Bioarchaeology
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Introduction

The study of the human bodies of past cultures, bioarchaeology became a major research area in the social sciences by the late 1970s. Originally influenced by the development of New Archaeology in the United States, bioarchaeology has become one of the more scientifically focused fields of social research (see also the OBO article on Processual Archaeology). By blending archaeology, biology, and cultural anthropology with theory and methods drawn from sociology, demography, chemistry, statistics, history, and forensics, among others, contemporary bioarchaeologists bring a multidisciplinary perspective to the past 10,000 years of humanity. Within that time-frame, humans developed agriculture and domesticated animals; both of these cultural advances have proven detrimental to the human body, particularly in terms of a decrease in health, which bioarchaeologists can see in the patterning of disease and trauma in skeletal remains. Economic changes such as the advent of agriculture also brought changes in the activities and behaviors that people engaged in, with a division in labor along gender lines evident in the biological remains of many societies. Another hallmark of humanity is migration: *Homo sapiens* have successfully inhabited much of the earth, with our cultural capabilities allowing us to invent ways of dealing with new ecological challenges and our biological make-up allowing us to adapt physically to new environmental conditions. Yet struggles for land and other necessary resources have a lengthy history, much of which can be read in the injuries seen in the skeletons of people subjected to violence and warfare. Bioarchaeology seeks to tell the stories of our collective ancestors. From the Roman legionnaire to the indigenous Britons he was tasked with subduing, from the sacrificed Aztec child to the people whose lives depended on the appeasement of their deity, from the African woman brought to the United States through the transatlantic slave trade to her white owners, bioarchaeology strives to understand how these people both individually and collectively contributed to world history.

Definition

The word bioarchaeology was first used in 1972 by the British archaeologist Grahame Clark (see Clark 1972), who employed the term to describe his analysis of faunal remains at Star Carr, a prehistoric site in North Yorkshire, England, and was further defined in Clark 1973. Clark was primarily interested in palaeoeconomics, or the evolution of the relationship between humans and their environment. The focus on faunal remains allowed Clark to discuss prehistoric economies in terms of hunting, butchering, and other practices. The term was independently invented in the late 1970s by anthropologist Jane Buikstra. Influenced by the New Archaeology and the tradition of US four-field anthropology, Buikstra 1977 outlined a bioarchaeology that emphasized the need to generate and solve research questions about past human populations, in contrast to the strongly descriptive skeletal studies that had been done in previous eras of American archaeology. Within the United States, the term “bioarchaeology” caught on as a way to describe the study of human skeletal remains from archaeological sites. In the United Kingdom, bioarchaeology sometimes refers to the study of all or a subset of biological remains (human, animal, and plant) and may be interchangeable with the term “osteoaarchaeology.” Although the definition of bioarchaeology is still quite broad in much of the world, this bibliography employs the denotation of the term common in the United States, where bioarchaeology deals with human skeletal remains, zooarchaeology deals with faunal remains, and palaeoethnobotany deals with plant remains.


Buikstra’s definition of bioarchaeology as a multidisciplinary research program addressing questions of burial, social organization,
behavior and activities, palaeodemography, population interaction, diet, and disease took hold in the United States in the late 1970s. This definition is used almost exclusively for the physical remains of humans.


Clark termed his study of faunal remains from the Star Carr site in Yorkshire, England, “bioarchaeology,” marking the invention and earliest use of the word.


With this article, Clark defined bioarchaeology both as “the archaeology concerned first and foremost with life,” (p. 464) and as “the archaeology of how men occupied territories and maintained life” (p. 466).

**General Overviews**

Although bioarchaeology as a discipline has existed in its present form for well over three decades, there are few introductory textbooks and general overviews covering the field. Most book-length treatments of bioarchaeology are edited volumes, many of which are focused on a particular research question, geographical area, or theoretical perspective. While these are undoubtedly useful, synthetic works that deal with bioarchaeological information in a cross-cultural manner are also needed. The only major works that approach a textbook on the field of bioarchaeology are Larsen 1999 and Martin et al. 2013, which are both extremely well researched but geared more toward the practitioner than the student. Both Larsen 2000 and Weiss 2009, however, are aimed at students and non-specialists, and they provide a good overview of the tenets of the field and the sorts of information that can be discovered through the analysis of human skeletal remains.


Offers a brief introduction to the field of bioarchaeology, along with in-depth treatments of analytical methods and research topics inherent to the field. Bibliography is comprehensive. Most useful for graduate students and professionals in the field.


Written for a non-specialist audience, this book explains the kind of information that can be gleaned from analysis of human skeletons and synthesizes what bioarchaeologists have learned about past populations.


This new volume aims to introduce archaeologists to the theory and practice of bioarchaeology through explanations of frequently used techniques and presentation of case studies. Of particular importance is the section on generating a research project.


Designed for introductory students, this volume presents the history of bioarchaeology, provides basic information about human osteology, and seeks to explain the current state of research into health, disease, trauma, and diet from a bioarchaeological perspective.
Historical Background

The development of bioarchaeology within the so-called four-field anthropology (which is made up of cultural, biological, archaeological, and linguistic subfields) of the United States has meant a different history and research trajectory than in the United Kingdom and other parts of the world. Armelagos, et al. 1982; Armelagos 2003; and Cook 2006 discuss how American bioarchaeology was conceived as a response to and repudiation of descriptive skeletal biology (see Definition), with the goal of answering anthropological questions with the study of human skeletons. As such, US bioarchaeologists have reflected on the history and evolution of the field far more frequently than have researchers in other parts of the world. Buikstra 2006 traces the intellectual origins of bioarchaeology back to Thomas Jefferson’s early excavation of a Native American burial mound and to the foundation of US (physical) anthropology by Franz Boas and Ales Hrdlička, and Beck 2006 argues for the importance of Earnest Hooton’s early work at Pecos Pueblo. The consensus, however, is that contemporary bioarchaeology began in the late 1970s. For the varied histories of bioarchaeology and skeletal biology in other parts of the world, Márquez-Grant and Fibiger 2011 includes basic information from dozens of countries, and Roberts 2006 discusses the development of the field in Britain.


Through a discussion of the development of bioarchaeology in the United States within the field of anthropology, this article argues for a multidisciplinary, cross-cultural approach to understanding variation in past human populations.


In covering the history of skeletal biology, this article deals directly with the practice and legacy of racial typology, as well as the metric analysis that was used to construct indices and typologies we now know to be too simplistic to capture human variation.


American bioarchaeology essentially began in the 1920s with the excavation of Pecos Pueblo by A. V. Kidder, who allowed E. A. Hooton to analyze thousands of skeletons. Hooton was the first anthropologist to use archaeological context in addition to biological typology in generating and answering questions about the past.


Traces the development of bioarchaeology in the United States from the early contributions of Thomas Jefferson to Samuel Morton to the transformation of physical anthropology by Ales Hrdlička and the first bioarchaeological work by Earnest Hooton.


Typological studies dominated physical anthropology well into the 20th century but became largely repudiated as racist. This essay argues, however, that significant strides were made in the nascent field of bioarchaeology by our predecessors, including attempts to understand the history of the world’s population.

Márquez-Grant, Nicholas, and Linda Fibiger, eds. 2011. The Routledge handbook of archaeological human remains and

In each chapter of this handbook, the historical background of the evolution of physical anthropology of a specific country is presented. This English-language resource is therefore particularly useful as a cross-cultural comparison of the history of bioarchaeology. European countries are best covered, with forty-two different chapters, followed by five chapters on North America, four on South America, three each on Africa and Oceania, two on Asia, and one on Antarctica.


Covers the history of bioarchaeology in the United Kingdom, including key practitioners. Development of the field in England has lagged somewhat behind the United States, where the early adoption of standards of data collection, a four-field approach, and training programs for students have helped advance the field.

Reference Works

Bioarchaeology is an increasingly interdisciplinary field, but even at its beginnings, it was conceived of as an integrative perspective on humans in the past (see Definition). Major reference works in the field therefore cover a variety of topics, from excavation to identification and recording of individual bones to the study of burial. This section presents reference works more or less as they would be needed in a bioarchaeological research project: first, a list of handbooks that cover how to find and excavate human remains; second, manuals that illustrate individual bones, teeth, and their anatomy for field and lab identification of remains; and finally the key articles that allow for demographic reconstruction of individuals and populations, as well as the standards of data collection based on these works. Additional reference texts guide the bioarchaeologist through the basic principles of mortuary analysis, the importance of other types of human remains (mummies, bog bodies, and cremains), and the standard works on identifying faunal remains from archaeological sites. A list of the key journals in the field is also presented, in which the latest advances in bioarchaeological theory and methodology are published.

ARCHAEOLOGICAL EXCAVATION

Sometimes skeletal remains are found eroding out of their burial context; but for the most part, ancient human skeletons need to be excavated and removed from the ground before the skeletal biologist can clean and study them. This “dirty” work is often done by an archaeologist, but many bioarchaeologists are on site from the first day of excavation, contributing their training in contemporary excavation techniques and expertise in human skeletal biology. The recent handbooks highlighted in this section help guide bioarchaeologists through the often-delicate process of recovering skeletal remains from various burial contexts, time periods, and states of decomposition. The classic text Ubelaker 1989 includes dental formation and eruption guides often cited in the bioarchaeological literature, but this work is more appropriate for those with some knowledge of the field already. Recent British publications, including Mays 2010 and Roberts 2012, afford greater coverage to the complicated process that starts with death and ends with analysis and publication of data, with a focus on excavation and recovery of human remains. Finally, Dupras, et al. 2011, a forensic anthropology manual, and Blau and Ubelaker 2009, on forensic archaeology and anthropology, both provide guidance in the recovery and analysis of skeletal remains of any era.


Includes information on the history of forensics, methods for both excavation and analysis of human remains, case studies of a forensic nature, and ethical and legal concerns of the forensic anthropologist. Particularly interesting are perspectives on forensic practice around the world, including chapters dealing with the United States, UK, Italy, France, Spain, Australia, Canada, and Indonesia. Part 2 (pp. 127–150), however, covers techniques used to search for, excavate, and recover human remains.

