CHAPTER 1

INTRODUCTION

This chapter introduces the book's key concepts, including systematics, Eastern Africa, prehistory, stone tools, and guidebooks. It also outlines the book's structure and its goals:

1. To provide students of Eastern African archaeology with a state-of-the-art introduction to stone tools.
2. To make it easier for archaeologists to compare stone tools, in detail, over the full sweep of African prehistory.
3. To nudge archaeologists closer to being able to investigate evolutionarily and historically important questions using evidence from Eastern Africa.

What we call things matters. Names can clarify, confuse, or do both simultaneously. Finding names for prehistoric stone tools poses special difficulties. When archaeologists unearth ceramics or metal tools, we do so from sediments no more than a few thousand years old – relatively recently on a geological timescale. As a result, we have familiar household words for ceramics (e.g., bowl, plate, jar) and metal implements (e.g., axe, knife, nail). Stone tools, in contrast, range in age from the ethnographic present to more than three million years ago. Few people make and use stone tools any longer, and for this reason we lack subject-specific common words for them. Instead, we borrow words for Industrial Era metal tools (e.g., scraper, pick, awl). In developing terms for stone tools, the nineteenth- and early twentieth-century archaeologists who developed the artifact typologies we still use today relied on their intuition, but those archaeologists' intuitions about stone tools and their functions reflected their experience excavating artifacts, not making or using them or observing others who did. Yet archaeologists have been reluctant to reform these stone tool systematics. We cannot blame their reluctance on sloth. Archaeologists are among the world's hardest-working scientists; nobody looking for a life of leisure becomes an archaeologist. Nor can we blame ignorance, for critiques about theory and method in stone artifact

analysis have a long history and have grown increasingly trenchant (e.g., Shea 2011b, Holdaway and Douglas 2012, Dibble et al. 2017). If the explanation for archaeologists' reluctance to reform stone tool systematics remains an enigma, the need for such reform has become ever more pressing, and no more so than in Eastern Africa. Eastern Africa provides unique fossil evidence about long-term patterns in human evolution. Even so, Eastern Africa's lithic record makes only a fraction of its potential contribution to African prehistory and to human origins research. Why is this so?

For me, studying and interpreting stone tools has always felt a bit like following animal tracks, an activity I learned at a young age, and one I still enjoy today. One can learn a lot about animal behavior from following a short segment of one animal trackway, but to know what is going on across the landscape, one has to follow tracks for longer periods and mentally correlate and integrate one's observations about different sets of tracks. A galloping deer track makes more sense after noting the accelerating pace of nearby coyote tracks. As matters stand today, archaeologists investigating Eastern African prehistory easily see only short segments of individuals' tracks; they use different terms for tracks left by the same animal, and similar terms for tracks left by different animals. Had our hunter-gatherer ancestors done this with actual animal tracks, they would have starved, and we would not be here.

Around the year 2000, I decided to compare the stone tools my colleagues and I found together with early *Homo sapiens* fossils in the Lower Omo Valley Kibish Formation, Ethiopia, to lithic artifacts from other sites of roughly the same age (104,000–195,000 years ago) as well as to some from older and younger periods of Eastern African prehistory. Surveying the archaeological literature, I found few archaeologists described stone tools the same way. Basic cardinal measurements, such as length, width, and thickness, went undefined. Stone tool systematics not only varied between time periods (as it does throughout much of the world) but also within time periods and between and within individual countries. Some archaeologists had imported artifact typologies intact from other regions. Others had devised their own idiosyncratic typologies. Still others combined these approaches. Few archaeologists illustrated their artifact typologies in any great detail but instead used terms such as "point" and "microlith" that enjoy different definitions among various research traditions. The more sites I tried to include in my comparisons, the less and less confidence I had in my findings. Often, when I thought I had found differences between stone tools from different sites, I could not reject the hypothesis that those differences arose not from variation in prehistoric human behavior but from variation in how archaeologists described the stone tool evidence. This "lithics systematics anarchy" contrasted starkly with what I had previously experienced in other regions, such as the Near East, Europe, and North America, where

archaeologists use standardized systematics (although different ones in each region).

