A HISTORY OF HUMANITY

THE EVOLUTION OF THE HUMAN SYSTEM

PATRICK MANNING

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Preface

During a long career as a historian, I have watched the dramatic changes in what is known as "world history." At first, I read writings on empires, wars, great men, and European expansion. In time these topics were set into the background by studies of globalization, gender, migration, environmental change, decolonization, and genomes. My own studies – focusing on Africa in world history and on economy, migration, and culture through multiple disciplines – changed along with those of other writers. Throughout, I planned to prepare a new review of world history, surveying the full length of the human experience. In completing this volume during the past three years, I have been repeatedly surprised by the new problems to study and new knowledge about them. The result, by no means definitive, is an update for 2020, addressing much of what is new in world history.

I began work on this volume by identifying a "Human System," to emphasize the numerous elements of human life, past and present, that interact with one another as parts of an elaborate, evolving organism. I chose to set the Human System in coevolution with "Gaia" – the complex natural environment with which humans interact as individuals and in groups. I also assumed that biological evolution, in giving rise to humankind, somehow linked up with a process of social evolution that gradually created the social groups of life today – cities, schools, nations, companies, teams. I assumed that the rise of speech – syntactic language – was central to the transition to social evolution.

One surprise was to discover that a theory arose in the 1980s on cultural evolution, in between biological and social processes. This theory successfully shows how individual learning was able to build human cooperation to a higher level. But the same theory assumes that no further steps were necessary to achieve large-scale human societies. In contrast, a still-newer theory of social evolution shows how agreements to join groups, especially via spoken language, enabled people to form social institutions with inherent dynamics. While the two new theories have not yet been fit together, I believe their combination can give a satisfactory account of the rise of the Human System. Sorting out these and other theories requires

debate on big questions. Can one treat humanity as a growing and functioning social system? Does there exist a process of social evolution that can explain main trends in history? Can we link social evolution and biological evolution? Is "cultural evolution" part of overall human evolution? How widespread and divergent are the meanings of "culture"? Was spoken language the first social institution? How do we understand our behavior in social groups – does the behavior of human groups bring improved decisions over individual behavior? Is migration helpful or harmful? Is popular culture as important today as capitalism?

My interpretation is the individual-level project of a researcher with a small-scale research design to explore a very big topic. But how can a single scholar assemble knowledge from so many disciplines? Needless to say, my deployment of the various disciplines will be uneven. Nevertheless, in what I expect is not a truly unusual experience in recent years, I have undergone training in several of these areas; I am an autodidact in others. I had undergraduate training in chemistry and biology, followed by graduate training in African history and economic history with a world-historical approach, including some anthropology. Later I conducted a formal study of demography and migration; I have also conducted reading and research on aspects of historical linguistics. I have done reading in genetics and climatology with guidance from specialists; I am self-trained in my recent research in history of science. Further, thanks to work by dedicated scholars, the basic principles and advances of many fields of study have been very well written up in the articles and books I have cited here. A final argument for taking on so many disciplines at once is systemic: the Human System functions through interrelated processes, and studying them at once should lead the researcher to encounter resonances that might not be visible with a piecemeal exploration. In addition, the assertions that I advance here, while I do stand by them, are to be understood as hypotheses rather than confirmed research results.

Research on human social and biological change, in my opinion, is moving in the direction that I have staked out, and I offer this book to point to additional possibilities, hoping to speed the process of research. My central hypothesis is that humans developed speech in Northeast Africa some 70,000 years ago. That assertion raised big questions about the time before and the time after that transformation – questions that are explored here. My second hypothesis, a Human System based on social evolution, gained reinforcement from James Miller's *Living Systems*, a framework at once biological, social, and systemic. Then began my program of reading and writing on how to link social, biological, and cultural evolution.

history of science at the Center and the University of Pittsburgh Press, for which my coeditors were Daniel Rood, Mat Savelli, and Abigail Owen. Center Director Ruth Mostern leads the World-Historical Gazetteer project, a resource central to spatial analysis. The Center brought me into contact with Daniel Bain and Aubrey Hillman for consultation in geology; with Monica Green on disease history; with Jason Carson on genomics; and with R. Charles Weller, who encouraged me to complete a chapter-length overview of the Human System in 2016. Pitt grad students James Hommes and Lars Peterson critiqued my world history manuscript; Chris Eirkson, Jack Bouchard, and especially Madalina Veres helped me map language distributions; Ahmet Izmirlioglu assisted me on language and network analysis; Matt Drwenski brought key insights in economic history. Jeremy Black and Felipe Fernandez-Armesto each kindly provided me with copies of their book manuscripts in process. Boris Michev and Daniel Andrus of Pitt's University Library System skillfully prepared the maps for this volume.