Although focused on ways to locate and collect human remains in a forensic setting, this handbook is also useful as a comprehensive resource for archaeological fieldwork involving skeletons.


This manual covers the basics of creation and excavation of an archaeological bone assemblage. It also includes an introduction to estimating age and sex, understanding disease and variation, and analyzing bone from cremations.


This handbook is devoted not just to the morphological and biochemical analysis of human skeletal remains but also to their lifecycle, from burial to excavation. Well suited for a course textbook or introduction to the practice of bioarchaeology.


Intended primarily as a manual for archaeologists, this volume covers methods of skeletal recovery along with basic forensic guidelines as to whether the bone is human or not, how to estimate time since death, and methods of facial reconstruction. Provides the original dental formation/eruption figure cited by later texts.

**HUMAN OSTEOLGY**

Once human remains are excavated, they are usually analyzed in a laboratory setting. Basic osteological identification includes making an inventory for each individual of the bones or fragments that are present and creating an MNI (minimum number of individuals) based on the skeletal elements present. The books listed in this section represent the standard works used in teaching human skeletal anatomy in English-speaking universities; many of these are also used for field and lab identification. For the most part, standard skeletal anatomy textbooks such as Bass 2005; Steele and Bramblett 1988; White, et al. 2011; and White and Folkens 2005 deal primarily with the adult skeleton, with only a cursory introduction to the juvenile skeleton. Both Baker, et al. 2005 and Schuerer and Black 2004, however, focus strictly on the developing skeleton. Cox and Mays 2000 provides the basics of method and theory in the field. Every bioarchaeologist likely has one or more of these volumes on his or her shelf and consults them regularly.


This practical guide to the excavation and analysis of juvenile remains is more basic than Schuerer and Black 2004 but more useful for a student or as a field manual. Includes a “quick reference” section at the end (pp. 157–172) that is handy for assessing age-at-death from epiphyseal fusion.


Small, compact, and spiral-bound, this manual includes a basic introduction to the human skeleton and the ways it can be used to estimate sex, age, height, and ancestry. This is most often used by practitioners as a field guide rather than as a textbook.

Designed as a companion textbook, this volume is authored by specialists in the field and covers skeletal growth and development, palaeodemography, disease, variation, trauma, and analytical methods. Most useful as a methodological overview in bioarchaeology.


While most osteology texts leave the juvenile skeleton as an afterthought, this volume stands out because it is focused on the development of bones from the embryonic stage through final adult form. It is most appropriate for practitioners who already have a good understanding of the adult skeleton.


This basic introduction to the human skeleton has large photographs and includes tables with each major bone that may help the osteologist estimate a person’s age, sex, and height. Also included are a chapter on bone biology and a glossary of anatomical terms.


Clear, highly detailed photographs make this reference book indispensable for most bioarchaeologists, from entry-level students to professionals. The first half of the book is a well-illustrated, comprehensive anatomical text, while the second half includes chapters on ethics, recovery, analysis, pathology, and forensics. Also included are color diagrams indicating muscle attachments.


A condensed version of White, et al.’s Human Osteology volume. Smaller and therefore more portable, for field use. Also includes a helpful photo target and scale in the cover.

TEETH (DENTAL ANTHROPOLOGY)

Most textbooks that deal with the identification and analysis of human skeletons include information about teeth (see Human Osteology). Many researchers, however, believe these elements of the human body deserve further consideration owing to the amount of information they hold about individuals and populations and to the fact that they are the likeliest part of the human body to be preserved because of the hardness of enamel. Contemporary approaches in dental anthropology use morphological, metric, nonmetric, and biochemical analyses of teeth to answer questions about past populations, including what people ate and how healthy they were. The works highlighted in this section are basic guides to the practice of dental anthropology. Both Rose and Burke 2006 and Scott 2008 outline the history and contemporary practice of dental anthropology in the United States. Van Beek 1983 is a reference guide aimed more at an audience of dental practitioners, but the drawings and anatomical information are relevant for bioarchaeologists as well. Hillson 2005 and Hillson 1996, however, remain the standard texts for the practice of dental anthropology.


Focused on human teeth, this volume covers topics such as morphology and development, variation, age estimation, and biochemistry, with an appendix of field and lab methods. Additional chapters concentrate on the application of dental analysis to anthropological questions about disease and diet in the past.


A lengthy introductory section of this volume covers the diversity of mammalian tooth forms, making it useful for identifying human and
animal teeth in an assemblage. Topics such as age estimation and dental wear are also presented in a cross-species manner.


Tracks the development and inclusion of dental analysis in contemporary bioarchaeology. Dental wear and disease were two early areas of research in this subfield, as they provide information about diet and economy in past populations.


Covering the history, terminology, and methods of dental anthropology, this paper succinctly summarizes the current state of the field. A section on population studies is a useful outline for the ways that dental traits can be employed to learn more about biological relationships in the past.


This slim reference guide covers the basic anatomy and morphology of the primary (adult) and secondary (deciduous) dentitions and provides drawings and a list of principal identifying features for each tooth type.

**SKELETAL IDENTIFICATION TECHNIQUES**

After individual bones are identified as to type and size, a bioarchaeologist will want to know if the individual they belonged to was male or female, how old the person was at death, how tall the person was, and whether the person was related to a certain social or ethnic group. These basic demographic data can be arrived at via a number of ways, and the bioarchaeologist’s choice of methods is often restricted by the completeness and preservation of the skeleton. In the field of forensic anthropology, gaining a positive identification is crucial to any case of forensic significance, so methods for estimating age-at-death and sex, in particular, are constantly being created and revised. Identifying the demographics of an individual is a multifactorial process in both forensic anthropology and bioarchaeology, and practitioners in both fields tend to use as many techniques as possible to narrow down the error range associated with these estimates. The methods most often used in American bioarchaeology for estimating sex, age-at-death, height, and ancestry are listed in this section. Illustrations for these techniques and further information can be found in most of the works listed in Standards for Data Collection and Human Osteology.

**Sex**

Estimating sex is the first step in identifying the demographics of an unknown individual, as estimating adult age-at-death (see Age) first requires knowing whether the skeleton is male or female. The most widely used methods for estimating sex include visual examination of the skull and the pelvis. Namely, sex estimation from the cranium is traditionally accomplished using techniques established in Acsádi and Nemeskéri 1970, while sex estimation from the pubis is done using features outlined in Phenice 1969.

Acsádi, György, and János Nemeskéri. 1970. History of human life span and mortality. Budapest: Akadémiai Kiadó. This classic text first detailed the attributes of the skull that can be visually assessed for sex of an individual, creating the foundation for sex estimation from cranial morphology.

The Phenice method of estimating sex based on three key features of the pubic bone (ventral arc, subpubic concavity, ischiopubic ramus) has become standard in American osteology. Casts are available to help students learn this method.

Age

Methods for estimating adult age-at-death can be performed on several different parts of the human body, including the skull, ribs, and pelvis. Based on degenerative changes to the pubic symphysis, Brooks and Suchey 1990 is most often used by American bioarchaeologists to estimate adult age-at-death, but the method described in Todd 1920 and Todd 1921, focusing on the same skeletal element, is also frequently employed, as is the technique described in Lovejoy, et al. 1985 of assessing changes to the auricular surface of the ilium. The approach outlined in İşcan, et al. 1984 using sternal rib ends is most useful when the thorax of the skeleton being investigated is largely complete. Less frequently employed but often reproduced in introductory textbooks is assessment of ectocranial suture closure, a method developed in Meindl and Lovejoy 1985. Subadult age-at-death, on the other hand, is generally estimated based on dental development and eruption, according to the guidelines set out in Moorrees, et al. 1963. Additional methods of estimating subadult age, including long bone measurements, are summarized in Ubelaker 1987. Most bioarchaeologists practice multifactorial age estimation, or using multiple methods to arrive at a conclusion about the individual’s age-at-death.


The Suchey-Brooks method of estimating age-at-death based on the changes to the face of the pubic symphysis has become standard in American osteology and is preferred over other estimates of adult age-at-death. Casts help students learn to identify age-related changes.


While estimates of age from the sternal rib can be relatively precise, this technique is generally not taught to introductory students because of the training necessary to identify the relevant changes and because the technique is most useful when numerous ribs are available for study.


Although changes to the auricular surface are more difficult for students to identify than are changes to the pubic symphysis, there are two main advantages to this method: first, it allows the practitioner to estimate age beyond fifty (the limit for the Todd 1920 and Todd 1921 methods); and second, the auricular surface is more likely to be preserved than the pubic symphysis in an archaeological specimen.


This method, which involves scoring the state of closure of the sutures on the external surface of the skull, is not the most precise, but it is generally reproduced in human osteology textbooks and often taught to students as one of the many methods available for figuring out adult age-at-death.

Dental Research 42.6: 1490–1502.

Variation in the timing of crown formation, root growth, and apex closure is a good guide to the age of a subadult whose teeth are still developing. The data, graphs, and illustrations found in this article are reproduced for osteologists in several of the works found in Standards for Data Collection.


This classic article covers the age-related changes seen in the pubic symphysis of white males. Illustrations and explanations of this method can also be found in most works in the Standards for Data Collection section. See also Todd 1921.


This follow-up article (see also Todd 1920) deals with the age-related changes to the pubic symphysis of white females. Illustrations and explanations of this method can also be found in most works in the Standards for Data Collection section.


Reviews the literature on estimating the age of juveniles, including appearance of ossification centers, epiphyseal closure, dental formation and eruption, and bone size. Although it is an older article, many of the citations have become part of the osteological canon.

Stature and Ancestry

In most forensic cases and in many archaeological cases, additional information for individuating a skeleton is useful. Bones and teeth can provide the bioarchaeologist with clues to an individual’s standing height and possibly ancestry as well. Trotter and Gleser 1958 gives the equations most frequently used to estimate living stature from skeletonized long bones. Howells 1973 identifies differences among populations based on cranial size and shape, and Gill and Rhine 1990 provides information on skeletal attributes that could reflect an individual’s ancestry.


