

Early Hominin Paleoecology

Matt Sponheimer, Julia A. Lee-Thorp, Kaye E. Reed, and Peter S. Ungar
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PALEOECOLOGICAL METHODS IN PALEOANTHROPOLOGY

Paleoanthropology is a scientific discipline that receives a substantial amount of media attention, especially when new hominin species are discovered. Scientists as well as the public in general are interested in human evolution. While paleoanthropological research is scientific, there are aspects of the discipline that are emotionally charged. The stakes seem high and tempers run short because we are writing the story of ourselves, not just any old mammal. Debates about which species belong to the hominin lineage and which do not will always be passionate.

Recent fossil hominin discoveries illustrate this point (Brunet et al. 2002; Berger et al. 2010; Haile-Selassie et al. 2010; Rightmire et al. 2006; Senut et al. 2001; Ward et al. 1999; White et al. 1994). Debates continue to rage because unusual morphological characters present in these hominins leave workers with many questions. Why does a bipedal *Ardipithecus ramidus* also have a divergent big toe? Why are *Paranthropus* molars so large and why did they need such strong chewing muscles? These questions, among many others, are complex, and workers today are only just beginning to answer these questions. One of the ways to continue shedding light on these topics is to better understand the selective pressures under which these species evolved. Since no species can live outside of ecological pressures, discovering factors that were influencing early hominin evolution can illuminate what caused the human lineage to evolve, as well as why certain morphological characters are seen at certain times in the fossil record.

There now is a growing consensus in paleoanthropology that paleoecological studies are integral to understanding hominin evolution (Dirks et al. 2010, Henry et al. 2012, Schoeninger et al. 2003, Sponheimer et al. 2005, Strait et al. 2009, van der Merwe et al. 2003, White et al. 2010, WoldeGabriel et al. 2010). Thus, *Early Hominin Paleoecology*, edited by Matt Sponheimer, Julia Lee-Thorp, Kaye Reed, and Peter Ungar, is a timely volume. It provides critical details about the current state of the field of paleoecology, particularly how paleoecological methods can be applied to paleoanthropology, and how those methods can help workers understand additional details about early hominin evolution. It is a high-quality book, great for advanced students and professionals interested in current methods in paleoecology.

This volume has three sections: paleoclimate and paleoenvironment, hominin adaptations and behavior, and

analogues and models. The paleoclimate and paleoenvironment section focuses on paleoecological methods that utilize faunal assemblages, facies analyses, stable isotope analyses, and global climate indicators. One contribution by Kaye Reed, Lillian Spencer, and Amy Rector evaluates a range of methods that can be used to analyze faunal assemblages from paleontological or archaeological sites. They examine the differences between taxonomic and taxon-free methods and highlight the biases inherent in these methods.

The hominin adaptation and behavior section focuses on hominin dietary adaptations. Articles in this section examine methods ranging from isotope and trace element analyses, microwear analyses, and functional morphology. Specifically, one article from Mark Teaford, Peter Ungar, and Frederick Grine evaluates the fundamental principles of dental microwear analyses and explains how those principles can be applied to paleontological and archaeological samples. The authors also explain the importance of comparing dental microwear patterns of living animals, both in the lab and in the wild, to what is seen in ancient assemblages. Additionally, David Braun discusses some methods that archaeologists use to infer hominin behaviors from the archaeological record. He details the importance of examining artifacts and bones found at archaeological sites and the methods workers can use to infer details about early hominin behavior.

Lastly, the analogues and models section focuses on the use and misuse of models in current paleoanthropological research. For example, John Mitani focuses on wild chimpanzee behavior models and how those models can be incorrectly applied. He also highlights how some workers who use wild chimpanzee behavior as a model for early hominin behavior use incorrect or outdated data. Additionally, Jeanne Sept focuses on methods used for paleobotanical reconstructions, where she explains that the structure of many plants has remained stable over the last few million years and that this allows workers to use plant remains as a model for building an environmental reconstruction.

All of the contributors to *Early Hominin Paleoecology* focus on how to correctly use the method they highlight, the biases or assumptions inherent in that method, the ways that methods have been used incorrectly, as well as suggesting directions for future research. For this reason, this is an invaluable volume for any person interested in conducting research within the field of paleoecology, whether they are a student or professional. The editors of this volume write

in the introduction that paleoecology is a dynamic and increasingly specialized field. Because of this increasing specialization, it is impossible for a single researcher to be an expert in all of these methods. Thus, volumes such as this are essential for those conducting research, as well as anyone who wishes to have a coherent understanding of the state of the discipline at large. The editors of this volume have shown how critical it is for workers to communicate with one another in a way that others outside of their specialization can understand. They also show that it is possible for highly specialized scientists to work together to highlight important details about hominin evolution.

Paleoecology has become an integral aspect of paleoanthropological research. As more hominins are added to the growing fossil record, the number of studies conducting paleoecological research will only increase. Thus, as new hominin species are discovered and new data is published, debates about hominin evolutionary history will continue. These new discoveries will be published in many different media outlets, not just scientific journals. Publications in the mainstream media make the debates about hominin evolutionary history accessible to not just scientists, but to the general public as well. It is important that human evolution is shared with the general public, not just with scientists within increasingly specialized disciplines, because human evolution is the story of all people. Because new hominin discoveries cause such intense debates in the field, it is incredibly important that workers today strive to discern more details about the paleoecological pressures that influenced the human lineage. It is only by discovering these paleoecological pressures that unusual morphological characters will begin to make more sense. It is for that reason that this volume, *Early Hominin Paleoecology*, is an extremely useful and timely volume for advanced students and professionals interested in learning more about hominin paleobiology and frequently used paleoecological methods.

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