My daughter, Pam Manning, showed me the benefits of wide reading on humans and animals. Liu Jiafeng and the Shandong University Institute for Global and Transnational History generously hosted me for seven lectures and support for writing in 2017. Readers of drafts of this study have provided valuable commentary: Eugene Anderson, Iris Borowy, Lincoln Paine, Christopher Ehret, Felipe Fernández-Armesto, Matthias van Rossum, Pim de Zwart, Ahmet Izmirlioglu, Bennett Sherry, Molly Warsh, and two anonymous referees for Cambridge University Press. Michael Watson of Cambridge University Press has skillfully shepherded this volume through the past two years of its revisions.

I dedicate this work with deep love to Susan Manning, my wife, with whom I have shared many happy years. She has been warmly and imaginatively supportive of the preparation of this book.

Introduction

1 The Human System

How did the human condition of today come to be? We live in a world created by human energies and activities, in which "nature" is receding steadily. The cities in which most of us live are the results of human construction – out of concrete, asphalt, iron, glass, and bricks. Even the wooden elements of cities are cut and reshaped by human energy. Water is piped in or transported in bottles; we bring gasoline in tanks and natural gas by pipeline. We communicate by electronic telephones, televisions, and computers that are built in factories. Even the countryside depends heavily on human construction and creativity – while the wonders of nature are a pleasure to see, the rural world is charted and exploited by humanity. The crops on farmlands have been bred and protected by chemical and biological engineering. Our cattle, sheep, pigs, and chickens live and die under human control: these domesticated species are the majority of all the large and medium-sized animals. Even the insects and the bacteria fall increasingly under human control. Fishing has transformed the populations of oceans, while plastic waste materials mark the oceanic currents and shores. Of course, Earth remains in its orbit so that the sun appears to rise and fall each day, yet even the seasons are changing.

The achievements of human energies have created a Human System, a complex set of social interactions and structures from local to global levels. This system reproduces and transforms itself on every continent, creating social institutions, material goods, and new knowledge, including science and culture. The system generates achievements and distributes benefits – yet the course of human expansion has brought oppression and destruction, leading in some cases to destruction of whole societies. The natural world, though increasingly marginalized, has not yet been tamed. New strains of bacteria and viruses overwhelm pharmaceuticals and vaccines, spreading disease where medical science thought it had achieved conquest. Cancers arise in response to the new creations of chemistry and petroleum. The burning of petrochemicals and the methane created by domestic animals are raising Earth's temperature

understanding that is increasingly critical of discrimination and exploitation by gender, age, or racial categorization.

One of the choices before the human community is whether to focus attention on learning more about the Human System – its evolution, its flaws, and the questions we face in seeking to guide it. As humans formed groups to achieve a common purpose, did they seek to assess how the common welfare would be affected? What is it that enables leading figures in institutions to profit for themselves and ignore the general welfare? To address this question, throughout this book, I trace the expansion of networks connecting humans for common purposes, and the parallel expansion of hierarchies – vertical networks that might also yield a division of labor that benefits human welfare. As I argue, human nature, though deeply embedded, has changed with time. A global consensus on social welfare, should it arise, might modify human nature once again and, with it, the direction of human history.

The adventures of *Homo sapiens* began more than 200,000 years ago and reach up to our day. The story traces drama in family life, in learning to speak, building social institutions, migrating to new lands, creating a Human System through maintaining connections, and encountering global crises in today's urban society. More than a story, the book presents puzzles to solve. I hope readers will join in working to reveal how our ancestors took each turn in their complex trajectory. We will explore data, logic, and terminology across many disciplines. My narrative centers on processes of evolution and migration in human history. I divide the narrative into four main periods, beginning with hominin biological and cultural evolution from the early Pleistocene epoch up to 70,000 years ago. I then trace three epochs dominated by social evolution – the late Pleistocene, from 70,000 years ago; the Holocene, from 12,000 years ago to 1800 CE; and the Anthropocene with its new levels of social evolution. I treat the issue of migration as subordinate to the overall question of social evolution, yet I see migration as essential to the human trajectory: it maintains diversity and originality in every region. More generally, my approach to human evolution highlights diversity in populations, to guard against the reasoning that there might have existed selected groups that carried forth the essence of human excellence. I emphasize genetic diversity, in reasoning analogous to that of Theodosius Dobzhansky who, writing in the 1930s to advance the neo-Darwinian hypothesis, emphasized the broad diversity of human populations in contrast to the arguments of eugenicists that excellence could be purified in a few key genes.[4] Further, I emphasize diversity in the learning processes of cultural evolution, in the institutions of social evolution, and in the expressions of emotions at individual and group levels. This is one reason for my emphasis on

migration and comprehensive regional coverage in this volume: it is an effort to point to the full range of human diversity over time.