Most bioarchaeologists do not attempt to estimate “race” in the way that forensic anthropologists do, but this volume is useful for understanding the skeletal expression of genetic traits that may be linked to racially defined groups, particularly in the United States.


The craniometric data that Howells collected from a variety of modern populations around the world has been used in programs such as FORDISC 3.0 (see Software and Databases and Image Collections) as a way to assess possible ancestry of a skeleton.


In this study, the height of US soldiers was recorded prior to death; long bones measured after death were used to create formulae
for stature estimation from the skeleton. This article presents the regression equations that are used by many bioarchaeologists to estimate stature. These equations are used in the programs in Software.

**STANDARDS FOR DATA COLLECTION**

One of the main strengths of the bioarchaeological approach to understanding the past is the possibility of inter-population comparisons of biological data. These comparisons can only be made, however, if the data are collected in a standardized manner, according to agreed-upon methods. The standards widely used throughout the world for estimating age, sex, stature, and ancestry are given in Skeletal Identification Techniques. This section lists several compendia of standards or best practices: the two major volumes used by bioarchaeologists trained in the United States or the United Kingdom, an international handbook of standards, and a cross-cultural project codebook created by Steckel (Steckel, et al. 2011) for the Global History of Health Project. Owing primarily to the need for US researchers to catalogue human remains under NAGPRA (see Ethical and Legal Concerns) and the availability of free software to aid in data collection (see Software), the volume Buikstra and Ubelaker 1994 is currently the best known and most widely utilized collection of osteological standards in the world. Moore-Jansen, et al. 1994 is often used by both bioarchaeologists and forensic anthropologists. British researchers, however, tend to favor Brickley and McKinley 2004, and information on recording methods in other countries can be found throughout Márquez-Grant and Fibiger 2011.


Created and used by bioarchaeologists trained in the United Kingdom, this manual suggests standard ways to compile a skeletal inventory, estimate age-at-death, sex, and ancestry; collect data on trait variation and pathological indicators; and take samples for bone chemistry. Helpful skeletal recording forms can be found at the end.


Created and used by bioarchaeologists trained in the United States, this compendium of standard techniques is used to collect and analyze data from skeletons. The basic techniques in this volume are also listed in Skeletal Identification Techniques. A free software program has been developed based on these standards; see Software.


The US and UK standards for data collection are used widely, but many countries have created their own. Each chapter of this handbook includes a section on the analytical methods used in that particular country. Although focused primarily on countries in Europe and the Americas, this compendium makes it easier for bioarchaeologists to compare data from around the world.


Designed to help researchers collect and enter information necessary for the National Forensic Data Bank at the University of Tennessee, this volume includes much of the information and images found in the more widely used Buikstra and Ubelaker 1994.


This codebook involves instructions specific to the Global History of Health Project but represents an attempt to standardize
osteological data collection across countries. These standards can largely be found elsewhere (e.g., Buikstra and Ubelaker 1994), but the manual is particularly useful for suggestions for coding pathological lesions.

MORTUARY ANALYSIS

The origins of bioarchaeology lie, of course, in the archaeological excavation of burials (see Historical Background). At the beginning, skeletal material found during a dig was largely ignored in favor of artifacts and riches included with the deceased, particularly in classical archaeological excavations in Europe. The advent of the New Archaeology in the United States in the mid-20th century, however, focused renewed attention on the form and placement of burials within a settlement in order to uncover information about social structure and other aspects of culture, a perspective that is often called “mortuary analysis.” While the relationship between mortuary structures and the skeletal remains that inhabit them is clearly important, in practice, bioarchaeology and mortuary analysis are not always integrated. One of the earliest volumes on mortuary practices following the rise of bioarchaeology is Chapman, et al. 1981, many of whose contributions meld archaeology and osteology. Focused largely on Europe, Parker Pearson 2000 and Duyard 2009 offer guidance in interpreting burials and reconstructing funeral and post-depositional processes. A move within American bioarchaeology toward a more integrated, interdisciplinary approach to the dead is advocated in Goldstein 2006 and Rakita, et al. 2008. The works cited in this section therefore represent the history of mortuary analysis, the current state of the field, and suggestions for creating a more contextualized approach to death.


Includes an interesting set of contributions from pioneers in the field of mortuary analysis. It is a good sampling of archaeological topics such as rank, social structure, spatial organization, as well as osteological topics such as pathology and demography.


Primarily a guide to understanding the taphonomy of burial and positioning of the skeleton within the grave, this volume is widely used in Europe, particularly in France and Italy. Each chapter includes text and images from Duyard’s lectures on such topics as the space of decomposition, multiple burial, and cremation.


The title of this essay demonstrates the author’s assertion that two different fields of research now sit in place of what once was a single, integrated approach to understanding past populations. Goldstein stresses that bioarchaeologists and mortuary specialists need to share more information to create a more contextualized approach.


Includes a chapter on excavation of skeletons, but most of the book is focused on the interpretation of burials: from reconstructing funerary practices to understanding social status of the dead. Balances processual and post-processual research questions and interpretive styles. Runs the gamut from the origins of human burial to recent history.


Separated into three themes: theoretical perspectives, treatment of the corpse, and evidence for violent deaths. This volume advocates an interdisciplinary approach to studying funerary practices. Most contributions are focused on the Americas, but several essays deal with Old World material as well.
CREMATIONS, MUMMIES, BOG BODIES

Skeletons constitute the bulk of the human remains discovered and collected around the world, but bioarchaeological analysis is also used to better understand mummies, bog bodies, and cremations. In various time periods and geographical locations, purposeful or accidental preservation of the human body occurred. Mummies are found cross-culturally, as they can be created through extreme heat, cold, or dryness. With many mummies, the biological body is inextricably linked with cultural objects such as wrappings, clothing, jewelry, and tattoos. These bodies can be studied as skeletal material, but they can also provide information about diseases of the soft tissue, and they can be investigated as the product of a mortuary ritual as well. Bog bodies, on the other hand, are found only in northern Europe and constitute the preserved skin and organs of a deceased individual, only occasionally including preserved bone material. Studies of the hair and skin of bog bodies has revealed a lot of information about diet and disease in this geographic area in the Iron Age. Like mumification, cremation is found throughout the world but usually represents purposeful burning of a corpse. Because fire changes the appearance of bone and its chemical composition, numerous bioarchaeological and forensic studies have been aimed at teasing out information about the dead from small fragments of bone and teeth. An overview of various preservation techniques is provided in Chamberlain and Parker Pearson 2002, including taphonomic processes that can naturally preserve organic remains. Major works on mummies in Auferheide 2003 and Cockburn, et al. 1998 deal with the history of the practice and cross-cultural comparisons. A theoretical approach to bog bodies is found in Sanders 2009. Finally, the state of research on the practice of cremation in both forensic and archaeological contexts is detailed in Schmidt and Symes 2008 and Ubelaker 2009. The selections here thus represent the most recent methodological and theoretical advances in the study of preserved and burned human remains.


The definitive textbook on mummies, this volume covers the history of mummy studies, reasons for mumification, methods used to create mummies, diseases found in mummies, and an impressive catalogue of mummies from around the world. Information on conservation and exhibition of mummies is also presented.


Written for the non-specialist, this book covers the basic ways that flesh can be preserved on archaeological bodies: through mumification, freezing, or placement in a bog. Additional sections deal with other environmental preservation methods, such as volcanic activity at Pompeii, and contemporary preservation techniques are also discussed.


Split into three major sections that cover the geographic range of mummies (Egypt, the Americas, and the rest of the world), this volume focuses on a cross-cultural comparison of the practice of mumification and the natural and cultural methods of achieving the preservation of fleshecd bodies.


Situated within contemporary social theory, this book approaches bog bodies discursively, showing how these remarkable remains have been used and experienced in modern times by such diverse figures as Sigmund Freud and William Carlos Williams.


The most thorough contemporary manual on forensic and archaeological cremations, this volume covers changes in the appearance and chemical properties of bone due to burning, methods of analyzing cremains, and cross-cultural mortuary practices that involve
cremation.


Summarizes the current state of cremation research, primarily from a methodological standpoint.

**ZOOARCHAEOLOGY**

Most recent definitions of bioarchaeology (see Definition) do not include animal bone as part of the purview of research in the field. Nevertheless, animals and humans have a long and intertwined history, particularly with the advent of domestication, meaning faunal remains are often found at the same site as human remains, even occupying space in the same grave. Bioarchaeologists need to be able to quickly and easily identify human versus non-human bone in the field and in the lab, especially with respect to elements of animals that look strikingly similar to humans; for example, a bear paw without claws may be mistaken for a human hand. For those students or practitioners interested in identifying faunal remains, the zooarchaeological manuals in Davis 1995, O’Connor 2008, and Reitz and Wing 2008 are suitable introductions. Russell 2011 provides additional, complementary information about the relationship between humans and animals (anthrozoology) from an archaeological perspective. See also the separate *Oxford Bibliographies Online* article on Anthrozoology.


This introductory textbook balances methods and techniques in the analysis of animal bone with an interpretive framework that foregrounds how human societies used and changed animal biology through domestication and other cultural practices.


An introduction to the information that bones can provide about the animals they were once a part of, including health and disease, diet, trauma, and age. Several chapters discuss the interaction between human societies and animals, particularly in terms of domestication, hunting, and butchering practices.


Covers the major research trajectories in the field of zooarchaeology, with a goal of explaining both the biology of animals and how human behavior has affected and has been affected by animals. Basic nondestructive methods and techniques are covered, as are newer biochemical approaches.


Animals have long been important to the human diet, but this volume is the first to thoroughly investigate the symbolic and social importance of animals to past human societies. Domestication and other human-animal relationships are contextualized in this volume as a way to move beyond an animals-as-food focus in zooarchaeology.