Calling this situation "anarchy" references the term's original political meaning, a landscape of small, self-governing communities, not its modern use as a synonym for lawless social chaos. Some Eastern African research traditions and research projects use internally consistent lithics systematics, but they differ among one another. One could also call the situation "lithics systematics diversity," but in modern usage, diversity has generally positive connotations, whereas lithics systematics anarchy does not. There is also the matter of the unfortunate acronym, LSD.

When I raised these concerns with colleagues, their responses varied widely. Some pointed out that prominent Eastern African archaeologists' calls for top-to-bottom reform in stone tool systematics made decades ago (Clark et al. 1966, Bishop and Clark 1967: 896–7, Kleindienst 1967) had little or no effect on archaeological practice. Others argued for reforming existing systematics by refining definitions of specific problematical artifact categories. I had enough experience with such "reform" efforts in Southwest Asian lithic analysis (Shea 2013b) and in Eastern Africa to know that such efforts had no chance of success whatsoever. (Getting academics to cooperate in this way is like herding cats with a compressed-air horn.) Others had full confidence in their own ways of describing stone tools but expressed suspicion about the methods their colleagues used. Such views may arise because so few Eastern Africanist archaeologists work in more than one country or with colleagues trained in different research traditions. Most indigenous Eastern African archaeologists *only* work in their home countries. A third group thought the problem too complex to solve, but, as a young Alexander of Macedon (later "the Great") showed when he undid the Gordian Knot by slicing it in half with his sword, complex does not mean unsolvable.

For answering questions about long-term change and variability in human evolution, no other region of the world has greater potential than Eastern Africa. Right now, because archaeological stone tool systematics are so variable, Eastern African archaeologists find themselves limited to single-site-focused narratives about the past – essentially short segments of longer animal trails. More integrative questions require inter-site comparisons, but differences in how archaeologists describe the stone tool evidence make such comparisons difficult. Those attempting them quickly discover that they have to collapse artifact-type categories in rough proportion to the number of samples included. Such comparisons further assume, based on no evidence whatsoever, that archaeologists all measure stone tools the same way. Changing the ways we measure and describe stone tools seems a trivially small price to pay for progress in answering "big" evolutionarily significant questions using the stone tool evidence. This first chapter explains the book's purpose by defining each component part of its title: Eastern Africa, prehistory, stone tools, and guidebooks.

WHAT IS EASTERN AFRICA?

Eastern Africa lies between roughly 30–52° East Longitude and approximately +18.00° North and -12.00° South Latitude. It encompasses both the Horn of Africa (Eritrea, Ethiopia, Djibouti, and Somalia) and East Africa (Kenya, Tanzania, Uganda, Rwanda, and Burundi), as well as parts of adjacent countries, such as South Sudan, the Democratic Republic of the Congo, Zambia, Malawi, and Mozambique (Figure 1.1). Eastern Africa encloses the southern end of the Red Sea and the western equatorial Indian Ocean coastline, the whole of the Ethiopian plateau, and the East African Rift Valley. The Equator divides the region more or less in half.

Both unique and a transition zone, Eastern Africa enjoys overall higher elevations and more varied topographic relief than adjacent regions. Relatively young volcanic deposits comprise a much greater proportion of the Eastern African landscape than elsewhere on the continent. Ancestral Eastern Africans' use of volcanic rocks, such as basalt and obsidian, created a distinctive lithic archaeological record. Eastern Africa has also enjoyed sustained and intense archaeological research since the mid-twentieth century. It joins South Africa, the East Mediterranean Levant, and southern France/northern Spain ("Franco-Cantabria") in contributing disproportionately to global prehistory. It differs from these other regions by preserving a much older archaeological record, one currently dating from around 3.5 million years ago, or ca. 3.5 Ma (see Box 1).

Eastern Africa sits at the conjunction of three "worlds," an arid zone stretching across North Africa to Southwest Asia, a humid and densely forested Sub-Saharan Africa, and the Indian Ocean's seasonally arid and humid western periphery. This conjunction makes Eastern Africa a conduit, a route by which plants, animals, humans and, in earlier times, human ancestors circulated. Few, if any, major human cultural institutions spread from any one of these three worlds to the others without leaving a footprint in Eastern Africa.

WHAT IS PREHISTORY?

