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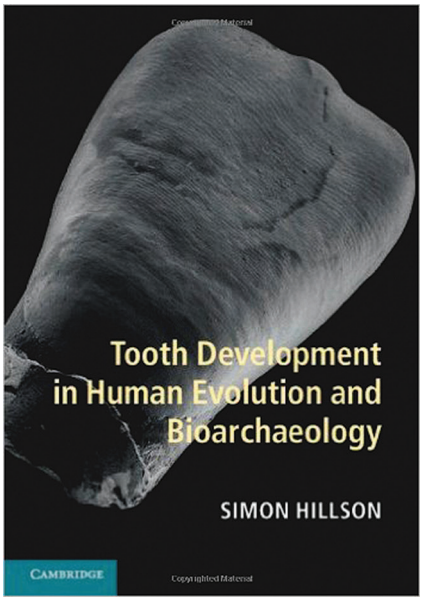
Book reviews

Tooth Development in Human Evolution and Bioarchaeology.
Simon Hillson
Cambridge University Press, New York. 2014. 307 pp. ISBN-13: 978-1107011335. $52.0–$75.0 (hardcover)



Simon Hillson's publication "Tooth Development in Human Evolution and Bioarchaeology" offers a comprehensive review of our current knowledge regarding human growth and development – based particularly on the entire possible information one can get from the hard tissues of teeth. There are two main topics focused on in this book: the uniquely slow human growth and its evolution, and the capacity of enamel and dentin to record the biological and cultural transitions in past human populations. To reveal the plot right from the start – it's not a simple task to answer questions about these issues and neither is it on the basis of tooth histology.

The text is divided into nine chapters and two appendices, replete with useful tables mostly concerning the ages of tooth development in apes and humans, and methods of working with dental material in microscopy and especially the tooth surface and tooth section. In the first few chapters we find information on the growth and development of humans and other primates in general, and on the growth and development of teeth in particular. Chapters 4 and 5, the core of the book according to the author, describe the structures of tooth's hard tissues, techniques of their microscopy, and methods of building a developmental chronology of teeth. The second half of the book mainly presents different types of studies focused on human growth and development in the fossil and archaeological record.

One of the most typical human characteristics is its uniquely slow growth. This is partly due to the overall trend we see in mammals, and especially in great apes: the strong relationship between body size and growth rate (*i.e.* bigger body = slower growth). However, in humans this trend is even more accentuated; thus, with regard to growth and development, humans are outliers compared to other primates. Development in human dentition is also unique – the order in which teeth develop and the enormous time it takes (the human eruption sequence is twice that of other great apes).

A tooth is an important medium for recording information on the quality of an individual's growth and development thanks to two essential features: firstly, its chemical composition makes a tooth highly durable and able to resist both the conditions within the human mouth during life as well as the taphonomical processes after an individual's death; secondly, there being no remodelation of hard tissue once it is made there exists a detailed record of a tooth's development. Providing conditions are good we can recover all this information many years after the death of an individual, and even when the remains are fossilized.

The dental tissues which are of special importance for growth and development research are the enamel and dentin. Both these hard tissues consist of incremental microstructures, which are regularly formed in short (circadian) and long periods (approximately weekly) and thus reflect the pace of growth and course of development. These structures are visible in tooth sections, the long-period increments of enamel being also visible on the crown surface in the form of perikymata. This forms the basis for building up developmental chronologies of teeth: through the estimation of tooth growth rate and timing of different developmental stages.

However, as mentioned above, the use of tooth developmental chronology in paleoanthropology or bioarchaeology is not straightforward. To answer questions on the evolution of human life history, we need to be cautious when using data obtained from fossil assemblages or primate populations that will never be as numerous or reliable as data from modern human populations. Despite this, it seems that answers to such questions are supposed to be found in the fossil record of the Middle and Upper Palaeolithic period. To answer questions on the effects of biological or cultural transitions in the health of past human populations, through the microscopic record of hard dental tissues (particularly enamel), we must make a definite connection between a certain enamel defect and a certain developmental disruption. While we know generally that connections between certain enamel defects and developmental disruption do exist, to connect particular causes in archaeological samples is very difficult, without even talking about the tricky recording of defects. This may explain the unclear results of some of the case studies presented in Chapter 8.

The histology of human teeth and the schedule of tooth development and growth have long been known – since the knowledge explosion of the nineteenth century. The basics of dental anatomy and histology, for example, are connected with the work of R. Owen, A. A. Retzius or J. Tomes, and we meet their names in the terms for the tooth's microstructures. During the twentieth and start of the twenty-first century, there have been many studies dealing with dental histology and tooth development and growth from various points of view. What is refreshing in Simon Hillson's publication

is the complexity with which he presents the possible ways of studying human variability through tooth histology. Hence, together with its practical instructions for the laboratory treatment of teeth and their hard tissues, it can be used as a manual for furthering research into human growth and development as recorded in their dentition.

References

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