**JOURNALS**

With the exception of regional journals, there is no serial, peer-reviewed publication devoted solely to the topic of bioarchaeology. Increasingly, the language of bioarchaeological scholarship is English, so the major academic journals are those edited and published in the United States or the United Kingdom. Because of the historical development of bioarchaeology in the United States as a subfield within physical or biological anthropology, the major American journal in which bioarchaeological articles are published
is the American Journal of Physical Anthropology. The top British journal for bioarchaeology is the International Journal of Osteoarchaeology. A newly created specialty publication, the International Journal of Paleopathology, focuses on disease in the past, and therefore publishes numerous bioarchaeological articles. Additional journals that often include bioarchaeology articles are the Journal of Anthropological Archaeology as well as the science-heavy Journal of Archaeological Science and Archaeometry. Open-access journals are becoming increasingly common, and bioarchaeology and palaeoanthropological articles are starting to be seen in journals such as PLOS ONE. Finally, the Journal of Forensic Sciences includes many articles on skeletal identification methods and taphonomic processes that are of interest to bioarchaeologists.

**American Journal of Physical Anthropology.**

The official journal of the American Association of Physical Anthropologists, the AJPA has been published since 1918. It is published monthly and includes research articles from the range of biological anthropology, from the evolution of primates to contemporary populations. AJPA also publishes abstracts from the annual AAPA conference.

**Archaeometry.**

An international journal that publishes articles in which scientific techniques are applied to understand archaeology and art. With respect to bioarchaeology, this journal is primarily of interest for papers that employ biochemical analyses or GIS approaches to cemetery analysis.

**International Journal of Osteoarchaeology.**

As noted in Definition, osteoarchaeology as used in the United Kingdom includes both human and animal remains. This journal therefore publishes papers on a wide variety of topics of interest to bioarchaeologists, including palaeopathology, taphonomy, epidemiology, and zooarchaeology.

**International Journal of Paleopathology.**

First published in 2011 as the journal of the Paleopathology Association, this publication boasts Jane Buikstra as founder and editor-in-chief. Articles are on topics related to health and disease of both animals and humans (from hominids to anatomically modern people), and the journal is published four times per year.

**Journal of Anthropological Archaeology.**

Focusing on both method and theory in archaeology, the goal of this journal is to publish articles that explain the workings of human societies. There are four issues per year.

**Journal of Archaeological Science.**

This monthly publication deals primarily with advancing scientific methods and techniques as applied to the field of archaeology. Articles that employ biochemical analysis of human remains to understand past societies are often published in this journal.

**Journal of Forensic Sciences.**

The official journal of the American Academy of Forensic Sciences, this publication deals with various branches of forensic science, including pathology and physical anthropology. Bioarchaeologists routinely consult this journal for advances in sex and age-at-death estimation methods, as well as for information on taphonomic processes such as time since death and cremation.
This peer-reviewed, open-access journal is regularly used in the hard sciences to publish cutting-edge research. Recent bioarchaeology articles published here include molecular and palaeopathological studies.

Bibliographies

Bibliographies in the field of bioarchaeology are rare. Although every book or journal article published on the subject includes a bibliography, there are only a handful of stand-alone bioarchaeology bibliographies such as MacKinnon 2007 and Rose 1996, and they are focused on the Old World, where a much longer tradition of compiling bibliographies exists. A comprehensive list of important references for a particular geographical region or time period is a valuable resource, but to date this has only been undertaken for classical bioarchaeology. See, however, the “Bibliography of Recent Literature” included with bioarchaeology articles published in the *Journal of Archaeological Research* (three of which have been cited in this section: Knudson and Stojanowski 2008, Larsen 2002, and Wright and Yoder 2003). The ubiquity of reference management software coupled with the move to put data online (see Databases and Image Collections) may change the lack of bibliographies in the near future.

An extensive bibliography at the end of this article tracks the latest research in understanding identities through bioarchaeology.

Several pages of bibliography of recent literature in the field of bioarchaeology are included at the end of this article.

Coming in at forty pages of unannotated bibliography, this exhaustive catalogue of human and animal osteological reports from the classical world is separated by geographical area and includes books, articles, edited volumes, theses, and dissertations primarily in English from international researchers.

Several hundred entries on skeletal and dental studies in Egypt and Nubia are arranged alphabetically here. There is also an index for time period and a topical index with such entries as cranio-metry and various pathological conditions.

At the end of this article, the authors have included a bibliography of literature from 1992–2003, relevant primarily to palaeodemography but with numerous references to isotope analysis, palaeopathology, and other topics important to bioarchaeology.
New Media

With the rise of the Internet and other digital technologies, the field of bioarchaeology is coming online quickly. Researchers are finding an established and knowledgeable community of osteology professionals on social networking sites such as Facebook and Twitter. Students are using online resources to study for their osteology classes and freely accessible skeletal databases for their term papers. In many areas of the world, however, legal or ethical issues prevent widespread sharing of data or images of the dead (see Ethical and Legal Concerns). The advent of open access publishing and data sharing has led to changes in the way osteologists collect data, with many US professionals adopting free software based on standard osteological methods, and has encouraged museums and research projects to share digital images with anyone who has an Internet connection. This section highlights the best of the bioarchaeological new media at the moment, including blogs, databases, and software, with the hope that the future will bring many more sources of information.

BLOGS

There are surprisingly few blogs devoted entirely to the topic of bioarchaeology. All of them are written by young professionals in the field who are bioarchaeologists with at least a master’s degree. As such, the blogs are updated semi-regularly. They cover a wide range of aspects of bioarchaeology, including method and theory, issues with media coverage of new findings, and reports about the blog author’s own research. Powered by Osteons, Bones Don’t Lie, and These Bones of Mine all tend to highlight news and interesting articles from the major journals, with reviews and critiques of peer-reviewed publications of interest to other bioarchaeologists.

Bones Don’t Lie.

Michigan State graduate student Katy Meyers began this blog in August 2010 with the aim of writing up thoughts and critiques of recent articles and news items in bioarchaeology and mortuary archaeology. She also writes about digital humanities and public archaeology.

Powered by Osteons.

Since 2007, bioarchaeologist Kristina Killgrove of the University of West Florida has been writing about her own research and teaching as well as skeletons in the news, and many of her pieces have been syndicated by other archaeological news sites.

These Bones of Mine.

In early 2011, David Mennie, now a graduate student at the University of Sheffield, began a blog about osteology. His ten-part series of posts about skeletal anatomy in particular is a useful introduction for beginning students.

DATABASES AND IMAGE COLLECTIONS

While hundreds of bioarchaeological databases exist in the world, most of them are not open access. Many universities or laboratories, for example, have skeletal databases available for students to use but do not make these available to the general public. Some image databases, particularly those of Native American skeletal remains, cannot be shared for ethical or legal reasons. Digital humanities is moving in the direction of open and freely available content, but the particular nature of human skeletal remains as a physical reminder of a once-living person means that bioarchaeological data are not as easily accessible as are data on artifacts or historical records. This section lists the major free or open-access skeletal and image databases currently available to bioarchaeologists. For basic anatomical information and images, the classic Gray 1918 (based on Gray’s Anatomy) is an excellent starting point, as are the University of Texas at Austin’s human and animal eSkeletons and Historical Anatomies on the Web. Databases with pathological and demographic information include From Cemetery to Clinic: Digitised Pathological Data from Archaeological Leprous Skeletons, the Wellcome Osteological Research Database, the William W. Howells Cranio metric Data Set, and the University of Michigan’s Ford Collection. Websites such as Open Context: Web-based Research Data Publication encourage
bioarchaeologists to share their data with others. Additional databases, some of which may be no longer available, are summarized in White 2007.

**eSkeletons. Univ. of Texas at Austin.**

A useful resource for learning human skeletal anatomy and for exploring comparative primate skeletal anatomy.

**Ford Collection. Museum of Anthropology, Univ. of Michigan.**

These skulls, collected in the second half of the 19th century, were recently digitized and put online. Queries can be made for specific pathologies or trauma, or Wikipedia can be browsed for more information about the diseases and the skulls that exhibit them.

**From Cemetery to Clinic: Digitised Pathological Data from Archaeological Leprous Skeletons.**

This website was designed to showcase X-rays and 3D scans of bones from individuals buried in a medieval leper cemetery. The same research team is currently working on digitizing bones of individuals with different diseases.


The classical text Gray’s Anatomy is available online. Images from this website are particularly useful in studying or teaching osteology.

**Historical Anatomies on the Web. US National Library of Medicine.**

Several dozen old anatomical texts are freely available through the National Institutes of Health (United States), and the collection includes works by European, Near Eastern, and Asian anatomists from the 14th to 19th centuries.

**Open Context: Web-Based Research Data Publication.**

Allows interested archaeologists to share their excavation data and images. Of particular interest to bioarchaeologists may be the finds from Domuztepe, which include photographs and contextual information for a number of human skeletons.

**Wellcome Osteological Research Database. Centre for Human Bioarchaeology, Museum of London.**

The Museum of London has inventoried thousands of skeletons from various time periods of the city’s history, and these data are available online in the WORD. Data include age and sex estimates, as well as pathological indicators and nonmetric traits, broken down by time period and general location. Useful for teaching and research.


This chapter introduces some of the available osteological databases, such as WORD and the Global History of Health Project. It notes that while standards may exist in data collection, the same does not hold true for databases, which are of varying quality, utility, and accessibility.

**William W. Howells Craniometric Data Set. Univ. of Tennessee at Knoxville.**
Biological anthropologist Benjamin Auerbach has made W. W. Howells’s craniometric data set available for download as Excel or CSV files. (See Stature and Ancestry for more information on the research in Howells 1973.)

