p 63–80.
- Harrod RP, Martin DL. 2014a. Peace at any cost: when violence is used as social control. *Anthropol News* <http://www.anthropology-news.org/index.php/2014/05/19/peace-at-any-cost/>.
- Harrod RP, Martin DL. 2014b. Signatures of captivity and subordination on Skeletonized Human remains: a bioarchaeological case study from the ancient southwest. In: Martin DL, Anderson CP, editors. *Bioarchaeological and Forensic Perspectives on Violence: How violent death is interpreted from skeletal remains*. Cambridge: Cambridge University Press. p 103–119.
- Harrod RP, Martin DL. In press. The bioarchaeology of social control: interpreting the skeletal markers of slavery, captivity, and indentured servitude. In: Marshall LW, editor. *The archaeology of slavery: toward a comparative, global framework*. Carbondale: Southern Illinois University Press.
- Henrich J, Heine SJ, Norenzayan A. 2010. The weirdest people in the world? *Behav Brain Sci* 33:61–83.
- Hershenson DB. 2011. Early modern Spain and the creation of the mediterranean: captivity, commerce, and knowledge. Unpublished Ph.D. dissertation ed. Ann Arbor: University of Michigan.
- Hodson TC. 1909. Head-hunting among the hill tribes of Assam. *Folklore* 20:132–143.
- Höglund K, Öberg M, editors. 2011. *Understanding peace research: Methods and challenges*. London and New York: Routledge.
- Hollimon SE. 1990. Division of labor and gender roles in Santa Barbara channel area prehistory. Unpublished Ph.D. Dissertation ed. Santa Barbara: University of California, Santa Barbara.
- Hong-wei L, Hong-fa C, Yongmin Y, Guo-xin D, Zhi-yong Y. 2012. Forensic medical study on morphology and formative mechanism of blunt head injury. *Chin J Traumatol* 15:342–346.
- Hrdy SB. 2009. *Mothers and others: The evolutionary origins of mutual understanding*. Cambridge: Harvard University Press.
- Hubbell A. 2001. A view of the slave trade from the margin: Souroudougou in the late nineteenth-century slave trade of the niger bend. *J Afr Hist* 42:25–47.
- Hussain K, Wijetunge DB, Jackson IT. 1994. A comprehensive analysis of craniofacial trauma. *J Trauma* 36:34–47.
- Jacks M. 2004. Osteological evidence for mesolithic and neolithic violence: problems of interpretation. In: Roksandic M, editor. *Evidence and Meaning of Violent Interactions in Mesolithic Europe*. Oxford: Archaeopress. p 23–39.
- James ST. 2013. Facing the sword: Confronting the realities of martial violence and other mayhem, present and past. In: Ralph S, editor. *The Archaeology of Violence: Interdisciplinary approaches*. Albany: SUNY Press, IEMA Proceedings 2. p 98–115.
- Jankowiak W, Sudakov M, Wilreker BC. 2005. Co-wife conflict and co-operation. *Ethnology* 44:81–98.
- Jones N, editor. 1997. *Craniofacial trauma: An interdisciplinary approach*. Oxford: Oxford University Press.
- Jones S, Walsh-Haney H, Quinn R. In press. *Kana tamata* or feasts of men: an interdisciplinary approach to identifying cannibalism in prehistoric Fiji. *Int J Osteoarchaeol* DOI: 10.1002/oa.2269.
- Joyce RA. 2005. Archaeology of the body. *Annu Rev Anthropol* 34:139–158.
- Judd MA. 2008. The parry problem. *J Archaeol Sci* 35:1658–1666.
- Judd MA, Redfern R. 2012. Trauma. In: Grauer AL, editor. *A Companion to Paleopathology*. Malden: Blackwell Publishing Ltd. p 259–279.
- Jurmain R. 1999. *Stories from the skeleton: behavioral reconstruction in osteoarchaeology*. Amsterdam: Gordon and Breach Publishers.
- Katzenberg MA, Saunders SR, editors. 2008. *Biological anthropology of the human skeleton*, 2nd ed. Hoboken: Wiley.
- Keeley LH. 1996. *War before civilization*. New York: Oxford University Press.
- Kelly RC. 2005. The evolution of lethal intergroup violence. *Proc Natl Acad Sci USA* 102:15294–15298.
- Kelly RL. 2013. From the peaceful to the warlike: ethnographic and archaeological insights into hunter-gatherer warfare and homicide. In: Fry DP, editor. *War, peace, and human nature: the convergence of evolutionary and cultural views*. Oxford: Oxford University Press. p 151–167.
