

# PREFACE

Establishing meaningful links across biological and cultural lines of evidence constitutes the core objective of research on human evolution, as this process enables the understanding of the complex environmental factors driving hominin behavioral adaptations. Given the multifaceted nature of human behavior, deciphering the course of its evolution is impossible without interdisciplinary research relying upon the integration of different – yet complementary – scientific fields, including archaeology, biological anthropology, primatology, linguistics, and paleogenetics. However, due to the natural complexity of synthesizing evidence from such diverse methodological frameworks, multidisciplinary approaches to reconstructing human behavior in past humans are still scarce.

One of the fundamental objectives of our DFG Center for Advanced Studies “Words, Bones, Genes, Tools: Tracking linguistic, cultural and biological trajectories of the human past” is to establish a proper collaborative framework for such multidisciplinary research. This edited volume, entitled “*Biocultural Evolution: An Agenda for Integrative Approaches*,” collects the proceedings of the Center’s sixth annual symposium, which took place in Tübingen on December 3<sup>rd</sup>-4<sup>th</sup>, 2021 (in a hybrid format). In total, more than 30 international scholars participated in this hybrid event (either online or in-person), representing a diverse spectrum of scientific fields. This volume is composed of nine chapters corresponding to most of the research presented at the symposium, including both original research papers as well as critical methodological reviews. These contributions are grouped into three thematic units, focusing on the methodological foundations for reconstructing habitual physical activity in the past (Chapters 1–3), the potential cognitive underpinnings of stone tool use in extant humans and nonhuman primates (Chapters 4–6), and key aspects of human linguistic evolution (Chapters 7–9).

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The volume begins with an introductory perspective piece by Co-Editor Fotios Alexandros Karakostis, asking whether “...*humans only do what they are good at?*” (Karakostis, this volume). This chapter highlights the conceptual difference between evolved functional adaptations and reflections of daily behavior in the fossil hominin record (associated with phenotypic plasticity), arguing that this distinction is often unclear in the hypotheses and interpretations of anthropological studies (for example, those on early stone tool use and Neanderthal manual behavior). On this basis, Karakostis recommends future studies on hominin physical activity to attempt to differentiate among the concepts of “basic functional capacity,” “evolved efficiency,” and actual “habitual behavior,” highlighting that the latter largely depends on environmental and cultural conditions. The author concludes with methodological suggestions for addressing each of these three behavioral components separately.

In Chapter 2, leading anthropologist Jane E. Buikstra provides a diligent critical review of the methods currently used to reconstruct habitual activity based on the morphology of human skeletal remains (Buikstra, this volume), relying on the example of a renowned bioarchaeological context (i.e., the Phaleron cemetery of Archaic Athens). After reviewing a wide range of activity markers, including both pathological and healthy bone modifications, the author concludes by highlighting the great potential of specific approaches, which involve the use of three-dimensional muscle attachment sites (entheses) and long bone cross-sectional geometry. Furthermore, the author underlines the necessity and importance of further advancements in the existing methodologies.

Chapter 3 (Wallace et al., this volume) represents an original experimental study on laboratory animals (guinea pigs) aiming to elucidate the causing factors of osteoarthritis, which is one of the most widely utilized skeletal activity markers in anthropological sciences. Their results suggest that increased physical activity can inhibit the appearance of knee osteoarthritis, thus questioning the traditional “wear and tear” assumption that the presence of this degenerative joint disease in a skeleton may directly reflect overall strenuous physical activities. Based on these findings and those of other studies by the same authors, Wallace and colleagues recommend caution when using knee osteoarthritis as an indicator of overall physical activity levels.

Chapter 4 (Bril, this volume) opens the second thematic unit with a diligent synthesis of her previous human stone-knapping experiments focusing on percussive actions. Through her extensive review, Bril posits that a deeper understanding of stone-knapping can be achieved by relying on a “bottom-up” functional framework that properly distinguishes between the concepts of “technique” (i.e., the physical modalities of action) and “method” (i.e., the sequence of actions required to reach a goal). The author concludes that, in contrast to common assumptions, the techniques required for flake production are complex and their mastery requires extensive practice.