SOFTWARE

Many bioarchaeologists employ computer software to aid in data collection and estimation of age, sex, and stature of individuals. While some write their own databases to allow for inclusion or omission of various fields, others—particularly those whose work requires them to comply with legal restrictions such as NAGPRA (see Ethical and Legal Concerns)—use software that takes as input standard measurements and observations. For many years, the only major osteological software product was FORDISC (Ousley and Jantz [2005]), but recent advances in technology have allowed computer-savvy bioarchaeologists to easily write their own apps. The software applications highlighted in this section were created by and for bioarchaeologists and forensic anthropologists. While FORDISC remains the standard computer application for forensic anthropology, many bioarchaeologists use Osteoware, and mobile apps such as Anthropomotron are being used by students and researchers in the field for quick estimations and analyses. Special-purpose programs that are often used in statistical analysis in bioarchaeology include ADBOU for transition analysis and RMET for analyzing metric traits.

**ABDOU 2.0.**

This free program employs transition analysis (see Statistical Analysis and Population Genetics) to estimate age-at-death.

**Anthropomotron.**

Free app for iPhone, iPad, and Android. Calculates stature from long bone measurements based on various regression formulae. Also calculates body mass and minimum number of individuals (MNI).

**FORDISC 3.0.**

Comprehensive discriminant function application for assessing sex and ancestry from cranial and postcranial measurements.

**Osteoware.**

Free standalone SQL database application designed by the Smithsonian National Museum of Natural History’s Anthropology Division to help document human skeletal remains and run basic osteological statistics. Data entry fields are based on Buikstra and Ubelaker 1994 (cited under Standards for Data Collection). For PC or Mac.

**RMET 5.0.**

RMET stands for “R Matrix from Metric Traits.” This free program produces a variety of statistics from metric skeletal data. This website also includes two additional programs, MANTEL 3.1 and MICRO 3.1, that may be of interest to biological anthropologists.

**Methods**

After identifying bones from individual skeletons (see Skeletal Identification Techniques) and estimating a minimum number of individuals, a bioarchaeologist will further analyze the remains to answer particular research questions. The main methods to do this involve techniques drawn from mathematics, medicine, and chemistry, and are often used in combination. Statistical analysis involves application of models and formulae to data that can be represented numerically. Typically, this analysis is done on measurements taken from the skeleton, from population-level data on age and sex, or from an observation of presence/absence of
particular traits and helps answer questions about genetic ancestry or changes in bodies through time. Palaeopathological analysis refers to the process of studying the skeleton for evidence of disease or trauma that occurred during an individual’s lifetime. This research method may yield information about disease ecology, transition to agriculture, and gendered division of labor, among other topics. The newest method of analysis, biochemical, has taken off in recent years because of a decrease in cost and an increase in reliability in stable isotope and ancient DNA analyses. Subjecting skeletal tissue to chemical analysis can provide information about patterns of migration, diet, kinship, and more. This destructive method, however, involves particular ethical questions, which have recently generated some discussion (see Ethical and Legal Concerns). This section outlines the major texts and articles that constitute the basis for analysis of skeletal remains.

**STATISTICAL ANALYSIS AND POPULATION GENETICS**

Metric analysis was a key component of early skeletal biology as a way to investigate variation in the peoples of the world (see Historical Background). Today’s statistical analyses of skeletons have moved beyond two-dimensional indices of skull shape and have adopted multivariate approaches to understanding human variation. Metric and nonmetric analyses of the skull and postcranial skeleton are largely performed when undertaking a biodistance study, a method that in essence quantifies changes in gene frequencies between two populations or within a population over time. With DNA analysis becoming faster, cheaper, and more reliable than ever before (see Biochemistry), biodistance studies are waning in popularity. Yet DNA analysis is destructive and as such cannot be performed on certain samples (see Ethical and Legal Concerns), leaving biodistance as the main method of understanding the history of many ancient populations. VanPool and Leonard 2011 provides an overview of statistics in archaeology, with some reference to bioarchaeological samples, and Pietrusewsky 2008 discusses how metric data from the skeleton can answer research questions on population genetics. Further information on biological distance studies can be found in Konigsberg 2006 and Saunders and Raney 2008, based on work in Hauser and De Stefano 1989 and Howells 1973.


This compendium of nonmetric or epigenetic traits of the cranium is a useful guide to identifying and scoring numerous genetically linked traits that can be used in biological distance studies.


Differences among populations of the world may be elucidated using metric analysis of the cranium. This work documents cranometrics from a variety of human populations and is also discussed in Skeletal Identification Techniques. Howells’s data can also be accessed online (see Databases and Image Collections).


The history and practice of biodistance analysis are presented in this essay, in light of the adoption of population-based genetic analysis of archaeological skeletal samples. DNA studies and three-dimensional scanning are revolutionizing the way bioarchaeologists compare genetic data within and among populations, and these techniques may replace indices as well as multivariate and biodistance analyses.


A primer for biological distance studies, this article explains the statistical methods frequently employed to transform metric skeletal data into information about population relationships. Sections on research design and useful algorithms will help the interested researcher undertake biodistance analysis.

Nonmetric skeletal traits are less straightforward to collect compared to skeletal metrics. This paper reviews the history of nonmetric trait variation, illustrates nonmetric traits of the skull and the researchers who described them, and discusses the information about past populations that can be gleaned from studies of biological variation.


This methodological handbook explains in great detail a variety of statistics applicable to archaeological samples. Human bone, animal bone, and cremains figure in to numerous examples in the text, making it useful for the bioarchaeologist who wants to statistically analyze a sample population.

PALAEODEMOGRAPHY

Knowing the demographic structure of a population can give bioarchaeologists a lot of information about the society, particularly in terms of age classes and the balance between males and females. But palaeodemography goes beyond questions of age-at-death and sex, seeking to answer questions about migration, health status, and environmental changes that affected people. The advent of ancient DNA analysis (see Biochemistry) has made estimations of sex and disease diagnoses more reliable, but many skeletal populations cannot be subjected to DNA analysis (see Ethical and Legal Concerns) or their organic matter is too degraded to test. Contemporary palaeodemography incorporates DNA studies but relies most heavily on methods and evidence from a variety of other sources, such as historical records and skeletal remains. Frankenberg and Konigsberg 2006 provides a history of palaeodemography, including major research themes, which are echoed in Milner, et al. 2008, which includes key references to the development of palaeodemography, from life tables to hazards models. The current practice of palaeodemography is best reflected in Hoppa and Vaupel 2002; Chamberlain 2006; Milner, et al. 2008; and Bocquet-Appel 2008; all of which include information on applying palaeodemographic techniques to an archaeological population. A major theoretical issue in palaeodemography, the “osteological paradox,” is presented in Wood, et al. 1992: namely, the idea that understanding health from skeletons is not a straightforward question. Wright and Yoder 2003 has a response that points to advancements in biochemical analysis, but the “osteological paradox” can still be problematic for researchers interested in questions of health and demography in antiquity. The works cited in this section therefore provide information on how and why palaeodemographic research is done, including some of the problems associated with attempting to reconstruct ancient populations based on the incomplete bioarchaeological record.


Covers the contemporary practice of palaeodemographic analysis, from generation of data to techniques employed to finding patterns and reconstructing past populations. The volume advocates a multidisciplinary approach to palaeodemography, including data from history, bioarchaeology, primatology, paleontology, and genetics.


A basic demographic instruction manual, this volume covers approaches to reconstructing the demographic make-up of past populations, from hominids to more recent times. Included are methods of archaeological demography, ways of using the historical and ethnographic records, and the contribution of genetic and pathology studies.

By structuring this essay around the mathematical themes underlying various approaches to palaeodemography, the authors present the field in an interesting light. They suggest that palaeodemography is moving into an evaluation phase in which statistical methods and anthropological questions are being tested and refined to move the field forward.


Grew out of a symposium convened to investigate and create better methods for estimating age-at-death of individuals and populations. Chapters in the book include information on the application of biostatistics to osteological remains, including techniques such as hazards models, transition analysis, and mortality models.


A concise introduction to the methodological problems in the reconstruction of demographic information from human skeletons and to the early-21st-century advances that have made palaeodemography an important research area. Authors argue that, in spite of modeling issues, palaeodemography can make significant contributions to understanding social organization and diseases in antiquity.


In essence, the osteological paradox states that it is too simplistic to assume a direct relationship between the demographic data and pathologies bioarchaeologists find on skeletons and the actual health status of that population. Demographic nonstationarity, selective mortality, and heterogeneity in frailty significantly complicate our interpretation of health in archaeological populations.


In response to the osteological paradox, this article takes stock of a decade’s worth of advances in bioarchaeological research methods and highlights the recent incorporation of aDNA and population genetics in understanding the demographic structure of past populations.

**PALAEOPATHOLOGY**

Many diseases and traumatic events leave their mark on the human skeleton. The study of palaeopathology has a long history, but the origin of the field as we know it dates to the end of the 19th century with Marc Armand Ruffer’s work on mummies (see Cremations, Mummies, Bog Bodies). Of particular interest to the bioarchaeologist are infections, tumors, joint disease, metabolic issues, trauma, growth and developmental disorders, and dental disease. Studying the incidence and prevalence of these conditions within a population, between populations, through time, and among different subgroups of a population (e.g., women, children) can provide a world of information about diet, activity, and the quality of life in the past. The works cited in this section represent the current understanding of a variety of diseases that affected people in the past. For identification of pathological lesions on skeletal remains, the two best manuals are Auferheide and Rodríguez-Martin 1998 and Ortner 2003; they are well-illustrated and comprehensive guides to palaeopathology. Roberts and Manchester 2007 provides a good introduction for students of palaeopathology, while Waldron 2008 goes into depth on numerous topics, making that text useful for the specialist. Two edited volumes on palaeopathology, Grauer 2012 and Pinhasi and Mays 2008, provide case studies and examples of the application of palaeopathology helpful for teaching and analysis. For a timely look at the field, Buikstra and Roberts 2012 range from historical foundations of palaeopathology to the future of the discipline.

An exhaustive compendium of diseases found in skeletons and mummies. Each entry includes sections on pathology and palaeopathology, and many entries are illustrated. Useful for the specialist.