- Kempe CH, Silverman FN, Steele BF, Droegemueller W, Silver HK. 1985. The battered-child syndrome. *Child Abuse Negl* 9: 143–154.
- Kimbel WH, Deleuzene LK. 2009. "Lucy" redux: A review of research on *Australopithecus afarensis*. *Am J Phys Anthropol* 140:2–48.
- King J, Diefendorf D, Apthorp J, Negrete VF, Carlson M. 1988. Analysis of 429 fractures in 189 battered children. *J Pediatr Orthop* 8:585–589.
- Klaus HD. 2012. The bioarchaeology of structural violence: a theoretical model and a case study. In: Martin DL, Harrod RP, Pérez VR, editors. *The Bioarchaeology of Violence*. Gainesville: University of Florida Press. p 29–62.
- Kleinman PK, editor. 1987. *Diagnostic imaging of child abuse*. Baltimore: Williams & Wilkins.
- Kleinman PK. 1998. Differential diagnosis III: Accidental and obstetric trauma. In: Kleinman PK, editor. *Diagnostic imaging of child abuse*, 2nd ed. San Diego: Elsevier Health Sciences. p 214–224.
- Kleinman PK. 2008. Problems in the diagnosis of metaphyseal fractures. *Pediatr Radiol* 38(Suppl 3):S388–S394.
- Klusemann S. 2012. Massacres as process: a micro-sociological theory of internal patterns of mass atrocities. *Eur J Criminol* 9:468–480.
- Knauft BM. 1987. Reconsidering violence in simple human societies: homicide among the gebusi of New Guinea. *Curr Anthropol* 28:457–482.
- Knüsel C, Smith MJ, editors. 2014. *The Routledge handbook of the bioarchaeology of human conflict*. Abingdon: Routledge.
- Kohler TA, Kramer Turner K. 2006. Raiding for women in the pre-hispanic northern pueblo southwest? *Curr Anthropol* 47: 1035–1045.
- Korbin JE. 1981. *Child abuse and neglect: Cross-cultural perspectives*. Berkeley and Los Angeles: University of California Press.
- Korbin JE. 1990. Hana 'ino: child maltreatment in a Hawaiian-American community. *Pac Stud* 13:7–22.
- Kramer K. 2002. Sex ratios and warfare in the prehistoric Puebloan southwest. Unpublished M.A. thesis ed. Washington State University.
- Kremer C, Racette S, Dionne C, Sauvageau A. 2008. Discrimination of falls and blows in blunt head trauma: Systematic study of the hat brim line rule in relation to skull fractures. *J Forensic Sci* 53:716–719.
- Kremer C, Sauvageau A. 2009. Discrimination of falls and blows in blunt head trauma: assessment of predicability through combined criteria. *J Forensic Sci* 54:923–926.
- Kuckelman KA, Lightfoot RR, Martin DL. 2002. The bioarchaeology and taphonomy of violence at castle rock and sand canyon pueblos, southwestern Colorado. *Am Antiquity* 67:486–513.
- Lambert PM. 1997. Patterns of violence in prehistoric hunter-gatherer societies of coastal southern California. In: Martin DL, editor. *Troubled times: violence and warfare in the past*. Amsterdam: Gordon and Breach. p 77–109.
- Lambert PM. 2002. The archaeology of war: a North American perspective. *J Archaeol Res* 10:207–241.
- Larsen CS. 1997. *Bioarchaeology: interpreting behavior from the human skeleton*. Cambridge: Cambridge University Press.
- Larsen CS, editor. 2001. *Bioarchaeology of Spanish Florida: The impact of colonialism*. Gainesville: University Press of Florida.
- Larsen CS, Walker PL. 2010. Bioarchaeology: health, lifestyle, and society in recent human evolution. In: Larsen CS, editor.

- A companion to biological anthropology. Chinchister: Wiley-Blackwell. p 379–394.
- Le BT, Dierks EJ, Ueek BA, Homer LD, Potter BF. 2001. Maxillofacial injuries associated with domestic violence. *J Oral Maxillofac Surg* 59:1277–1283.
- LeBlanc SA. 1999. Prehistoric warfare in the American southwest. Salt Lake City: The University of Utah Press.
- Lee KH, Snape L, Steenberg LJ, Worthington J. 2007. Comparison between interpersonal violence and motor vehicle accidents in the aetiology of maxillofacial fractures. *ANZ J Surg* 77:695–698.
- Lewis GK, Peruisea SC. 1959. The complex mandibular fracture. *Am J Surg* 97:283–296.
