



## Anthropological Perspectives on Tooth Morphology: Genetics, Evolution, Variation

G. Richard Scott and Joel D. Irish, eds. 2013. Cambridge University Press, Cambridge. 612 pp., 107 black and white illustrations, 8 color illustrations, 47 tables. \$120.00 (cloth), \$96.00 (ebook). ISBN: 978-1-10701-145-8.

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The study of teeth is a diverse topic that has inspired a continuous flow of books in the last few decades. *Anthropological Perspectives on Tooth Morphology* is the latest compilation describing the state of research on the evolution of hominin and human dental morphology. This edited volume stems from a symposium organized by the editors in honor of Regents' Professor Christy G. Turner II, held at the 2010 annual meeting of the American Association of Physical Anthropologists in Albuquerque, New Mexico. The standardization of dental nonmetric traits outlined in the Arizona State University Dental Anthropology System (ASUDAS) has been an important foundation for developing studies on dental morphology. The book is highly scholarly, and is an advanced treatment of dental morphology. All of the authors are dental anthropologists or specialists in related fields, most with many years of experience.

The publication is composed of 21 chapters. The editors divide the contributions into three general sections: a genetic and evolutionary perspective (Part I); fossil hominins and dental morphology (Part II) and a global perspective on recent human dental variation (Part III). Some chapters focus on emerging techniques used in evaluating dental morphology including geometric morphometrics (GMM) and microfocal X-ray computed tomography. The volume editors, G. Richard Scott and Joel D. Irish, set the stage in their introduction through critical analysis of the history of dental morphology and the role that Professor Turner played in advancing this field. Those looking for previous volumes on variation in modern human dental morphology with more detail may wish to look at Scott and Turner (1997 and 1988). The second chapter is a detailed autobiograph-

ical chapter written by the late Professor Turner about his education and training along with the development of the Arizona State Dental Anthropology System (ASUDAS).

The first section is composed of papers on genetics and evolution. In the last 20 years, our knowledge of the relationship between genetics and dental morphology has grown exponentially. This section is a welcome new addition, as these authors take on the important issues of developmental genetics, dental ontogeny, and chromosomal nondisjunction. The chapter by Guatelli-Steinberg is particularly noteworthy on understanding phenotypic correlations associated with the Carabelli's trait. The third chapter explores the relationship between sex chromosome genes and tooth formation. The contribution by Mizoguchi reports on the correspondence between environmental factors and the expression of morphological traits in the ASUDAS system. To conclude this section, Rizk and his colleagues provide a detailed introduction to studies that use geometric morphometric approaches to human tooth morphology highlighting connections between tooth shape and various environmental and developmental factors.

In the second section, various authors focus on paleoanthropological research. In past volumes, fossil hominin dental morphology was of secondary importance and these chapters show how far the field has advanced in the past 60 years. The first chapter by Schror and Wood represents a novel approach to reconstruct the dental morphology in the last common ancestor of humans and apes. They explore the tooth crown morphology of modern humans as well



as extinct and fossil members of extant apes. Martin-Torres and her colleagues further investigate the large sample of Middle Pleistocene hominin teeth from the site of Sima de los Huesos (SH) in northern Spain. They focus upon finding intrapopulation variability within the earliest example of a hominin population with Neanderthal features. In the next chapter, Bailey and Hublin address the issue of dental modernity by exploring what nonmetric dental traits set *Homo sapiens* apart from earlier species of *Homo*. They argue that it is impossible to list a set of traits that define the “modern” human dentition, as there is such a high degree of dental variation in modern *H. sapiens* populations. The final chapter in this section explores the potential of microfocal X-ray computed tomography which allows researchers to explore not just the external crown and root surfaces, but also the inside of a tooth.

The third section of the book includes a large number of in-depth, specific bioarchaeological studies and presents a global view of variation in recent modern human populations. Major geographic locations are covered including Africa, Europe, East and Southeast Asia, and the New World. In the course of the next ten chapters topics including peopling of remote islands, population interaction, and migration are discussed. The contributors successfully integrate broader large scale and regional questions of population origins with major evolutionary questions in dental anthropology. The first chapter by Irish further expands upon Afridonty in Sub-Saharan Africa, and Scott explores unique features of the Basque dentition. Hanihara presents a novel approach to support the out of Africa model, by utilizing an R-matrix based approach to correlate within group variability with geographic distance. The chapter by Stojanowski synthesizes the long history behind studying Native American dental morphology and tooth size. Some chapters in this section expand upon previous studies, such as Lee and Zhang’s

chapter that represents a concise and clearly formulated update of nonmetric dental traits of previous populations present in China and Mongolia. In closing, Edgar and Ousley’s evaluation of forensic applications highlight the ability of tooth morphology to help identify unknown persons, and Burnett and his colleagues illustrate the important potential pitfalls of tooth morphology studies that are related to tooth wear.

Criticisms of this volume are few. Given the relatively high price of the book, some problems with the finished product should be noted. If I have any reservations about this collection of papers, it is that some of the writing is dense and jargon-heavy in some of the chapters, occasionally making lines of argument difficult to follow. Despite these problems, the publication has enough interesting content to merit a qualified recommendation.

Overall, the text is a welcome addition to the literature on dental anthropology. The volume is generally edited to a very high standard, and has a high quality of illustrations distributed throughout the book. It will be of interest to scholars across diverse disciplines, including archaeologists, paleoanthropologists, biologists, and geneticists. Ethnobiologists concerned with the role of environmental interactions in the history of human evolution will particularly find this book useful. As an interdisciplinary overview of the state of current knowledge and method in the study of tooth morphology, this book is highly recommended.

#### References Cited

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