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THEMATIC SECTION INTRODUCTION

Archaeology and Cognitive Evolution: Introduction to the Thematic Section

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In 1954 Christopher Hawkes proposed his influential "Ladder of Inference" model for archaeological interpretation (Hawkes 1954). Hawkes was concerned with the limitations of "where and when" archaeology; that is, archaeology that was overly focused on geography and chronology. The problem with where and when archaeology was that, in limiting itself "to a mere external chronicling of material culture traits, it will be stopping short of its proper anthropological objective, and will simply be compiling statistics when it should be revealing culture" (Hawkes 1954, p. 156). A properly anthropological archaeology, on the other hand, would acknowledge that "the statistical assembling of many archaeological data still can leave one outside the cultural reality of the life of the peoples one is studying" (1954, p. 160). In other words, the point of archaeology is to "get inside" the cultural lives of past populations, and simply documenting the age and location of artifacts only gets us so far toward that goal.

So how do we meet this challenge? Well, this is when things get particularly tough. Hawkes's ladder is a four-part ordering of inferences from material remains to the behaviors that produced them: at the lowest level are inferences from artifacts to the techniques used to produce them; at the second level are inferences to subsistence economics; at the third level are inferences to social/political institutions; and at the final level are inferences to religious/spiritual life. There are two important points to this ordering. First, as we go up the ladder the inferences become progressively more challenging. Second, as we go up the ladder we get closer to the goal of "getting inside" the cultures of past peoples. Achieving the goal of a properly anthropological archaeology thus looks particularly challenging when presented with an assemblage of artifacts at the bottom of the ladder.

A lot has been written about Hawkes's ladder (see Evans 1998 for an overview), and a lot has changed since 1954. Archaeology has rushed to address the challenge raised by Hawkes, and indeed has in many ways raised—and met—the stakes of that challenge. This is epitomized by the field of evolutionary cognitive archaeology. Here archaeologists aim beyond the top rung of Hawkes's ladder, and make inferences to the *cognitive capacities* underlying the behaviors that produce the archaeological record. Evolutionary cognitive archaeologists are not just trying to get inside the culture of past peoples; they are trying to get inside their minds.

But how can we achieve this ambitious goal? How can we make an inference from, say, a stone tool that has been lying in the ground for 2 million years to the cognitive capacities of an extinct species of hominin? Overcoming this challenge requires synthesizing work from a daunting array of disciplines. Cognitive archaeologists routinely draw on theories and methods from psychology, neuroscience, linguistics, evolutionary biology, anthropology, and philosophy, as well as archaeology, in producing inferences to the past. It is a deeply interdisciplinary endeavor, which as a result has always paid close attention to methodology. It is also a discipline that is undergoing an exciting expansion. From Tom Wynn's pioneering early work (Wynn 1979, 1981) the field

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has grown to include a huge range of approaches—from neuroimaging to phenomenology—and address a diverse array of cognitive phenomena—from numerical cognition to intentionality.[1]

This thematic section, "Archaeology and Cognitive Evolution," provides a glimpse into current evolutionary cognitive archaeology. It encompasses both first-order work focused on building inferences to the past[2,3] and more methodological work assessing how we can overcome the inferential challenges facing the discipline[4,5].

In their contribution, Lombard and Gärdenfors address what the archaeological record can tell us about the evolution of causal cognition. They argue that causal cognition and theory of mind capacities are more intimately connected than has previously been thought. In particular, as causal cognitive capacities become increasingly complex, they become increasingly dependent on theory of mind capacities. They build this into previous work outlining seven grades of causal cognition (Lombard and Gärdenfor 2017; Gärdenfors and Lombard 2018, 2020). In their view, our capacities for technology and sociality are deeply connected.

Shipton's contribution looks at the phenomenon of lithic miniaturization. During the Later Stone Age, hominins systematically used the finest-grained rocks to produce very small stone flakes. Shipton argues this archaeological pattern signals the presence of the cognitive capacity for abstraction; that is, having ideas about ideas. As with Lombard and Gärdenfors, Shipton sees an important evolutionary connection between human capacities for sociality and human capacities for technology. In particular, abstraction may have advanced both domains in ways that gave us competitive advantages over other hominins. Shipton's article illustrates the diversity of disciplines and methodologies exploited by cognitive archaeologists, building his case using lithic analysis, ethnography, and psychological models.

While interdisciplinary integration is an essential feature of evolutionary cognitive archaeology, it nonetheless presents challenges. In their contribution, Killin and Pain address one such challenge. Cognitive archaeology faces the problem of *minimum necessary competence*: the most sophisticated thinking of ancient hominins may have been in domains that leave no archaeological signature; consequently we must assume that tool production and use reflects only the lower boundary of cognitive ability. However, Killin and Pain argue that different models from the cognitive sciences will produce different minimum necessary competency results. Given this, which cognitive models should we select, and why? They point to two heuristics in overcoming this problem: appealing to multiple lines of independent evidence and theoretical diversity.

Cultural phylogenies are an important, if controversial, recent addition to the cognitive archaeologist's methodological toolkit. In her contribution, Bromham examines this new tool, assessing how we should interpret cultural phylogenies and what we should use them for. In terms of interpretation, Bromham argues for a detailed account of a phylogeny's connection to actual historical trajectories. Phylogenies are at best abstract representations of history, with the degree of abstraction highly dependent on the data and assumptions built into the model. In terms of how we use phylogenies, Bromham argues that the abstract nature of these models does not undermine their utility. Instead, cultural phylogenies allow us to test theories of human diversification and correct potential errors of inference.

Evolutionary cognitive archaeology is an exciting area of research, and the articles in this thematic section illustrate some of the important new directions the field is moving in. Archaeology has made substantial steps toward ascending—and extending—Hawkes's ladder. The future looks bright.

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[1] This diversity is nicely captured in the recently published *Oxford Handbook of Cognitive Archaeology* (Wynn et al. 2022).

[2] This issue: Lombard M, Gärdenfors P (2021) Causal cognition and theory of mind in evolutionary cognitive archaeology. Biol Theory. https://doi.org/10.1007/s13752-020-00372-5.

[3] This issue: Shipton C (2023) Miniaturization and abstraction in the Later Stone Age. Biol Theory. https://doi.org/10.1007/s13752-022-00423-z.

[4] This issue: Bromham L (2022) Meaning and purpose: using phylogenies to investigate human history and cultural evolution. Biol Theory. https://doi.org/10.1007/s13752-022-00401-5.

[5] This issue: Killin A, Pain R (2021) Cognitive archaeology and the minimum necessary competence problem. Biol Theory. https://doi.org/10.1007/s13752-021-00378-7.

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