- LoBugio Basgall A. 2008. Northwestern plains Indian women: a bioarchaeological analysis of changing roles and status. Unpublished M.A. thesis ed. Las Vegas: Department of Anthropology, University of Wyoming.
- Lovell NC. 1997. Trauma analysis in paleopathology. *Yearb Phys Anthropol* 40:139–170.
- Lovell NC. 2008. Analysis and interpretation of skeletal trauma. In: Katzenberg MA, Saunders SR, editors. *Biological Anthropology of the Human Skeleton*, second edition. Hoboken: Wiley. p 341–386.
- Madhavan S. 2002. Best friends and worst of enemies: competition and collaboration in polgyny. *Ethnology* 41:69–84.
- Malik Y, Chaliha RR, Malik P, Sangwan K, Rathi C. 2013. Head in homicides: a post-mortem study from north east India. *J Indian Acad Forensic Med* 35:249–250.
- Mann RW, Hunt DR. 2005. Photographic regional atlas of bone disease: a guide to pathologic and normal variation in the human skeleton. Springfield: Charles C Thomas.
- Manoli A II. 1984. Bone healing and repair. In: Mathog RH, editor. *Maxillofacial Trauma*. Baltimore: Williams and Wilkins. p 59–70.
- Martin DL. 1997. Violence against women in the la plata river valley (A.D. 1000–1300). In: Martin DL, Frayer DW, editors. *Troubled times: violence and warfare in the past*. Amsterdam: Gordon and Breach. p 45–75.
- Martin DL. 2008a. Reanalysis of trauma in the la plata valley (900–1300): strategic social violence and the bioarchaeology of captivity. In: Stodder ALW, editor. *Reanalysis and Reinterpretation in Southwestern Bioarchaeology*. Tempe: Arizona State University, Anthropological Research Papers. p 167–184.
- Martin DL. 2008b. Ripped flesh and torn souls: evidence for slavery in the prehistoric southwest, AD 800–1500. In: Cameron CM, editor. *Invisible citizens: captives and their consequences*. Salt Lake City: The University of Utah Press. p 159–180.
- Martin DL, Akins NJ. 2001. Unequal treatment in life as in death: trauma and mortuary behavior at la plata (AD 1000–1300). In: Mitchell DR, Brunson-Hadley JL, editors. *Ancient Burial Practices in the American Southwest*. Albuquerque: University of New Mexico Press. p 223–248.
- Martin DL, Akins NJ, Goodman AH, Swedlund AC. 2001. Harmony and discord: bioarchaeology of the la plata valley. Santa Fe: Museum of New Mexico, Office of Archaeological Studies.
- Martin DL, Anderson CP, editors. 2014. *Bioarchaeological and forensic perspectives on violence: how violent death is interpreted from skeletal remains*. Cambridge: Cambridge University Press.
- Martin DL, Frayer DW, editors. 1997. *Troubled times: violence and warfare in the past*. Amsterdam: Gordon and Breach.
- Martin DL, Harrod RP. 2012a. Body parts and parts of bodies: traces of violence in past cultures. *Int J Paleopathol* 2:49–52.
- Martin DL, Harrod RP, editors. 2012b. Body parts and parts of bodies: traces of violence in past cultures, editorial. *Int J Paleopathol* 2:49–52.
- Martin DL, Harrod RP, Fields M. 2010. Beaten down and worked to the bone: bioarchaeological investigations of women and violence in the ancient southwest. *Landscapes Violence* 1: Article 3.
- Martin DL, Harrod RP, Pérez VR, editors. 2012a. *The bioarchaeology of violence*. Gainesville: University Press of Florida.
- Martin DL, Harrod RP, Pérez VR. 2012b. Introduction: Bioarchaeology and the study of violence. In: Martin DL, Harrod RP, V P, editors. *The Bioarchaeology of Violence*. Gainesville: University of Florida Press. p 1–10.
- Martin DL, Harrod RP, Pérez VR. 2013. *Bioarchaeology: an integrated approach to working with human remains*. New York: Springer.
- Maschner HDG, Reedy-Maschner KL. 1998. Raid, retreat, defend (repeat): the archaeology and ethnohistory of warfare on the north pacific rim. *J Anthropol Archaeol* 17:19–51.
- Maxeiner H, Ehrlich E. 2000. Site, number and depth of wounds of the scalp in falls and blows—A contribution to the validity of the so-called hat brim rule [original title in german]. *Archiv Für Kriminologie* 205:82.
