BIOLOGICAL ANTHROPOLOGY OF THE HUMAN SKELETON. Edited by M. Anne Katzenberg and Shelley R. Saunders. New York, Toronto. Wiley-Liss, Inc., 2000. 504 pp. ISBN 0-471-31616-4. $80.75, cloth.

This exciting and comprehensive volume, detailing methods of bioanthropological research as applied to the human skeleton, brings together 21authors in 16 chapters. An initial impulse is to compare this work with the 1992 book edited by Saunders and Katzenberg, *Skeletal Biology of Past Peoples: Research Methods*, as many of the same authors appear in both volumes. However, to characterize this book as an updated version of the 1992 volume is to grossly misrepresent this work. On closer inspection, it is clear that the editors have adopted a mature approach to the biocultural study of the human skeleton. Many contributors are cautionary, but not pessimistic as they discuss in detail the limitations associated with bioarchaeological research, while other chapters portray practical applications for describing and analyzing biological data. The definitive theme of the book is to report advanced methods in skeletal and dental research, however a welcome addition is the introductory chapter on ethics in bioarchaeology.

The book is divided into five parts, with the first section consisting of two chapters devoted to theory and application in studies of past peoples. The remaining four sections emphasize current perspectives for specific areas of skeletal and dental anthropology such as morphological analyses, paleopathology, chemical analyses of bone (including aDNA research), aging techniques, and quantitative applications.

In the first chapter, P. Walker sharply focuses the reader's attention to bioethics and addresses the moral conflicts associated with bioarchaeological research. Walker presents the historical background for research on human remains highlighting the paradoxical position of bioarchaeology with its roots both in medicine and anthropology (p. 3). One strength of this chapter is that Walker provides a framework for discourse between bioarchaeologists and indigenous populations—a discourse that employs respect born from historical perspective and understanding. In the second chapter, D. Ubelaker examines forensic anthropology. Again, a historical background provides a basis for understanding that the "theoretical approach employed in forensic anthropology basically involves a broad anthropological population perspective applied to the individual" (p 49). Ublelaker reviews the methods employed in forensic anthropology and supports that the future of forensic research is bright.

Part two consists of five chapters concerning morphological analyses and age changes. C. Ruff presents an overview of biomechanical research as applied in the reconstruction of past human behavior. He discusses different methods for structural analysis of long bones and reviews the exciting results of biomechanical studies as applied to long term evolutionary trends, microevolutionary changes and variation within an individual's lifetime. Students looking for a detailed discussion on dental morphology recording strategies will be thrilled to read J. Mayhall's chapter. Mayhall provides extensive descriptions of morphological methods and notes the strengths and limits of each technique. He emphasizes that dental morphological studies should employ methods that are consistent, easily achievable, and comparable with other studies. S. Saunders takes a careful look at subadult growth studies as indicators of past population health and applies a practical perspective for addressing some of the problems associated with these studies. She explores issues such as the recovery of an unbiased sample of subadults, the limits of sexing subadults and the inherent difficulties associated with age estimation techniques. Although cautionary, Saunders stresses that the potential of data recovered from living individuals, forensic cases, historic cemeteries as well as aDNA techniques and histology may serve to clarify age estimation in subadult skeletons and provide population specific databases for testing growth study assumptions. C. FitzGerald and J.C. Rose discuss exciting methods for assessing subadult age using dental growth markers. The authors provide a generous review of dental anatomy, which allows the reader to understand how enamel is formed and thus how enamel microstructures can be used to determine subadult age. A major strength of this chapter is its practical focus, which includes discussions on preparation of tooth samples, microscopy as well as image analysis. A. Robling and S. Stout review the physiology and histomorphology of cortical bone and provide a synthesis of histomorphometric age estimation research. The authors include discussions of several factors that affect histological age estimates at both the physiological and methodological level. Again, the practical perspective must be applauded which includes worked examples of age estimation methods in the appendix.