Evolution of the Human System: Key Questions, Key Assumptions

Between the crowded world of today and the days of our ancestors on the East African savanna lies a missing link – a disconnect in knowledge linking the biological emergence of humankind to the social complexity of humanity today. The missing link is temporal, disciplinary, and theoretical. Temporal, because some 70,000 years separate humans today from our ancestors as they began speaking and migrating to new lands. Disciplinary, since the training and reading of biologists, social scientists, and historians address significantly different materials. The gap is also theoretical. That is, biologists are guided by Darwinian theory, by the recent advances in genetics and epigenetics, and by connection to disciplines including physics and biochemistry; historians and social scientists have worked less with theories than with narrative, though their facility with theories is advancing. Between the natural sciences and the social sciences lies the gap on which I seek to focus – although I emphasize the thread of erudite discussion among scholars linking those disciplines, whose contributions may be resolving aspects of the big questions about human growth and change.[5]

How can one hope to bridge the gap between biological study of humanity (for early times) and historical study of humanity (for early and especially recent times)? The first step in bridging is to identify major questions that point us toward exploring the gap. To begin this study of the Human System, I pose four questions that will be pursued throughout the book:

- System. How does humanity function as a system?
- Evolution. What are the processes of human evolution?
- Natural World. How are humanity and the natural world linked?
- Transformation. What major transformations has humanity faced in the past and the present?

These four questions, in varying ways, focus on two big issues: system behavior and human evolution. Such questions lead us deeply into exploring processes and events in human history. Study of growth and change in the Human System involves identifying the system's elements, tracing their interplay, and analyzing their transformations up to today – especially with attention to the roles of individual and collective consciousness – our "behavior" and "human nature." By "human evolution" I mean several overlapping processes: not only biological evolution but

also the processes of cultural and social change, right up to the present. Is the Human System now prepared with adaptive responses that will respond automatically to current crises? Is the system capable of changing its direction in time to limit the damage and threat that it faces from within and without? Or, to anticipate a question that will be central in this book: can human nature change, either at the level of individuals or in group behavior?

The four questions just posed will not answer themselves: they must be addressed by analysts who frame their inquiry with well-chosen *assumptions.* In the selection of assumptions, I have been inspired (as have been many others) by Charles Darwin's assumptions and analyses in the study of biological change. Darwin specified with remarkable clarity the key assumptions in his *On the Origin of Species by Means of Natural Selection* (1859):

> Owing to this struggle for life, any variation, however slight and from whatever cause proceeding, if it be in any degree profitable to an individual of any species, in its infinitely complex relations to other organic beings and to external nature, will tend to the preservation of that individual, and will generally be inherited by its offspring . . . . I have called this principle, by which each slight variation, if useful, is preserved, by the term of Natural Selection.[6]

Darwin thus emphasized his assumptions on the struggle for existence, variation, and inheritance, summarizing them as natural selection. The principal effect of natural selection was *divergence* among the species.[7]

In contrast to Darwin's specificity, Herbert Spencer, the wide-ranging sociologist, published a vaguer and more general overview of "progress" in 1857. Spencer ranged across the natural and social sciences, highlighting "evolution" and "progress" as characteristic of every field of study.

> The advance from the simple to the complex, through a process of successive differentiations . . . is seen in the geologic and climatic evolution of the earth, and of every single organism on its surface; it is seen in the evolution of humanity, whether contemplated in the civilized individual or in the aggregation of races; it is seen in the evolution of society in respect alike of its political, its religious, and its economical organization; and it is seen in the evolution of all those endless concrete and abstract products of human activity which constitute the environment of our daily life.[8]

Spencer's logic was to lump together, under the term "evolution," every sort of transformation, assuming that "progress" was inherent at each level. While he would soon accept the mechanism that Darwin proposed for biological change, labeling it "evolution," Spencer did not propose equivalent mechanisms for other sorts of change. He described what he

saw as a universal result, then vaguely referred to a universal cause but without offering specifics. Spencer was the theorist of progress in every domain; Darwin was the theorist of divergence in the biological domain. Darwin's theory, since it included a specific mechanism to back up its overall hypothesis, was testable and ultimately verifiable, while Spencer provided no mechanism for "the transformation of the homogeneous into the heterogeneous" and simply repeated his overall hypothesis. Darwin launched a concrete research project on biological evolution, while Spencer's speculations fueled debate yet did not launch organized study of human social change. The problem of ensuring that analytical assumptions are sufficiently specific will occupy us significantly in this book.