- McGuire RH, Van Dyke RM. 2008. Dismembering the trope: Imagining cannibalism in the ancient pueblo world. In: Crown PL, Nichols DL, editors. *Social Violence in the Prehispanic American Southwest*. Tucson: University of Arizona Press. p 7–40.
- McHugh MC, Hanson Frieze I. 2006. Intimate partner violence: New directions. *Ann NY Acad Sci* 1087:121–141.
- Mead M, editor. 1937. *Cooperation and competition among primitive peoples*. New York: McGraw-Hill Book Company, Inc.
- Milner GR, Larsen CS, Hutchinson DL, Williamson MA, Humpf DA. 2000. Conquistadors, excavators, or rodents: What damaged the king site skeletons? *Am Antiquity* 65:355–363.
- Moraitis K, Spiliopoulou C. 2006. Identification and differential diagnosis of perimortem blunt force trauma in tubular long bones. *Forensic Sci Med Pathol* 2:221–229.
- Murphy EM, editor. 2008. *Deviant burial in the archaeological record*. Oxford: Studies in Funerary Archaeology 2, Oxbow Books.
- Neumann GK. 1940. Evidence for the antiquity of scalping from central illinois. *Am Antiquity* 5:287–289.
- Nielsen AE, Walker WH. 2009a. Introduction: The archaeology of war in practice. In: Nielsen AE, Walker WH, editors. *Warfare in Cultural Context: Practice, agency, and the archaeology of violence*. Tucson: University of Arizona Press. p 1–14.
- Nielsen AE, Walker WH. 2009b. *Warfare in cultural context: practice, agency, and the archaeology of violence*. Tucson: University of Arizona Press.
- Novak SA. 2006. Beneath the façade: A skeletal model of domestic violence. In: Gowland R, Knüsel CJ, editors. *The Social Archaeology of Funerary Remains*. Oxford: Oxbow Books. p 238–252.
- Novak SA, Allen T, Bench LL. 2007. Patterns of injury: accident or abuse. *Violence Women* 13:802–816.
- Novak SA, Hatch MA. 2009. Intimate wounds: Craniofacial trauma in women and female chimpanzees. In: Muller MN, Wrangham RW, editors. *Sexual coercion in primates and humans: an evolutionary perspective on male aggression against females*. Cambridge: Harvard University Press. p 322–345.
- O'Connell JF, Hawkes K, Blurton Jones NG. 1999. Grandmothering and the evolution of homo erectus. *J Hum Evol* 36: 461–485.
- O'Connor JF, Cohen J. 1998. Dating fractures. In: Kleinman PK, editor. *Diagnostic Imaging of Child Abuse*, 2nd ed. San Diego: Elsevier Health Sciences. p 168–177.
- Ogura I, Kaneda T, Mori S, Sekiya K, Ogawa H, Tsukioka T. 2012. Characterization of mandibular fractures using 64-slice multidetector CT. *Dentomaxillofacial Radiol* 41:392–395.
- Okumura M. 2011. The end of slavery: disease patterns and cultural behaviours of African Americans in suriname. *Int J Osteoarchaeol* 21:631–642.
- Okumura M, Siew YY. 2013. An osteological study of trophy heads: unveiling the headhunting practice in borneo. *Int J Osteoarchaeol* 23:685–697.
- Olson RA, Fonseca RJ, Zeitler DL, Osbon DB. 1982. Fractures of the mandible: a review of 580 cases. *J Oral Maxillofacial Surg* 40:23–28.
- Orschiedt J, Haidle MN. 2012. Violence against the living, violence against the dead on the human remains from herxheim,

- germany: evidence of a crisis and mass cannibalism? In: Schulting RJ, Fibiger L, editors. *Sticks, Stones, and Broken Bones: Neolithic violence in a European perspective*. Oxford: Oxford University Press. p 121–137.
- Ostrach B, Singer M. 2013. Syndemics of war: Malnutrition-infectious disease interactions and the unintended health consequences of intentional war policies. *Ann Anthropol Pract* 36:257–273.
- Owens LS. 2007. Craniofacial trauma in the prehispanic canary islands. *Int J Osteoarchaeol* 17:465–478.
- Owsley DW, Berryman HE. 1975. Ethnographic and archaeological evidence of scalping in the southeastern united states. *Tenn Archaeol* 31:41–60.
- Padilla T. 2008. Rural resistance in the land of zapata: the jaramillista movement and the myth of the *Pax priísta*, 1940–1962. Durham: Duke University Press.
- Paine RR, Mancinelli D, Coppa A. 2007. Cranial trauma in iron age samnite agriculturist, alfedena, Italy: Implications for biocultural and economic stress. *Am J Phys Anthropol* 132: 48–58.