Part three presents three chapters detailing current methods and research in prehistoric health and disease. N. Lovell examines several methods used in paleopathological research such as gross macroscopic observations, radiographic methods, computed tomography, magnetic resonance imaging, endoscopy, microscopic methods, and biochemical methods. She cautions that although paleopathology is the discipline that "aims to reconstruct the history and geography of disease" it is mostly restricted to lesions from trauma and chronic conditions (p. 217). She states that researchers must consider the larger role of disease as factors in biocultural evolution in order for paleopathology to have relevance outside our scientific community. S. Hillson reviews methods for evaluating dental pathology and provides extensive discussions on developmental defects of enamel, dental wear, dental calculus, caries

and periodontal disease. Hillson reminds the reader that the pathologies reflected in the human mouth are linked and their pattern of progression is complex and can sometimes interact in contrasting ways. Therefore it is important that the recording systems and analyses of dental pathology reflect accurate life processes. Hillson provides excellent advice for recording and evaluating dental data and presents a scoring system for caries and periodontal disease (pp. 273-280). The final chapter in this section reviews palaehistological methods as a technique in evaluating health and disease. S. Pfeiffer stresses that the size and organization of osteons, haversion canals, and other bone microstructures provide telltale clues in reconstructing past human life. Pfeiffer describes methods for obtaining, preparing and analyzing samples. She also presents research from different studies that employ palaehistological methods in evaluating bone structure variation, health and disease.

Part four, Chemical and Genetic analyses of Hard Tissues, includes three chapters that explore stable isotope, trace element, and ancient DNA analyses. M.A. Katzenberg provides a mature look at stable isotope analyses and how these studies are integrated with other biocultural questions and themes. She reviews methods for obtaining samples and presents research studies that employ stable isotope techniques to reconstruct diet, determine infant weaning strategies, identify pathological bone changes and identify residence and migration patterns. M. K. Sandford and D. S. Weaver present a frank discussion on elemental analyses in skeletal research, emphasizing the confounding affects of diagensis. The authors review bone chemistry, biogenic and diagenetic processes and conclude with a plea for "genuine interdisciplinary collaborations and more specialized, up-to date training of our students" (p. 344). A. C. Stone reviews the methods for recovering ancient DNA, drawing attention to how DNA is preserved and modified in the original environment and during subsequent extraction. Stone cautions that there are still challenges within the field, such as experimental design and contamination of samples, but also demonstrates the potential rewards for this area of research. Through numerous examples, Stone demonstrates how molecular archaeology can be used as supplemental verification for traditional anthropological questions or provide unique evidence such as in the identification of specific pathogens.

The final section of the book contains three chapters that emphasize quantitative methods and population studies. M. Pietrusewksy presents a non-technical discussion for using multivariate statistical methods in analyzing morphometric data. Starting with the assumptions used in biological distance studies, Pietrusewksy provides a step by step review of quantitative techniques and ultimately focuses on current computer statistical packages. Examples of Pietrusewksy's personal research in craniometric analyses provide excellent references for use in comparison studies. M. Jackes offers a thought-provoking discussion on adult age determination and portrays a clear depiction of the crises that bioarchaeology faces without accurate age estimates. Jackes exhaustively reviews all techniques used in evaluating age at death and provides a test of each technique. She maintains that skeletal indicator stages are stages of skeletal change and not direct indicators of chronological age. Jackes concludes that statistical techniques cannot take the place of accurate descriptive methods and that any analyses of adult age must employ seriation of adults by many different stage methods scaled by cemental anulations whenever possible. G. R. Milner, J. W. Wood and J. L. Boldsen revisit several questions that are fundamental to the field of paleodemography and at the center of skeletal research in general. The authors present a pragmatic approach to understanding problems of sampling, age and sex estimation, population non-stationarity, heterogeneous frailty and selective mortality. They promote the use of parametric mortality models, maximum likelihood estimation, and other statistical modeling methods as strategies to provide a more reliable estimate of life and death in past populations.

Bioarchaeology is a highly specialized discipline and students must be well versed in the methods of chemistry and statistics as well as in the discourse of bioethics. This book addresses these concerns by providing in unambiguous detail advanced methods for the analysis of bones and teeth. Although many of the methods highlighted in this volume employ destructive techniques, it is evident that students new to graduate research as well as international scholars and senior researchers will find this book a useful tool. Indeed, every chapter contains an extensive bibliography as well as practical, reality-based approaches to skeletal research. Each author has provided well-written and insightful contributions, with only a handful of errors mainly contained to captions, missing references and a few proofing errors within the text. It is clear that this book will be a mainstay for bioanthropology graduate reading lists and will acquire a welcomed spot on many bioarch-laboratory bookshelves.

TERI TUCKER
Department of Anthropology
The Ohio State University
Columbus, OH 43210