Prehistory describes both the time before written historical records and scientific accounts of events during that time. A maximally inclusive prehistory could stretch backward from roughly 5,000 years ago, when precursors to Egyptian hieroglyphs and Mesopotamian cuneiform writing appear, to the Earth's geological origins some 4.5 billion years ago. Archaeologists use a more restricted definition, one starting the period after the oldest-known archaeological sites, or, since 3.5 Ma.

Deciding when prehistory "ends" in any given region can be far from simple and straightforward. Many early written records are economic records (Mesopotamia), political-religious tracts (the Nile Valley), elite records (Mesoamerica),

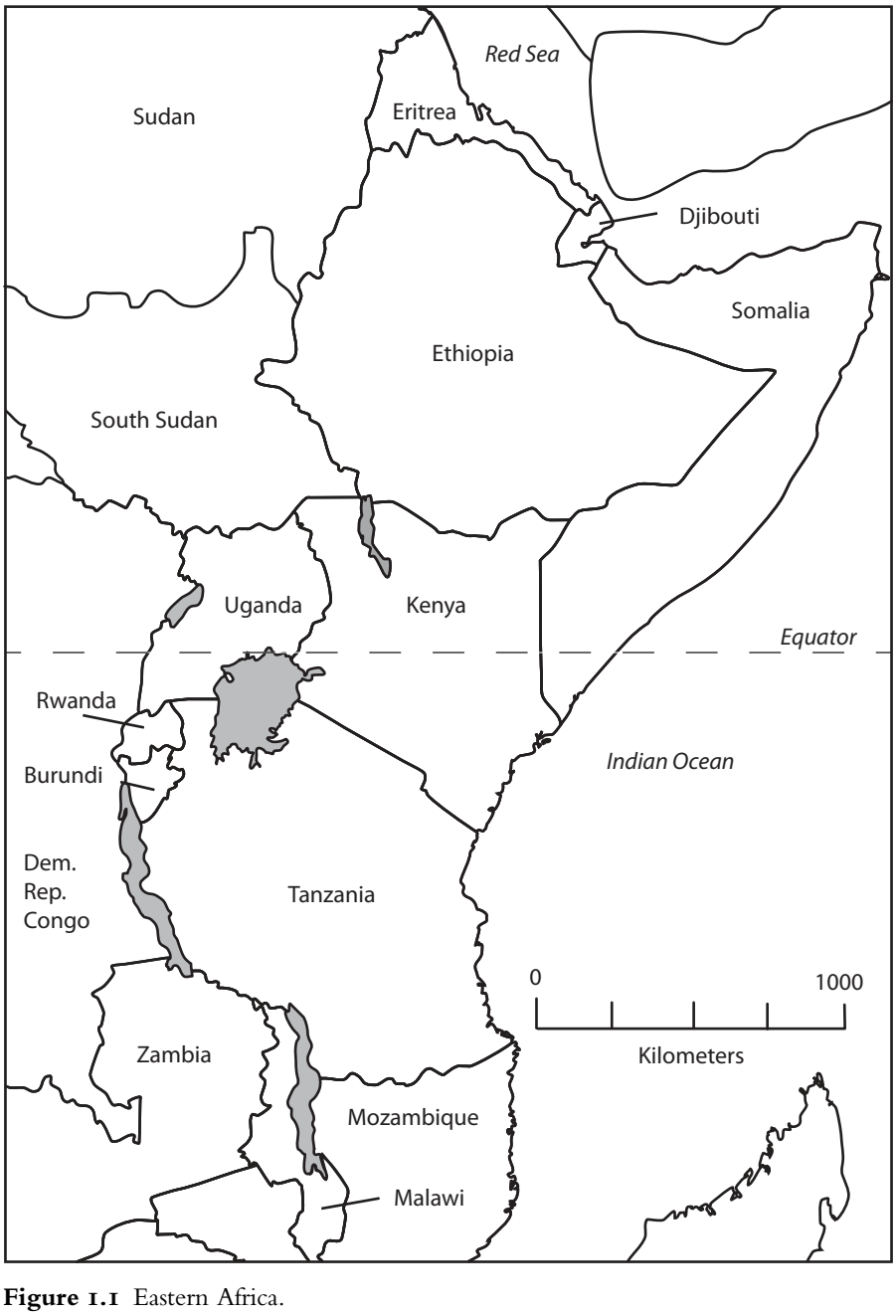

Figure 1.1 Eastern Africa.