- Palmer R. 2012. Death and the coroner: some reflections on current practice and proposed reforms. *Med Sci Law* 52:63–70.
- Pardini DA, Raine A, Erickson K, Loeber R. 2014. Lower amygdala volume in men is associated with childhood aggression, early psychopathic traits, and future violence. *Biol Psychiatry* 75:73–80.
- Passalacqua NV, Fenton TW. 2012. Developments in skeletal trauma: blunt-force trauma. In: Dirkmaat DC, editor. *A companion to forensic anthropology*. Chichester: Wiley. p 400–411.
- Patterson O. 1982. *Slavery and social death*. Cambridge: Harvard University Press.
- Pearson MP. 1999. *Archaeology of death and burial*. College Station: Texas A&M University Press.
- Pearson MP. 2005. Warfare, violence and slavery in later prehistory: an introduction. In: Pearson MP, Thorpe IJN, editors. *Warfare, Violence and Slavery in Prehistory*. Oxford, British Archaeological Reports. p 19–35.
- Pérez VR. 2003. Nahualli tlamatini/tlahueliloc nahualli: the power of anthropological discourse. In: Peck T, Siegfried E, editors. *Indigenous People and Archaeology*. Calgary: Archaeological Association of the University of Calgary. p 135–153.
- Pérez VR. 2012a. The politicization of the dead: violence as performance, politics as usual. In: Martin DL, Harrod RP, Pérez V, editors. *The Bioarchaeology of Violence*. Gainesville: University of Florida Press.
- Pérez VR. 2012b. The taphonomy of violence: recognizing variation in disarticulated skeletal assemblages. *Int J Paleopathol* 2:156–165.
- Pinker S. 2011. *The better angels of our nature: why violence has declined*. New York: Viking.
- Pollock S. 2008. Archaeology as a means for peace or a source of violence? an introduction. *Archaeologies: J World Archaeol Congr* 4:356–367.
- Potter JM, Chuipka JP. 2010. Perimortem mutilation of human remains in an early village in the American southwest: a case for ethnic violence. *J Anthropol Archaeol* 29:507–523.
- Potts M, Hayden T. 2008. *Sex and war: how biology explains warfare and terrorism and offers a path to a safer world*. Dallas: BenBella Books, Inc.
- Price TD, Bentley RA. 2006. Isotopic evidence for mobility and group organization among neolithic farmers at talheim, germany, 5000 BC. *Eur J Archaeol* 9:259–284.
- Prosser I, Lawson Z, Evans A, Harrison S, Morris S, Maguire S, Kemp AM. 2012. A timetable for the radiological features of fracture healing in young children. *Am J Roentgenol* 198: 1014–1020.
- Proulx DA. 1999. Nasca headhunting and the ritual use of trophy heads. In: Rickenbach J, editor. *Nasca: Geheimnisvolle Zeichen im Alten Peru*. Zurich: Museum Rietberg Zurich. p 79–87.
- Raine A. 2013. *The anatomy of violence: The biological roots of crime*. New York: Pantheon Books.
- Raj A, Sabarwai S, Decker MR, Nair S, Jethva M, Krishnan S, Donta B, Saggurti N, Silverman JG. 2011. Abuse from in-laws during pregnancy and post-partum: qualitative and quantitative findings from low-income mothers of infants in mumbai, india. *Matern Child Health J* 15:700–712.
- Rakita GFM, Buikstra JE, Beck LA, Williams SR, editors. 2008. *Interacting with the dead: perspectives on mortuary archaeology for the new millennium*. Gainesville: University Press of Florida.
- Ralph S, editor. 2013. *The archaeology of violence: interdisciplinary approaches*. Albany: SUNY Press, IEMA Proceedings 2.
- Rassam A. 1980. Women and domestic power in morocco. *Int J Middle East Stud* 12:171–179.
- Ray L. 2011. *Violence and society*. London: SAGE Publications Ltd.
- Redfern R. 2008. A bioarchaeological analysis of violence in iron age females: a perspective from dorset, england (fourth century BC to the first century AD). In: Davis O, Sharples NM, Waddington K, editors. *Changing Perspectives on the First Millennium BC*. Proceedings of the Iron Age Research Student Seminar 2006 Oxford: Oxbow Books. p 139–160.
- Reece RM. 1994. *Child abuse: medical diagnosis and management*. Philadelphia: Lea & Febiger.
- Reichs KJ, editor. 1998. *Forensic osteology: advances in the identification of human remains*. 2nd ed. Springfield: Charles C. Thomas.