This comprehensive volume includes biographies of key figures in the field of palaeopathology, essays on the development and state of the field in countries around the world, information on organizations and professional meetings, and a look forward to the evolutionary trajectory of the study of pathology in past populations.


The essays in this volume are arranged into three main sections: the role of palaeopathology in the study of past populations, methods and techniques used in recording and interpreting pathological indicators on human remains, and syntheses of research into diseases such as leprosy and treponematoses. An indispensable volume for teaching.


The most comprehensive and well-illustrated palaeopathology text currently on the market, by one of the pioneers of the field. Separate sections cover each disease’s pathology (biological mechanism) and palaeopathology (evolution and distribution of the disease in antiquity). Not an introductory text, but indispensable for the professional osteologist.


Contributions to this volume advocate a multidisciplinary approach to the study of palaeopathology, with papers that detail analytical methods and those that cover diagnosis and interpretation. The goal of this book is to present ways to reconstruct health and disease in past populations.


With two introductory chapters and numerous archaeological examples throughout the text, this volume is a good introductory palaeopathology text. Most chapters take a disease ecology approach, explaining the cultural and geographical contexts in which diseases developed and spread in antiquity.


Geared more toward the specialist than the introductory student, this volume discusses at length the biological causes of diseases that affect the skeleton. Definitions for key pathologies (e.g., osteoarthritis) are presented, as well as information about differential diagnoses.

**BIOCHEMISTRY**

Advances in chemical analysis of biological materials have begun to generate results much more quickly and with much lower costs than ever before. As a result, many bioarchaeologists have used biochemical analysis in their attempts to learn more about a past population. Trace element analysis has been around longer than isotopic analysis and DNA analysis, at least in bioarchaeology, but it is generally limited to investigating questions of palaeodiet. Isotopes that are frequently analyzed in human skeletal material
include carbon and nitrogen as proxies for diet, and strontium and oxygen as proxies for homeland, thus allowing bioarchaeologists to reconstruct past diets and migration patterns. Ancient DNA (or aDNA) analysis, on the other hand, provides a much finer picture of individual lives and population genetics, but the utility of generating a vast amount of information from sections of DNA and from whole genomes is still being debated, as are the ethical concerns inherent in the practice (see Ethical and Legal Concerns). Still, ancient DNA of pathogens can be isolated from human and animal bones, and this field is beginning to produce fascinating information about the evolution of pathogens and the plagues they have caused. Two useful introductory texts on the utility of biochemistry for answering anthropological questions from skeletal remains include Brown and Brown 2011 and Price and Burton 2011. Trace element analysis is covered more specifically in Burton 2008 and Pollard and Heron 2008. Pollard and Heron 2008 also deals with stable isotope analysis, and more information on this topic can be found in Katzenberg 2008 and Schoeninger 2010. The basics of ancient DNA analysis are provided in Kaestle 2010 and Stone 2008. The books and articles cited in this section are only a small sample of the early-21st-century explosion in research on the archaeological applications of biochemistry but will provide the interested bioarchaeologist with the basic references on the subject. The latest research on the subject is most often found in publications such as PLOS ONE, Archaeometry, and the Journal of Archaeological Science (all cited under Journals), and this includes critiques of the methods of isotope and aDNA analysis.


An important guide to biochemical analysis in archaeology, this volume is split into sections on the units of analysis (e.g., DNA, stable isotopes), issues with preservation, and ways that biochemistry can be applied to bioarchaeological questions of kinship, diet, disease, and migration.


Trace element analysis is not as frequently used as stable isotope analysis in contemporary bioarchaeology, but it represents an important method for understanding diet in antiquity. This paper explains how trace element analysis works and lays out some of the problems with postmortem alteration of elements in bone.


An introduction to the role of DNA in bioarchaeology, this essay covers the methods of analysis as well as the applications, including production of a better understanding of migration, hunting behavior, diet, domestication of plants and animals, tracing the history of human and animal diseases, and reconstructing past environments.


A succinct introduction to stable isotope analysis, this paper focuses on explaining how the isotopes of carbon and nitrogen can be used to understand diet and weaning in past populations. Migration studies using oxygen isotopes are also briefly mentioned. Essential reading for anyone undertaking C/N isotope analysis.


Includes information on both trace elements and isotopes that can be measured from human bone and enamel. Explanations for the reconstruction of diet and mobility are useful and illustrated with examples, and a discussion is included on the issues associated with “provenancing” humans using Sr/O isotopes.

Blending anthropological inquiry and scientific analysis, this volume covers everything from the questions that archaeologists have to the methods by which those questions can be answered. Microscopy as well as elemental, isotopic, organic, and mineral analyses are covered, and the conclusion includes an important section on ethical considerations.


Succinct article that explains the utility of measuring C, N, H, O, and Sr isotopes to reconstruct such aspects of past lifestyles as diet, migration, and environment.


This chapter summarizes the advances in ancient DNA analysis, including mitochondrial, nuclear, and Y chromosome DNA. Methods are explained, and criteria for authenticity are highlighted. Case studies illustrate the use of aDNA for understanding social organization, migration, sex identification, diet, and disease from past populations.

### Major Research Questions

Since the origins of bioarchaeology as a research field, it has taken a biocultural perspective on understanding humans in the past: individuals and populations are seen as the interaction between biology and culture. As such, bioarchaeologists use their knowledge of the human body and their understanding of the particular culture in which that body existed to reconstruct past lifeways. Major research questions in contemporary bioarchaeology therefore include: diet and health, and the economies that influenced them; social structure of the population and its history of migration and interaction with other populations; violence and warfare both within a population and between populations; and differences in activities and behavior among various groups within a population, such as women or children, and between populations. Many of these research questions also involve a temporal component, as changes in both biology and culture occur through time. Foundational to the generation of major research questions in bioarchaeology are works that survey the kinds of information skeleton can provide, including İşcan and Kennedy 1989, Larsen 2002, Larsen 2006, and Larsen and Walker 2010. Included in the subsections below are books and articles that represent current questions of anthropological interest in the field of bioarchaeology.


One of the earlier volumes on bioarchaeology, this book includes chapters from pioneers in the field and covers methods of sex determination, nonmetric variation, pathologies, trauma, and skeletal indicators of behavior and activity. Although mostly methodological in scope, the focus of this volume is to highlight research questions in bioarchaeology.


Contemporary bioarchaeology is concerned with a number of research areas, including: diet, disease, physiological stress, violence, activity, population history, and palaeodemography. The author reviews recent methodological advances and the contribution bioarchaeology has made to these topics and also suggests the need for more cross-cultural comparisons to understand the human condition.

As bioarchaeology has become more integrated and contextualized, research questions have changed. Contemporary bioarchaeology is primarily concerned with issues of: quality of life in the past, behavior and lifestyle, and population history. Adoption of new scientific advances and theoretical perspectives makes bioarchaeology an innovative approach to understanding the past.


Bioarchaeology involves a biocultural approach, one that views humans as biological organisms whose lives and lifestyles are mediated by culture. As a result, major research questions in contemporary bioarchaeology involve health and lifestyles, as well as population history and interaction.

Diet, health, and economy

The questions of diet, health, and economy in the past are quite often inseparable, as highlighted in the works in this section that cover the biological effects of the transition to agriculture. In short, this change in economy several millennia ago resulted in major changes to the diet and an overall decrease in health. Bioarchaeologists writing in Cohen and Armelagos 1984 were among the first researchers to show that the adoption of agriculture was not without its drawbacks to society. Additional data on this all-important transition can be found in Larsen 1995 and Mummert, et al. 2011, along with the edited volumes Lambert 2000 and Pinhasi and Stock 2011. Observing changes in health among past populations, bioarchaeologists such as Roberts 2010 argue, can provide us with information useful for dealing with contemporary health issues, such as the reemergence of diseases, changes in ecology, and the influence of modern food production practices on diet. Additional information about past human health can be found in Palaeopathology.


Represents the beginnings of bioarchaeological research into how the transition to agriculture affected human health. In most societies, a decline in health with the adoption of agriculture was seen.


Focused on the geographical region of the US southeast, this collection of essays takes an interdisciplinary approach to understanding the biological and cultural effects of the economic transition to agriculture. Contributions cover changes in disease prevalence and violence while showing through archaeological evidence the variability of societies in the area.


The human body changed significantly with the spread of agriculture: prevalence of pathologies increased, growth patterns changed, activity levels decreased, and the face and teeth changed shape as a result of a softer diet. Agriculture therefore did not bring widespread improvements in quality of life.


A reevaluation of the conclusion that health declined with the adoption of agriculture. Using additional data available since the original publication of the idea in 1984, the authors confirmed a reduction in health and decline in stature worldwide following the transition to
agricultural production.


This edited volume is wide-ranging in geographical areas, with chapters covering the transition to agriculture in various parts of Europe, Africa, Asia, and the Americas. Importantly, it demonstrates that adoption of agriculture affected different populations in different ways. Investigating this heterogeneity is one of the current research themes of bioarchaeology.


An overview article on what bioarchaeology has contributed to our understanding of health and the prospects for the future of this research area. Notably, the author suggests that learning about ancient diseases and ecological issues can aid in dealing with contemporary issues such as climate change and reemerging diseases.

VIOLENCE AND WARFARE

Throughout human history, violence has played a part in social interactions (see also the OBO article on Violence). The old notion of our ancestors as pacifists has been dismantled in the late 20th and early 21st centuries by bioarchaeologists who have investigated healed and unhealed traumatic injuries within past populations. This research, however, is ongoing as bioarchaeologists have begun to investigate the variation in violence within populations, between populations, in different geographic areas, and through time. Martin and Frayer 1997 led the field with an interdisciplinary volume on violence in the past, while Walker 2001 and Parker Pearson and Thorpe 2005 deal more directly with skeletal correlates of traumatic injuries. A new synthetic treatment of the bioarchaeology of violence can be found in Martin, et al. 2012. The sociocultural contexts of violence therefore constitute a major research area in contemporary bioarchaeology, with scholars investigating such questions as domestic violence directed at women or children, the ritual components of violence, and the patterns of violent interactions that occur during warfare and raiding. Changes in the type and frequency of violent trauma on the skeleton, particularly in concert with historical records or archaeological findings, can therefore provide key information on changes in ecology and economy in the past.