In Chapter 5 (Motes-Rodrigo and Tennie, this volume), the authors rely on original experimental data involving extant primate species (chimpanzees and gorillas) to revisit the proposed role of social learning in producing and using stone tools at the early stages of hominin evolution. Their results showed that nonhuman primates are unable to socially learn how to knap from human demonstrations, contradicting the findings of previous experimental works. The authors suggest that this discrepancy between studies may likely be due to the important fact that, in contrast to previous research, their experiments involved unenculturated and untrained individuals.

The second thematic unit closes with Chapter 6 (Kalan, this volume), which focuses on the crucial and highly controversial topic of laterality and the evolution of handedness. The author reviews previous experimental studies on handedness in nonhuman primates, discussing the theories that link the evolution of laterality with that of stone tool use and language. Subsequently, Kalan proposes an innovative multimodal approach for investigating handedness that considers the role of sounds and auditory information in stone tool-using behaviors.

Chapter 7 (Dediu et al., this volume) opens the third thematic unit of this volume, which addresses key research questions surrounding linguistic evolution. Dediu and colleagues address the patterning and evolution of dental fricatives, which represent a cross-linguistically rare group of consonants that tends to be present in some of the most widely spoken languages today. Relying on an innovative approach integrating linguistic and three-dimensional anatomical data, the authors propose that the

**Fig. 1.** Some of the symposium attendants in front of the Neue Aula building of the University of Tübingen. The event took place in a hybrid format due to the restrictions of the COVID-19 pandemic.

diachronic scarcity and geographic patterning of dental fricatives may be affected by patterns of anatomical variation in the anterior oral vocal tract.

Chapter 8 (Cathcart, this volume) provides a diligent review of various applications of rate variation models in the field of diachronic linguistics that aim to assess linguistic change. This synthesis also includes the discussion of biological models that are often overlooked in linguistic literature. Relying on detailed observations, the author proposes a new analytical framework for investigating linguistic change, defined as “Distributional Phylogenetic Modeling,” reporting the results of original research that is currently in progress.

Finally, in the concluding Chapter 9 (Enfield and Sidnell, this volume), the authors focus on a fundamental property of language, which is its reflexivity (i.e., its ability to refer to itself). In this perspective piece, the authors provide a definition for reflexivity in language and discuss its evolutionary implications for modern humans, including its role in key aspects of human social behavior and organization. Additionally, in the context of the known hypothesis that metalanguage might be a prerequisite for language, the authors suggest the potential evolutionary importance of employing repair practices (e.g., the use of the word “*Huh?*”).

We are deeply grateful to all participants of the symposium and contributors to this volume, whose excellent presentations and chapters led to the development of this remarkable collection. We are also extremely thankful to the entire organizing committee of the symposium, composed of Fotios Alexandros Karakostis, Miri Mertner, Marisa Köllner, Monika Doll, Gerhard Jäger, and Katerina Harvati. Importantly, we are extremely thankful to both the principal investigators of the DFG Centre for Advanced Studies “Words, Bones, Genes, Tools: Tracking linguistic, cultural and biological trajectories of the human past”, Katerina Harvati and Gerhard Jäger, for providing the framework and means required to organize the symposium and this edited volume. Special thanks are also due to Kerns Verlag, as well as all the colleagues that kindly agreed to review the chapters published in this volume, for all their meticulous and valuable work during this book’s development. We would also like to thank all student assistants, volunteers, and members of the DFG Centre that helped us with organizing the symposium and volume, including Lourdes Gabriela Tamayo Cáceres, Kim Apholz, Simona Affinito, Brie Eteson, Elena Moos, Julia Zastrow, and Alessio Maiello. The funding required for the conference and the volume was provided by the German Research Foundation (Deutsche Forschungsgemeinschaft), in the framework of the DFG-Kollegforschergruppe Center for Advanced Studies “Words, Bones, Genes, Tools” (DFG FOR 2237). Finally, we are deeply thankful to our families and colleagues for their care, patience, and support.

*Fotios Alexandros Karakostis, Gerhard Jäger*  
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