# STONE TOOLS IN HUMAN EVOLUTION: BEHAVIORAL DIFFERENCES AMONG TECHNOLOGICAL PRIMATES

In *Stone Tools in Human Evolution* John Shea argues that over the past three million years hominins' technological strategies shifted from occasional tool use, much like that seen among living non-human primates, to a uniquely human pattern of obligatory tool use. Examining how the lithic archaeological record changed over the course of human evolution, he compares tool use by living humans and non-human primates, and predicts how the archaeological stone tool evidence should have changed as distinctively human behaviors evolved. Those behaviors include using cutting tools, logistical mobility (carrying things), language and symbolic artifacts, geographic dispersal and diaspora, and residential sedentism (living in the same place for prolonged periods). Shea then tests those predictions by analyzing the archaeological lithic record from 6500 years ago to 3.5 million years ago.

John J. Shea is Professor of Anthropology at Stony Brook University. He is the author of *Stone Tools in the Paleolithic and Neolithic Near East: A Guide* (2013), and co-editor of *Out of Africa 1: The First Hominin Colonization of Eurasia* (2010). Shea is also an expert flintknapper whose demonstrations of stone tool production and other "ancestral technology" skills appear in numerous television documentaries and in the United States National Museum of Natural History in Washington, D.C., as well as in the American Museum of Natural History in New York City.

# STONE TOOLS IN HUMAN EVOLUTION

## Behavioral Differences among Technological Primates

JOHN J. SHEA

*Anthropology Department*
*Stony Brook University*

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*For Pat, Bianca, and Boudicca*

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# PREFACE

Stone tools are potentially rich sources of information about the evolution of human behavior, but archaeologists squander that potential. Countless books and papers try to convince other paleoanthropologists of stone tools' relevance to major issues in human evolution, but time and again when archaeologists read papers about stone tools at scientific meetings, their colleagues check email, peruse the meeting program, or head for the restrooms or the bar. College textbooks on human evolution barely mention the lithic (stone tool) evidence. In my own archaeology classes, I spend less and less time lecturing about stone tools each year.

This is a shame. No other line of evidence has such a wide perspective on the evolution of human behavior. Our ancestors and other hominins left stone tools everywhere they lived. Because non-human primates also use stone tools, stone tool use is a logical focal point for comparisons of human vs. non-human primate behavior. Behavior varies, and human behavior varies more than that of any other animal. Stone tools outnumber hominin fossils by multiple orders of magnitude. Each fossil preserves time-averaged evidence for lifetime behavior. Each stone artifact is a snapshot of human behavior at one moment. Stone tools' durability and widespread occurrence make them almost uniquely well suited for research on the evolution of human behavioral variability.

I decided to write this book while I was attending a scientific meeting about European and Asian stone tools dating to around 30,000–40,000 years ago. Earlier archaeologists had grouped these tools together into a single "Aurignacian Industry." My colleagues were debating whether regional differences among these tools were sufficient to justify calling them different names. For archaeologists, calling groups of stone tools by different names implies that they represent different groups of people. Archaeologists had long linked the Aurignacian Industry to *Homo sapiens*' dispersal into Europe; so, knowing whether it represented one, two, or even more distinct groups of people could shed light on how humans dispersed from Africa into Eurasia.

The meeting had been going on for hours when I realized we were wasting our time. We were treating stone tools as if they were emblems of prehistoric social identities, like the plastic name tags we were wearing. Hypotheses about those identities can only be proven wrong by interviewing extinct humans themselves. Stone tools are not people; they are residues of behavior. Their variation and their variability arise from differences in humans' and ancestral hominins' strategies for solving problems requiring sharp cutting edges, piercing tools, abrasive surfaces, and rigid percussors. Anything more than this, any claim to greater knowledge based on the stone tool evidence, requires theoretical justification. The most credible such "middle-range" theoretical justifications are hypotheses grounded in observations of contemporary human and nonhuman primate behavior. This approach to explaining the past, "uniformitarianism," originated in geology, but it is now a guiding principle in all historical sciences. The least credible hypotheses are those derived from the archaeological record itself. One cannot use the same evidence to test an hypothesis as that which inspired the hypothesis in the first place. All too often, however, and with the Aurignacian in particular, the archaeological record is both wellspring and proving ground for hypotheses about stone tool variation. In a word, archaeologists err by equating the patterning of the stone tool evidence with the processes that created it.