or documents concerning supernatural phenomena (China). Scholars in Western societies with long traditions of written history produced the first nonsupernatural scientific accounts of prehistoric events during the eighteenth and nineteenth centuries (Daniel and Renfrew 1988). Predictably, prehistory's definition privileges written records over oral histories. Historical records for the Horn of

Box 1 *Time*

Prehistoric Stone Tools of Eastern Africa: A Guide uses the following abbreviations for dates, Ma = millions of years ago, Ka = thousands of years ago. Where dates are calibrated radiocarbon ages, they are designated Ka cal. BP. "BP" means "before present," i.e., the International Radiocarbon Year, AD 1950. Dates referenced as Ka derive from dating techniques other than radiocarbon, such as Uranium-series (U-S), thermoluminescence (TL), electron spin resonance (ESR), optically stimulated luminance (OSL) dating, or various radiopotassium-based techniques, such as potassium-argon (K-Ar) and single-crystal argon dating ($^{40}Ar/^{39}Ar$). These dating techniques can disagree with one another to varying degrees without necessarily invalidating one or the other set of results. Table 1.1 lists the dates for major cultural periods and geological epochs.

TABLE 1.1 *Cultural and geological periods. Youngest periods are listed in the upper row of each column. Note: Cultural and geological periods on the same row are not equivalent.*

Cultural Periods/Age-Stages	Geological Periods/Epochs
Iron Age – iron metallurgy, extensive trade with external regions, since around 0.5–2.5 Ka cal. BP.	Anthropocene – ongoing, begins 2 Ka cal. BP.
Neolithic – domesticated plants and animals, pottery, 2–6 Ka cal. BP.	Holocene – ongoing, begins 11.7 Ka cal. BP at boundary of MIS* 1 and 2.
Later Stone Age – geometric microlith production, 6–50 Ka cal. BP.	Later Pleistocene – begins 128 Ka, at the start of MIS 5.
Middle Stone Age –"Levallois" prepared cores, 50–300 Ka.	Middle Pleistocene – begins at boundary of Brünhes Normal Paleomagnetic Chron, 728 Ka.
Early Stone Age – stone tools modified by controlled fracture, 0.3–3.5 Ma.	Early Pleistocene – begins at 2.6 Ma.**
	Pliocene 2.6–5.3 Ma.

* MIS = marine oxygen isotope stage
** In 2009 the International Union of Geological Sciences reset the start date for the Pleistocene. Formerly it was 1.8 Ma.

Cultural periods (aka "ages" or "age-stages") divide time based on variation in the contents of archaeological deposits. Since the nineteenth century, European and Asian archaeologists have divided prehistoric time into Stone, Bronze, and Iron Ages and split the Stone Age into Lower, Middle, and Upper Paleolithic periods, followed by Mesolithic (aka Epipaleolithic) and Neolithic periods. For the most part, Eastern Africa's earlier cultural periods use the Earlier, Middle, and Later Stone Age.

Box 1 (*Cont.*)

framework originally developed in Southern Africa (Goodwin and van Riet Lowe 1929) and the Neolithic and Iron Ages from Eurasian prehistory. (The term, "Bronze Age" rarely appears in the Eastern African archaeological literature.) Some researchers combine terms from Eurasian and Southern African frameworks, such as "Earlier Paleolithic" or "Later Paleolithic."

Geologists define geological periods, or "epochs," in terms of changes in rocks and fossils and dated geochronometrically, usually by radiopotassium, Uranium-series, or radiocarbon dating. Most of Eastern Africa's Stone Age prehistory falls within the Pleistocene Epoch, 2,600,000 years ago (2.6 Ma) to 11,700 years ago (12 Ka). This was a period of increased aridity and ever wider climatic variability. The Pliocene Epoch (2.6–5.3 Ma) precedes the Pleistocene, and the Holocene Epoch (<12 Ka) follows it. During the Pliocene Epoch, Eastern Africa was generally warm and humid with minor climatic oscillations. Hominins evolved and differentiated themselves from other anthropoids (apes) during the Pliocene. Geologists divide the Pleistocene into Early, Middle, and Later periods that they define in terms of changes in paleomagnetism and variation in marine oxygen-isotope stages. The Holocene Epoch was generally warmer and more humid than the Later Pleistocene. It is, thus far at least, also more stable than any period of Middle-Late Pleistocene prehistory of equivalent duration.