- Renzetti C. 1997. Violence in lesbian and gay relationships. In: O’Toole L, Schiffman J, editors. *Gender violence: interdisciplinary perspectives*. New York: New York University Press. p 285–293.
- Reza A, Mercy J, Krug E. 2001. Epidemiology of violent deaths in the world. *Inj Prev* 2:104–111.
- Robarchek CA, Dentan RK. 1987. Blood drunkenness and the bloodthirsty semai: unmaking another anthropological myth. *Am Anthropol* 89:356–365.
- Robarchek CA, Robarchek CJ. 1998. Reciprocities and realities: world views, peacefulness, and violence among semai and waorani. *Aggressive Behav* 24:123–133.
- Robbins Schug G, Gray K, Mushrif-Tripathy V, Sankhyan AR. 2012. A peaceful realm? trauma and social differentiation at harappa. *Int J Paleopathol* 2:136–147.
- Roscoe P. 2007. Intelligence, coalitional killing, and the antecedents of war. *Am Anthropol* 109:485–495.
- Ruby RH, Brown JA. 1993. *Indian slavery in the pacific northwest*. Spokane: The Arthur H. Clark Company.
- Rupani R, Verma A, Rathore S. 2013. Patterns of skull fractures in cases of head injury by blunt force. *J Indian Acad Forensic Med* 35:336–338.
- Sauer NJ. 1998. The timing of injuries and manner of death: distinguishing among antemortem, perimortem, and postmortem trauma. In: Reichs KJ, editor. *Forensic osteology: advances in the identification of human remains*. 2nd ed. Springfield: Charles C. Thomas. p 321–332.
- Schulting RJ, Fibiger L, editors. 2012. *Sticks, stones, and broken bones: neolithic violence in a european perspective*. Oxford: Oxford University Press.
- Semelin J. 2007. *Purify and destroy*. London: Hurst.
- Shackelford TK, Weekes-Shackelford VA, editors. 2012. *The oxford handbook of evolutionary perspectives on violence, homicide, and war*. Oxford: Oxford University Press.
- Shuler KA. 2011. Life and death on a barbadian sugar plantation: historic and bioarchaeological views of infection and mortality at newton plantation. *Int J Osteoarchaeol* 21:66–81.
- Singleton TA. 1995. The archaeology of slavery in north America. *Annu Rev Anthropol* 24:119–140.
- Skelton RR. 2011. *A survey of the forensic sciences*. Raleigh: Lulu.com.
- Smith M. 2009. Bloody stone age: war in the neolithic. *Curr Archaeol* 230:12–19.
- Smith MJ. 2014. The war to begin all wars? contextualizing violence in neolithic britain. In: Knüsel C, Smith MJ, editors. *The Routledge Handbook of the Bioarchaeology of Human Conflict*. Abingdon: Routledge. p 109–126.

- Smith MO. 1996. 'Parry' fractures and female-directed interpersonal violence: implications from the late archaic period of west tennessee. *Int J Osteoarchaeol* 6:84–91.
- Sofaer JR. 2006. *The body as material culture: a theoretical osteoarchaeology*. Cambridge: Cambridge University Press.
- Spencer SD. 2012. Detecting violence in the archaeological record: clarifying the timing of trauma and manner of death in cases of cranial blunt force trauma among pre-columbian amerindians of west-central illinois. *Int J Paleopathol* 2:112–122.
- Spencer SD. 2014. Violence in the lower illinois river valley (ca AD 700–1250): an examination of injuries at schild utilizing taphonomy, paleopathology and forensic science. Unpublished Ph.D. dissertation ed. Las Vegas: Indiana University.
- Stanko EA. 2001. Re-conceptualising the policing of hatred: confessions and worrying dilemmas of a consultant. *Law Critique* 12:309–329.
- Stone PK. 2012. Binding women: ethnology, skeletal deformations, and violence against women. *Int J Paleopathol* 2:53–50.
- Sussman RW. 2013. Why the legend of the killer ape never dies: the enduring power of cultural beliefs to distort our view of human nature. In: Fry DP, editor. *War, peace, and human nature: the convergence of evolutionary and cultural views*. Oxford: Oxford University Press. p 97–111.
- Symes SA. 2005. Handout. In: Anonymous What is the Future of Forensic Anthropology? Assuming there is one? Erie: Mercyhurst Archaeological Institute, Department of Applied Forensic Sciences, Mercyhurst College.