It would be convenient if the Aurignacian and other named stone tool industries corresponded to social and cultural differences among prehistoric humans; but there is no reason to assume they do and compelling reasons to think they do not. The word "Aurignacian" first appears in the archaeological literature more than a century ago. Archaeologists applied this term and others like it to stone tools excavated from caves, rockshelters, and other sites throughout western Eurasia. In deciding how to organize these artifacts into higher-order groupings, such as artifact-types and industries, early archaeologists relied on their intuition. This intuitive approach created many problems, if only because intuition varies. Comparisons of stone tools from the same levels of sites collected decades apart routinely reveal variation due to differences in earlier archaeologists' intuitive choices about which artifacts were important enough to keep. Worse still, efforts to investigate older collections with newly developed analytical methods often fail to take such "selective curation" into account. Debates about the nature of particular artifact-types and stone tool industries, exhortations to recognize new ones, and attempts to redefine established ones, swell the archaeological literature of all continents from the oldest phases of prehistory to recent times.

In theory, these lithic "systematics" help archaeologists explain human biological and cultural evolution using concepts analogous to those used to explain historical events. In practice, they do no such thing. "Anthropogenic" narratives (hypotheses about human evolution presented as narratives) and

"prehistory" can be satisfying explanations of the facts we know at any given moment. But inductively generated explanations lack predictive power. Every new discovery comes as a surprise, a "game changer" in the argot of "press-release science." Consequently, archaeologists constantly tinker with these narratives and their component elements in order to accommodate newly discovered evidence. Such constant tinkering makes these narratives ever more complex and less comprehensible to non-archaeologists.

Discontent with traditional archaeological approaches to stone tool analysis runs deep, but there is also a lot of complacency, even a bit of fatalism, about prospects for change. Invoking Gabriel de Mortillet, the French researcher who identified many of the stone tool industries we still recognize today, archaeologist Lawrence Straus recently despaired, "We are all prisoners of de Mortillet!" But does this make any sense? Is there any other science whose ways of organizing evidence have remained fundamentally the same for more than a century? Do physical anthropologists analyze DNA in order to redefine human races? Are cultural anthropologists still searching for primitive cultures? Archaeologists revere the past, but we misplace our reverence when we apply it to concepts developed in the infancy of prehistoric research. All prisoners want to be free.

Told that I was writing a book about stone tools' role in human evolution, a colleague remarked, "If anyone can write that book, you can; after all, you're a flintknapper." I was flattered. I do make and use stone tools and practice other ancestral skills. But, the questions this book asks and the hypotheses it proposes do not arise from my making and using stone tools. I wrote this book as a paleoanthropologist who uses archaeological methods to answer evolutionary questions. Stone tools, properly studied, have tremendous potential to change our views about human evolution. Traditional archaeological approaches to the lithic evidence prevent us from realizing that potential.

Archaeologists need to see alternative paths for connecting the stone tool evidence to major issues in human evolution. Physical anthropologists and geneticists need to see these other paths too. Many of them think narrative prehistory is all stone tool analysis has to offer human origins research. *Stone Tools in Human Evolution* explores a new path. It uses a comparative analytical approach to assess how the evolution of behavioral differences between humans and non-human primates influenced the stone tool evidence at various inflection points over the last 3.5 million years. *Stone Tools in Human Evolution* develops an hypothesis about how hominin strategies for making and using stone tools changed from an ancestral pattern of occasional stone tool use, one much like that seen among living non-human primates, to a situationally variable mixture of occasional, habitual, and obligatory stone tool use, a condition in which all humans lived until recently.

Students, physical anthropologists, and archaeologists will each get something different from this book. *Stone Tools in Human Evolution* will help students

identify and understand the "big questions," the questions all of us involved in human origins research care about. Physical anthropologists will find in it a possible path to "consilience," that rare occasion when research in separate fields leads to new integrative syntheses that are more than the sum of their parts. How better to test hypotheses about the origins of behavioral differences between humans and non-human primates originating from analyses of genes, fossils, and behavior than with a virtually indestructible archaeological lithic record? Archaeologists will be surprised that *Stone Tools in Human Evolution* does not use age-stages or named stone tool industries, and uses only a handful of named lithic artifact-types. I do this to make an important point. These terms and concepts are so deeply embedded in archaeological method and theory that the impossibility of reforming them is itself a major barrier to more anthropologically engaged stone tool analysis. *Stone Tools in Human Evolution* shows not only that we do not need these things, but also that paleoanthropology is better off without them.

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