Many archaeologists and other paleoanthropologists use the informal term "Plio-Pleistocene" for the later Pliocene and early Pleistocene, roughly 1.6–3.5 Ma. The "Anthropocene," a recently proposed term for a geological epoch marked by global-scale human impacts on the environment, has neither been formally defined nor recognized as yet, but the term appears in some recent popular and scientific works.

In 2009, the International Union of Geological Sciences redefined the boundary between the Plio-Pleistocene from 1.8 Ma to 2.6 Ma.

Africa stretch back thousands of years, while in Eastern Africa's interior, "prehistory" ended after nineteenth-century European colonial incursions.

Why is prehistory important? It provides answer to anthropology's existential questions: namely, why humans differ from other primates and why humans differ from one another. All of the major behavioral differences between humans and non-human primates evolved during prehistoric times. Tool making, bipedalism, controlled use of fire, art and symbolic artifacts – of these things' origins, history offers mere hints. Prehistory offers evidence. Root causes for the major differences among living humans: language, geographic dispersal, farming and herding, trade, religion, even early cities, all developed in prehistoric times, and during periods when humans made, used, and

discarded stone tools. The differences between Israelis and Palestinians, between Irish and British, between Chinese and Vietnamese pale to insignificance compared to the differences between any living human and earlier hominins.

WHAT ARE STONE TOOLS?

Stone tools, also known as lithics or lithic artifacts, are portable objects made from rocks and nonmetallic minerals that deliberate fracturing and abrasion have altered from their natural state. This definition excludes immovable features such as modifications to bedrock as well as large stones used for architectural purposes. Most archaeologists do not consider figurative stone sculptures, stone vessels, beads, pendants, and other personal adornments lithics. Archaeological reports usually tally such artifacts separately from more utilitarian flaked and groundstone artifacts. This work includes beads and vessels among stone tools because archaeologists who describe fractured and abraded stone tools often have to describe these other artifacts as well. If only for convenience, it makes sense to include guidance about how to describe and measure these artifacts in this guidebook.

Why devote an entire book to stone tools? Stone tools are a common denominator for nearly all of prehistory and a logical starting point for research into behavioral differences among "technological primates" (i.e., humans and other primates who use tools). Every stone tool ever made has either been collected, destroyed by geological processes, or still awaits discovery. Since at least 1.7 Ma, hominins appear to have been at least habitual stone tool users (Shea 2017a). That is, at least some artifacts made and discarded since that point in time exhibit such "patterned imposition of non-intrinsic shape" that they almost certainly reflect intergenerational transmission of technological knowledge rather than just latent (spontaneously generated) solutions to needs for cutting edges and percussive surfaces. In Eastern Africa, as in much of the world (Australia, the Americas), archaeological traces of human activity appear without stone tools only during the last thousand years, after iron and steel implements largely displaced stone tools from their longstanding roles. People still make and use stone tools in various remote parts of Eastern Africa.

WHY A GUIDEBOOK FOR EASTERN AFRICAN STONE TOOLS?

A guidebook aids its readers in identifying meaningful differences among its subjects. Guidebooks for birds, for example (e.g., Van Perlo 2009), include colloquial and scientific names, illustrations showing male versus female and adult versus juvenile birds of a given species, definitions of key identifying features (different kinds of beaks or wing feathers) as well as descriptions of common ways to describe and measure those features. As with its author's

previous guidebook for the Southwest Asian lithic record (Shea 2013b), this book provides similar information about stone tools from Eastern Africa. It differs from previous works by devoting chapters to major artifact categories rather than to different time periods. Unlike in Southwest Asia, where different age-stages have strikingly different lithic evidence (although less so than generally thought), the same stone artifact types and ways of making stone tools cross-cut traditional Eastern African prehistoric age-stages.