By prefacing a slate of geographically diverse bioarchaeological articles with an ethnographic perspective on violence, this volume pushed the study of skeletal trauma out of simple description and contextualized it in light of gender, ritual, and warfare.


The contributions in this volume deal with warfare, ritualized violence, and small-scale conflict as evidenced by patterns of trauma seen in skeletal populations, as well as with the methods and theory used to interpret violence within an anthropological context.


Papers in this volume are focused on the physical evidence of violence left on the human skeleton. Sites and populations studied are largely from prehistoric Europe.

This cross-cultural review of violence as seen in the bioarchaeological record shows that interpersonal violence, particularly among men, has a long history in our species. The author dismantles the notion of our collective non-violent past with numerous examples and makes comparisons with contemporary acts of violence and their sociological explanations.

**SOCIAL STRUCTURE**

Understanding social structure in the past involves data drawn from both biology and archaeology, making bioarchaeologists the key scholars tackling this research question. Before the widespread availability of DNA analysis, bioarchaeologists used metric and nonmetric methods of assessing the demographic structure of a society (see Statistical Analysis and Population Genetics). The pioneering study of Lane and Sublett 1972, for example, employed nonmetric cranial traits to show that Seneca society was organized along male kinship lines, and Konigsberg 1988 confirmed the utility of this practice through mathematical modeling. Social structure within a society remains an important topic in bioarchaeology, and its study is in many ways similar to Palaeodemography. Techniques such as biodistance analysis can be applied at the intracemetery level to better understand social structure, as demonstrated in Stojanowski and Schilliaci 2006. Ancient DNA analysis is becoming a popular method as well, demonstrated through studies such as Bolnick and Smith 2007 and Haak, et al. 2008. The trend in contemporary analyses, as highlighted in Meyer, et al. 2012, is for a multidisciplinary perspective, using several lines of evidence to better understand the organizing principles behind ancient societies.


Analysis of mitochondrial DNA did not reveal strong links in maternal ancestry, suggesting that Hopewell society was not organized matrilinearily in that status was not inherited from the mother. Archaeological data, though, showed that the population was matrilocal. A good example of integrating biological and archaeological data to elucidate social structure.


The authors used several methods to tease information on social structure out of bioarchaeological data: DNA explicated the kinship relations among the individuals in four multiple burials in Germany, and strontium isotope analysis revealed a different origin for females versus males and children. The society may have been exogamous and patrilocal.


In this paper, application of the island model of drift and migration and the migration matrix method led the author to conclude that using nonmetric cranial traits to infer residence patterns from the bioarchaeological record is a valid practice. As such, this research provides support for studies of intra-site variation, which can reveal social structure in the past.


Using nonmetric cranial data, the authors investigated several historic Seneca populations for evidence of patrilocality or matrilocality. Unsurprisingly, they found that the society was organized along male kinship lines, which was further reinforced by ethnohistoric data.

Meyer, Christian, Robert Ganslmeier, Veit Dresely, and Kurt W. Alt. 2012. New approaches to the reconstruction of kinship and

By combining archaeological context regarding placement of graves with osteological analysis of the skeletons and ancient DNA analysis of genetic kinship, the authors effectively argue that an ethnographic understanding of social structure of past societies can be reconstructed through a multidisciplinary bioarchaeological approach.


Patterning of skeletal and dental traits within a cemetery or between groups within a cemetery can reveal kinship and residence patterns. This article ably summarizes the previous research and current methods used to assess biodistance at the intracemetry level; examples from bioarchaeological populations illustrate the utility of this approach.

**POPULATION HISTORY, INTERACTION, MIGRATION**

Biological anthropologists have long been interested in population interaction, from the origin of new species of hominids to the way that contemporary people move throughout the world. This question can be examined by bioarchaeologists using a number of methods. For example, analysis of metric and nonmetric data from populations can indicate changes in gene frequency attributable to population interaction. More recently, analyses of the isotopes of elements such as strontium and oxygen in the skeleton have been used to identify individuals who migrated during their lifetimes. DNA analysis is also growing in popularity as a method for assessing genetic differences at both the individual and population levels. The literature on methods is vast (see the references in the Biochemistry and Statistical Analysis and Population Genetics sections for a basic introduction), and the studies that employ these methods are even more numerous. Included here is a selection of studies aimed at understanding population history and interaction in a variety of places and eras. Blakey 2001 contextualizes the African diaspora, Hutchinson 2007 investigates European contact with Native Americans, Tung and Knudson 2011 look at migrants and captives in the Wari Empire in South America, and the contributions in Eckardt 2010 reconceive of migration in the Roman Empire as a form of diaspora. Although virtually all areas of the world boast bioarchaeological studies on population interaction, there appear to be no current synthetic treatments on the bioarchaeology of migration.


The African diaspora was a singular population movement event. This article attempts to contextualize the past study of African American skeletal remains, comments on the information that bioarchaeologists have discovered from these analyses, and suggests a more socially and historically informed approach to diaspora studies in the future.


Papers in this volume focus on the frequent movement of people that occurred in the Roman Empire. With historical, archaeological, and bioarchaeological approaches, the contributions represent a multidisciplinary understanding of diaspora in the ancient world. Notable themes include changes in health and the constant reconceptualizing of identity in this mutable culture.


Although European-introduced diseases undoubtedly affected the health of Native Americans around the time of contact, the author uses osteological, archaeological, and historical data to argue that political, social, and economic changes have to be examined alongside biological changes when attempting to make sense of the effects of population interaction.

The authors contrasted the strontium isotope values of individuals buried in a cemetery with those from trophy heads. The latter were found to be non-local, suggesting they were captives. Comparisons of strontium in teeth and bones revealed the foreigners were more mobile in their lifetimes than were the more sedentary locals.

**Lifestyles (Activity and Behavior)**

Repetitive activities leave a mark on the human skeleton, as overuse of joints can lead to osteoarthritis and an increase in muscle mass can be reflected in a change in bone cross-section. It has long been known that changes in behavior can lead to changes in biology, but bioarchaeologists are generally interested in how those activities and behavior are structured within a society. Patterns in activities as viewed through the skeleton can lead to suggestions about gendered division of labor, occupations, and subsistence strategies. The articles in this section are a guide to the literature on biomechanical analysis, robusticity studies, and musculoskeletal markers. Early research in Jurmain 1977 on osteoarthritis patterns within and between populations was followed by Kennedy (Kennedy 1989) on possible markers of occupational stress. Hawkey and Merbs 1995 further detail musculoskeletal markers within an Eskimo population, while Bridges 1995 reviews research on robusticity of skeletal elements. Pearson and Buikstra 2006 and Ruff 2008 take an holistic approach to understanding lifestyles from human remains, arguing for the use of multiple methods in reconstructing past behavior.

**Bridges, Patricia S. 1995. Skeletal biology and behavior in ancient humans. Evolutionary Anthropology 4.4: 112–120.**

A review of the research on skeletal robusticity and its link to activities and behavior.


Patterns in the musculoskeletal stress markers found in the upper bodies of Eskimos suggest males and females were engaging in different repetitive activities, and changes in the MSM patterning through time suggest a change in subsistence strategy.


The development of osteoarthritis is related to stress and overuse of joints, but comparative analysis across populations reveals that differences in lifestyle, as well as factors intrinsic to the individual such as age and sex, affect the frequency of degenerative changes.


This compilation of dozens of markers of occupational stress (which include musculoskeletal markers, trauma, and robusticity) assumes that repetitive behavior or activities will leave an impression on bone.


Attempting to find patterns of behavior in skeletal remains has a long history in physical anthropology, which this essay details. Contemporary approaches involve collecting data on cross-sectional geometry, osteoarthritis and trauma, and musculoskeletal markers to generate a holistic perspective on behavior and activity in past populations.

Repetitive behavior can be reflected in the skeleton, and this paper reviews the methods bioarchaeologists use to see changes and trends in the biomechanics of skeletons. These analyses can yield information about subsistence strategy, geographical location, and sexual dimorphism in past populations and can illustrate different lifestyles in individuals.

Contemporary Theoretical Perspectives

Since its inception, bioarchaeology as a field has been guided by social theory as a way to understand and generate hypotheses about the cultural dimension in which biological bodies are constructed. With post-processual and postmodern approaches to anthropology taking hold toward the end of the 20th century, bioarchaeology became more concerned with gender and other aspects of individual and collective identity. Bioarchaeologists’ engagement with theory became more explicit in the new millennium, however. The construction of identity in the past is still of paramount interest to bioarchaeologists (see Identity), but other theoretical perspectives that have taken on currency in recent years include Social Bioarchaeology, Life Course Analysis, and Osteobiography. Although these major theoretical perspectives are listed here separately, in practice they are often interlinked, so references cited under Social Bioarchaeology, Life Course Analysis, Osteobiography, and Identity may be seen to cross theoretical boundaries. Following is a selection of recent bioarchaeological studies that combine osteological analysis, archaeological information, and social theory.

SOCIAL BIOARCHAEOLOGY

Bioarchaeology has always had a cultural component, but social bioarchaeology makes the theoretical connection between biological and cultural anthropology more explicit. Most notably, this theoretical orientation came to prominence with Soffer 2006, which advocated thinking about bodies as products of culture rather than just biological organisms. Following Soffer’s lead, a number of treatments have appeared recently on how and why bioarchaeologists should inject social theory into osteological analysis, such as the contributions in the volumes Agarwal and Glencross 2012 and Gowland and Knüsel 2006. Bioarchaeologists looking reflexively at the state of the field, such as Knudson and Stojanowski 2008 and Zuckerman and Ameralagos 2011, go even further, arguing that social theory needs to play a more prominent role in asking and answering research questions. As bioarchaeologists begin to engage theoretical perspectives more frequently and start generating theory themselves, social bioarchaeology is likely to end up the norm for the field rather than simply the new theoretical bent.