- Tarlow S, Stutz LN, editors. 2013. *The oxford handbook of the archaeology of death and burial*. Oxford: Oxford University Press.
- Tayles N. 2003. Murder or mortuary behavior? an iron age enigma from northeast thailand. *Int J Osteoarchaeol* 13:197–206.
- Taylor T. 2005. Ambushed by a grotesque: archaeology, slavery and the third paradigm. In: Pearson MP, Thorpe IJN, editors. *Warfare, Violence and Slavery in Prehistory*. Oxford, British Archaeological Reports. p 225–233.
- Teschler-Nicola M, Gerold F, Bujatti-Narbeshuber M, Prohaska T, Latkoczy C, Stinger G, Watkins M. 1999. Evidence of genocide 7000 BP-neolithic paradigm and geoclimatic reality. *Coll Antropol* 23:437–450.
- Thomas LM. 1984. Injuries of the head and cervical spine. In: Mathog RH, editor. *Maxillofacial Trauma*. Baltimore: Williams and Wilkins. p 74–78.
- Thorpe IJN. 2003. Anthropology, archaeology, and the origins of warfare. *World Archaeol* 35:145–165.
- Thorpe IJN. 2005. The origins of warfare and violence. In: Pearson MP, Thorpe IJN, editors. *Warfare, violence and slavery in prehistory*. Oxford, British Archaeological Reports. p 1–19.
- Tomczak P, Buikstra JE. 1999. Analysis of blunt trauma injuries: vertical deceleration versus horizontal deceleration injuries. *J Forensic Sci* 44:253–262.
- Toyne JM. 2011. Possible cases of scalping from pre-hispanic highland peru. *Int J Osteoarchaeol* 21:229–242.
- Tung TA. 2007. Trauma and violence in the wari empire of the peruvian andes: warfare, raids, and ritual fights. *Am J Phys Anthropol* 133:941–956.
- Tung TA. 2008. Dismembering bodies for display: a bioarchaeological study of trophy heads from the wari site of conchopata, peru. *Am J Phys Anthropol* 136:294–308.
- Tung TA, Knudson KJ. 2008. Social identities and geographical origins of wari trophy heads from conchopata, peru. *Curr Anthropol* 49:915–925.
- Tung TA, Knudson KJ. 2010. Childhood lost: abductions, sacrifice, and trophy heads of children in the wari empire of the ancient andes. *Latin Am Antiquity* 21:44–66.
- Tung TA, Knudson KJ. 2011. Identifying locals, migrants, and captives in the wari heartland: a bioarchaeological and biogeochemical study of human remains from conchopata, peru. *J Anthropol Archaeol* 30:247–261.
- Turner CG II, Turner JA. 1999. *Man corn: Cannibalism and violence in the prehistoric American southwest*. Salt Lake City: The University of Utah Press.
- Ubelaker DH, Adams BJ. 1995. Differentiation of perimortem and postmortem trauma using taphonomic indicators. *J Forensic Sci* 40:509–512.
- Underwood MK. 2003. *Social aggression among girls*. New York: The Guilford Press.
- van Willigen J, Channa VC. 1991. Law, custom, and crimes against women: the problem of dowry death in India. *Hum Organ* 50:369–377.
- Wade N. 2014. *A troublesome inheritance: genes, race, and the rise of the west*. New York: The Penguin Press.
- Wahl J, Trautmann I. 2012. The neolithic massacre at talheim-A pivotal find in conflict archaeology. In: Schulting RJ, Fibiger L, editors. *Sticks, stones, and broken bones: neolithic violence in a European perspective*. Oxford: Oxford University Press. p 77–100.
- Walker PL. 1989. Cranial injuries as evidence of violence in pre-historic southern california. *Am J Phys Anthropol* 80:313–323.
- Walker PL. 1994. Is the battered-child syndrome a modern phenomenon? Göttingen: Xth European Meeting of the Paleopathology Association.
- Walker PL. 1997. Wife beating, boxing, and broken noses: skeletal evidence for the cultural patterning of violence. In: Martin DL, Frayer DW, editors. *Troubled Times: violence and warfare in the past*. Amsterdam: Gordon and Breach. p 145–180.
- Walker PL. 2001. A bioarchaeological perspective on the history of violence. *Annu Rev Anthropol* 30:573–596.
- Walker PL, Cook DC, Lambert PM. 1997. Skeletal evidence for child abuse: a physical anthropological perspective. *J Forensic Sci* 42:196–207.
- Walker PL, Hewlett BS. 1990. Dental health diet and social status among central african foragers and farmers. *Am Anthropol* 92:383–398.