Differences in Eastern African stone artifact systematics make it difficult to compare evidence archaeologists have gathered, not just within and between countries but also within and between prehistoric time periods. This problem is especially acute in recent prehistoric periods for which lithic evidence is abundant and in which more archaeologists conduct research; but no time period is immune, and our understanding of Eastern African prehistory suffers. Even though the number of archaeologists working in Eastern Africa has grown since the 1960s and millions of dollars have been spent on research, more than sixty-five years have passed since Sonia Cole published the last major synthesis of the region's Stone Age record, *The Prehistory of Eastern Africa* (1954).

Eastern Africa's "lithics systematics anarchy" reflects it colonial history, but postcolonial factors perpetuate it. Unlike North and South Africa, where single colonial powers controlled vast regions, Eastern Africa had diverse British, Italian, German, and French colonizers. European prehistoric archaeologists work largely within their own countries and those countries' past and former colonies. As a result, their methods for describing stone tools diverge from one another. When European archaeologists began working in Eastern Africa, they described stone tools using conventions developed in their national research traditions. Researchers from the United States, Canada, Japan, and other countries with no prior colonial presence in Eastern Africa further increased variation in how archaeologists describe stone tools. Today, Eastern Africans seeking professional archaeological training abroad absorb further different ways of dealing with the stone tool evidence. Others develop their own stone tool systematics. Because most indigenous Eastern African archaeologists only work in their home countries, and because relatively few foreign researchers work in more than one East African country concurrently, stone tool systematics vary widely within and between countries – more so than anywhere else in Africa, and possibly more so than anywhere else in the world.

Eastern Africa's systematics anarchy is not just a problem for archaeologists working in that region. When prehistoric research began and fieldwork took place mainly in Europe and the Mediterranean Basin, archaeologists projected their inferences about human biological and cultural evolution in these regions to global scales. As evidence accumulated from Asia, Africa, Australia, and the Americas over the course of the twentieth century, archaeologists recognized that the European evidence possessed its own uniquely derived features, ones

not shared globally (Clark 1977). Today, prehistoric archaeologists aspire to a global prehistory – to developing and testing hypotheses about variation and variability in the evidence for human behavior evolution (e.g., Gamble 2013, Shea 2017b). To do this, we need to compare evidence over long time periods and between major regions. Humans and our evolutionary precursors made and used stone tools in Eastern Africa longer than anywhere else on Earth. Eastern Africa is the logical place to search for patterns of long-term change and variability in the stone tool evidence. That the ways archaeologists have organized Eastern Africa's stone tool record obstructs this search ranks among paleoanthropology's greatest ironies.

HOW IS THIS BOOK ORGANIZED?

Prehistoric Stone Tools of Eastern Africa: A Guide has three major parts. The first, Chapters 2–3, provides a basic introduction to stone tools and lithic technology. *Prehistoric Stone Tools of Eastern Africa*'s target audiences include college students and professional archaeologists not already deeply familiar with stone tools. For this reason, these chapters assume little or no prior knowledge of that subject. They introduce essential terms and concepts, including the vocabulary archaeologists use to describe the lithic evidence and advice on how to "read" (visually examine and interpret) stone tools.

The second part, Chapters 4–5, describe Eastern Africa and its archaeological stone tool evidence. Chapter 4 introduces Eastern Africa's geology and other geographic properties that influence its paleoanthropological record. It also discusses the history of prehistoric research in the region and contemporary frameworks for Eastern African prehistory. Chapter 5 focuses more narrowly on the Eastern African lithic record, describing the artifact-types and industries that characterize major prehistoric periods. To gauge the extent to which Eastern Africa's lithic record fits with this stadial (stage-wise) framework, Chapter 5 compares more than two hundred and fifty archaeological stone tool collections from the full range of Eastern Africa's prehistoric record using Stoneworking Modes A-I, a framework specifically designed for such comparisons. By any conceivable measure, the lithic evidence and archaeologists' stadial framework correlate poorly with one another. Difficulties comparing lithic evidence across the full sweep of the region's prehistory justify the book's centerpiece, the Eastern African Stone Tool (EAST) Typology.

The third part, Chapters 6–9, presents the EAST Typology. This typology describes stone tools in terms of nine major technological categories (Groups I–IX), each of which it further subdivides into more specific artifact types. This hierarchical typology has three goals. First, it enables Eastern African archaeologists to develop concordances among the many different stone tool typologies they currently use. Second, it allows archaeologists to more effectively compare archaeological lithic evidence from different prehistoric periods.