As laid out in this introductory chapter to a larger edited volume, social bioarchaeology involves contextualization of human remains, as distinct from older, more descriptive analyses. Since humans are eminently social creatures, the authors look to bioarchaeological analysis to help reconstruct the social aspects (e.g., identity) of humans in the past.


The contributions in this British volume attempt to pair osteological analysis of the human body with archaeological data generated from burial context. This call for a truly integrated bioarchaeology is echoed by American bioarchaeologists as well (e.g., Agarwal and Glencross 2012).

Although bioarchaeology has seen significant advances in methodology, the authors argue that social theory needs to play a bigger role in interpretation so that we can learn more about social identities of people in the past.


One of the foundations of contemporary bioarchaeology for its novel approach, this volume launched a new appreciation for social theory in bioarchaeology by exploring the relationship between biologically based osteology and material-culture-based archaeology. It also sparked the theoretical perspectives of Life Course Analysis and Osteobiography.


The authors argue in this paper that bioculturally oriented bioarchaeology recognizes the effects that external structures such as technology, ideology, and social organization can have on the human body. Bioarchaeology is therefore a powerful way to answer questions about biological and cultural adaptation in the past.

**Life Course Analysis**

Drawn from sociological analyses of major life transitions, the perspective of life course analysis is easily applicable to a bioarchaeology interested in the evolution of individual lives. For example, Prowse 2011 looks at osteological and historical data to argue that the period of weaning in Roman Italy was both a biologically and a culturally important point in an individual’s life. Similarly, Agarwal 2012 and Glencross 2011 question the received understanding of age and sex as distinct or immutable categories and demonstrate changes that occur during the life course, particularly in reference to health and injury. The bioarchaeological study of children and childhood also draws from both life course analysis and identity (see Identity), wherein recent approaches have advocated the need for a better understanding of age and how age categories, both cultural and biological, influence the lives and lifestyles of past people. A focus on the bioarchaeology of children can be seen in the research of Perry 2005, Lewis 2006, Halcrow and Tayles 2011, and Sofaer 2011. As biochemical techniques advance (see Biochemistry), it is likely that more studies will use skeletal elements that form at different times in an individual’s life to investigate key time periods and transitions that held cultural or biological meaning within a society.


Biological categories of age and sex are insufficient for understanding complex identities and evolving life histories. A study of variability in bone loss in past populations shows that there is a need for a more gendered perspective on aging and a better understanding of what aging meant in past societies.


This contribution uses trauma to bone to discuss the bioarchaeological application of life course theory, namely by exploring the relationship among growth and development, age, fracture patterns, and behaviors in a case study of individuals from the Late Archaic site of Indian Knoll in Kentucky.


Recent bioarchaeological interest in juvenile skeletons has put childhood social theory at the forefront of many investigations. This paper discusses ways to combine that theory with skeletal identification methods and the analysis of mortuary rituals to arrive at a
better understanding of the lives and identities of children in the past.


The perception of children and childhood varies through time and across cultures, with different activities and emotions expected of them. This book reviews the research on the bioarchaeology of children, discusses topics such as biological versus cultural age, and includes a discussion of children in forensic cases.


Methodological and conceptual issues in the bioarchaeology of children loom large in this paper. The author argues that culturally appropriate age grades are often more useful than assessing biological age. For example, looking at trauma patterns may indicate when young individuals became involved in traditionally adult activities such as warfare.


By combining historical information with isotopic and dental pathology data from an Imperial-period skeletal series from Italy, the author shows a link between transition foods given during weaning and the early onset of dental disease. This life course stage (weaning) was therefore marked both socially and biologically in the population.


Concepts of age are different in humanistic and social fields compared to biological fields such as osteology. This paper challenges bioarchaeologists’ traditional idea of discrete age divisions with a view of aging as more culturally specific and socially contingent in order to better understand the differences among physiological, chronological, biological, and social ages.

**OSTEOBIOGRAPHY**

The technique of osteobiography (i.e., telling a story using data drawn from the skeleton) has been around for well over a decade, but only recently has it found its way into more mainstream bioarchaeology as a way of humanizing the past. These osteobiographies can be *vitae*, a sort of highlight reel of an individual’s life based on skeletal and biochemical data, combined with archaeology and historical evidence, as in Barrett and Blakey 2011 and the contributions in Stodder and Palkovich 2012. Or, as with Boutin’s 2012 article, the osteobiography can be a narrative, a short story centered around the time of death or a major life transition, carefully annotated with findings from osteological analysis. Peopling the past has become increasingly important in recent years owing to widespread interest in human skeletal remains and the modern techniques that bioarchaeologists and forensic anthropologists use to resurrect individual lives from them.


Osteological data from skeletons recovered from the African Burial Ground demonstrate how much information can be gained about individuals and groups of people (e.g., women, children, elderly) often not represented in historical records. The osteobiographies of individuals and groups paint a poignant picture of enslaved laborers in colonial New York.

Following extensive discussion of the archaeological site of Alalakh in Syria and the human remains found there, the author crafts fictional narrative reconstructions based on osteological analysis of the skeleton, with the goal of combining sociohistoric and biological evidence to create a richer interpretation of people’s lives in the past.


A series of osteobiographies is carefully constructed from a variety of data sources, such as osteological analysis, bone chemistry, DNA, grave goods, and historical records. These contributions situate individual lives within the last several thousand years of world history.

IDENTITY

It can be easy to assume that the lives of people in the past were not as complex as ours are in the early 21st century. The bioarchaeology of identity, which began early in the discipline’s history, runs counter to this assumption, showing that skeletal remains can provide interesting information about gender, ethnicity, and status, among other aspects of personhood. Major works and examples of how to use skeletal data to understand gender identity in the past include Grauer and Stuart-Macadam 1998, Hollimon 2011, and Knüsel 2012. Lozada 2012 complicates the typical understanding of ethnic identity as genetically linked, asking bioarchaeologists to use comparative ethnographic data to rethink interpretations, Buzon 2006 examines archaeological and biological correlates of identity in ancient Egypt, and Knudson and Stojanowski 2009 advocates a holistic approach to reconstructing identity in the past. Thinking about bodies and identity may also benefit from contemporary approaches in queer theory, which seeks to challenge heteronormative assumptions about sexuality, but few bioarchaeologists other than Geller 2009 have begun to interrogate this aspect of identity. This selection of references represents some of the most recent and most interesting research on the bioarchaeology of identity.


This case study from a well-documented ancient Nubian population confronts questions of identity and power at a time when the area was controlled by Egypt. Using cranial measurements and archaeological correlates of ethnicity, Buzon shows that identity was a complicated, negotiated cultural phenomenon.


Queer theory is a new and still rather tangential perspective in bioarchaeology. This article challenges bioarchaeologists to question their framework for understanding ancient bodies, including whether such binaries as male/female and heteronormative assumptions about sexuality are hindering the advancement of a theoretical bioarchaeology.


The ten papers in this volume range from infectious disease in archaeological samples to health in contemporary rural populations. All contributions take a biocultural perspective, incorporating contemporary social theory on sex and gender with the science of palaeopathology to better understand the interplay between health and identity.


This contribution is notable for its extensive bibliography on sex and gender in bioarchaeology, and it touches on other major research themes in the discipline.


Contributors to this volume employ a wide range of bioarchaeological techniques to unpack the idea of identity and to address factors that go into its creation, such as age, gender, and ethnicity. Although the focus is on the Americas, the approach taken is applicable to other parts of the world.


A thorough study of historical context, types of weaponry, and pathological indicators on bone (avulsion fractures of the medial humeral epicondyle) allows the author to reconstruct a version of masculine identity in late medieval England.


Ethnic identity and genetic relatedness are not one and the same, as highlighted by examples from the Andes in this paper. A key take-away is that similarities in genes do not necessarily map to mortuary behavior or ethnicity; cultural constructions of family and affinity are also important.

Ethical and Legal Concerns

Since bioarchaeology takes as its material the physical remains of deceased people, it comes as no surprise that there are ethical concerns with its analysis, particularly regarding the study of skeletons from populations with living descendants and from groups of people who were or are mistreated, disrespected, and marginalized, in the United States, for example, legal challenges to the study of skeletal remains are seen in the Native American Graves Protection and Repatriation Act (NAGPRA for short). Many other countries have laws that cover the proper treatment of human skeletal remains; Turner and Andrushko 2011 discusses ethical concerns in Peru, for example, and the comprehensive Márquez-Grant and Fibiger 2011 contains information about laws concerning human skeletons elsewhere in the world. Specific ethical considerations have been discussed in reference to the field of biological anthropology in general by the contributors to Turner 2005, and in reference to bioarchaeology specifically in Walker 2008. With the recent rise in ancient DNA analysis (see Biochemistry), however, further consideration of the ethics of genetic testing, genome analysis, and the responsibilities to descendant populations will be needed.


Each chapter in this handbook is devoted to the practice of physical anthropology in one modern country. Most coverage is devoted to Europe, followed by the Americas, with some contributions dealing with countries in Africa, Asia, and Oceania. A section in every chapter includes information about legislation surrounding human remains, specifically as regards the protocols for launching an archaeological excavation.

From primates to hominids to ancient societies to modern populations, the essays in this volume cover the ethics of biological anthropology writ large. Of particular interest for bioarchaeologists are the contributions on aDNA, ethnicity, and repatriation.


Through presentation of a case study in Peru, the authors explore ethical issues surrounding the practice of bioarchaeology in the Americas and relate experiences navigating their relationship with the Peruvian public and with indigenous populations. Notably, the authors call for respect, transparency, inclusion, and collaboration as ethical foundations for international bioarchaeology.


A concise history of research on and the sources of human remains serves as a backdrop for a discussion of the ethical responsibilities of bioarchaeologists around the world. Conflict does occur between skeletal biologists and descendants of people whose skeletons are being studied, and resolution necessitates cultural understanding and mutual respect.

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