- Walker PL, Sugiyama LS, Chacon RJ. 1998. Diet, dental health, and cultural change among recently contacted south American Indian hunter-horticulturists. In: Lukacs JR, editor. *Human dental development, morphology, and pathology: a tribute to Albert A. Dahlberg*. Eugene: University of Oregon Anthropological Papers, No. 54. p 355–386.
- Walters ML. 2009. Invisible at every turn an examination of lesbian intimate partner violence. Unpublished Ph.D. dissertation ed. Las Vegas: Department of Sociology, Georgia State University.
- Warner J, Graham K, Adlaf E. 2005. Women behaving badly: gender and aggression in a military town, 1653–1781. *Sex Roles* 52:289–298.
- Waters H, Hyder A, Rajkotia Y, Basu S, Rehwinkel JA, Butchart A, editors. 2004. *The economic dimensions of interpersonal violence*. Geneva: World Health Organization.
- Waterson A, Kukaj A. 2007. Reflections on teaching social violence in an age of genocide and a time of war. *Am Anthropol* 109:509–518.
- Webb S. 1995. *Palaeopathology of aboriginal Australians: health and disease across a hunter-gatherer continent*. New York: Cambridge University Press.
- Wedel VL, Galloway A, editors. 2013. *Broken bones: anthropological analysis of blunt force trauma*. Springfield: Charles C. Thomas.
- Wendorf F. 1968. Site 117: A nubian final paleolithic graveyard near jebel sahaba, sudan. In: Wendorf F, editor. *The Prehistory of Nubia*. Dallas: Southern Methodist University. p 954–995.
- Wensley D, King M. 2008. Scientific responsibility for the dissemination and interpretation of genetic research: lessons from the "warrior gene" controversy. *J Med Ethics* 34:507–509.
- White TD. 1992. *Prehistoric cannibalism at mancos 5MTUMR-2346*. Princeton: Princeton University Press.
- White TD, Folkens PA, Black MT. 2012. *Human osteology, third edition*. Burlington: Academic Press.
- Whitehead NL. 2004a. Introduction: Cultures, conflicts, and the poetics of violent practice. In: Whitehead NL, editor. *Violence*. Santa Fe: School of American Research Press. p 3–24.

- Whitehead NL, editor. 2004b. *Violence*. Santa Fe: School of American Research Press.
- Whitehead NL. 2005. War and violence as cultural expression. *Anthropol News* 46:23–26.
- Wild EM, Stadler P, Häusser A, Kutschera W, Steier P, Teschler-Nicola M, Wahl J, Windl HJ. 2004. Neolithic massacres: local skirmishes or general warfare in Europe? *Radiocarbon* 46:337–385.
- Wilkinson RG. 1997. Violence against women: Raiding and abduction in prehistoric michigan. In: Martin DL, Frayer DW, editors. *Troubled times: violence and warfare in the past*. Amsterdam: Gordon and Breach. p 21–44.
- Wilkinson RG, Van Wagenen KM. 1993. Violence against women: Prehistoric skeletal evidence from michigan. *Midcontinental J Archaeol* 18:190–216.
- Willey P, Emerson TE. 1993. The osteology and archaeology of the crow creek massacre. *Plains Anthropol* 38:227–269.
- Wrangham RW. 1999. Evolution of coalitionary killing. *Yearb Phys Anthropol* 42:1–30.
- Wrangham RW, Glowacki L. 2012. Intergroup aggression in chimpanzees and war in nomadic hunter-gatherers: evaluating the chimpanzee model. *Hum Nat* 23:5–29.
- Wrangham RW, Peterson D. 1996. *Demonic males: apes and the origins of human violence*. Boston: Houghton Mifflin Company.
- Wright LE. 2006. *Diet, health, and status among the pasión maya: a reappraisal of the collapse*. Nashville: Vanderbilt Institute of Mesoamerican Archaeology, Vanderbilt University Press.
- Zimmerer KS. 2007. Cultural ecology (and political ecology) in the "environmental borderlands": exploring the expanded connectivities within geography. *Prog Hum Geogr* 31:227–244.
- Zimmermann M. 2006. Conclusion: Violence in late antiquity reconsidered. In: Drake HA, editor. *Violence in late antiquity: perceptions and practices*. Hampshire: Ashgate Publishing Limited. p 343–358.
- Zuckerman MK, Armelagos GJ. 2011. The origins of biocultural dimensions in bioarchaeology. In: Agarwal SC, Glencross BA, editors. *Social Bioarchaeology*. Malden: Wiley-Blackwell. p 15–43.