Darwin's analysis provoked a related question: how does the history of human social and cultural change fit into biological evolution? Edward B. Tylor, a founding figure in anthropology, began his *Primitive Culture* (1871) with a definition that has since remained famous: "Culture or Civilization, taken in its wide ethnographic sense, is that complex whole which includes knowledge, belief, art, morals, law, custom, and any other capabilities and habits acquired by man as a member of society."[9] This definition of culture left unspecified whether its locus is the human individual or the social group, though Tylor's focus on law and custom implies that he saw culture as existing at the level of groups.[10] Tylor proceeded to discuss racial differences in humans, concluding that distinct races had arisen from a uniform original human species, and he emphasized the special roles of language and consciousness in human history. Tylor supported scientific study of human change but expressed his methods in terms of narrative and description rather than proposing mechanisms of change. Thus, Tylor saw anthropology, the study of humanity, as scientific study that was separate from the study of biological evolution.[11]

The specificity of Darwin's theorization meant that, with time, his errors have been identified and addressed. Darwin assumed a set of workings of natural selection, relying on individual level motivation and action. In the time since these initial statements, biological analysis has developed with great complexity, mostly reinforcing rather than negating Darwin's early insights. In contrast, the imprecision of nineteenth-century social-science analysis hid both the strengths and the weaknesses of social science. Spencer assumed an inevitable result of progress from unity to diversity, but without assuming a process that would yield the result. Many analysts of change in human society, in addition to Spencer, tended to assume a general and unspecified impulse to progress rather than any more specific mechanism.[12] Tylor assumed the existence of culture that relied in unspecified ways on human groups, but he described

culture rather than analyzing it. Social scientists in general, lacking specific theoretical mechanisms for social change, failed also to establish a basis for their studies that could match that of biology.[13] This failure resulted not from weakness of the scholars but, at least in part, from the complexity of consciousness and the sensitivity of social science to ideological claims.

While today's analysis of human biological evolution is coherent though imperfect, we do not yet have a coherent analysis of human social evolution. My understanding of social evolution relies significantly on the insights of psychologist Donald T. Campbell, who asserted the centrality of social evolution in human society and modeled it in Darwinian terms.[14] Yet I revise Campbell's approach, based on advances since his time in fields that are discussed throughout this book. The analysis of social evolution, in my opinion, should center on group behavior and social institutions. Still-unresolved issues include: How do we explain the functioning of human groups? What is the role of spoken language in human evolution? What is the place of migration in human history and evolution? At a larger scale, we do not yet have a coherent analysis linking the roles of individual and group behavior in human change, the functioning of humanity as a system, the place of cultural production in that system, the interplay of humanity and the environment of the natural world, and the major transformations in the human experience – especially the expansion of human knowledge about our past. To that end, this book is to propose a framework for analysis of overall human evolution, focusing especially on the logic of social evolution. In an Appendix, I provide a compact summary of methods within that framework.[15]

A World-Historical Approach

The discipline of world history provides an appropriate institutional framework for exploring this set of big questions. With this framework, I seek to provide a new analysis and a new narrative of world history. The world-historical framework includes working with such valuable conceptual resources as multiple perspectives (disciplinary and ideological), multiple scales of existence (in humanity and in the natural world), and systemic interactions among the elements of society – those thought to be central but also other elements. World history, while a relatively new field of study and not yet a large one, presents advantages for this task because of its focus on coordinating study across multiple disciplines. Here I offer a statement of the broad scope of the field. At the birth of world-historical studies, the founding analysts participated actively and successfully in advancing environmental history, including climate history and history of

To illustrate my claim that human behavior is a mix of individual motivation and group solidarity, I offer two brief historical examples, each of which links individual identities to national groups. In 1789, as the French Revolution unfolded, the National Assembly adopted the Declaration of the Rights of Man and the Citizen, a memorable statement of individual rights in contrast to monarchical domination. Yet three years later, as France entered war with invading powers, the focus shifted from the individual to the nation and to the commonality of its military forces as expressed in the group-focused popular anthem, "La Marseillaise." A parallel drama of the balance between individual and group identity unfolded after the World War II. After the defeat of Nazi and Imperial Japanese campaigns of racial hierarchy, the newly formed United Nations adopted in 1948 the Universal Declaration of Human Rights: this was another memorable statement of individualistic philosophy. Yet as the Declaration was adopted, a great era of decolonization took place. More than 100 new national collectivities arose, in which national identities expanded as never before. In both cases, one sees a formal statement of the primacy of the individual and individual rights, linked to the practical development of powerful communities in which participants (or most of them) agree to devote themselves to the common welfare. In sum, theorization and analysis in terms of human groups are as important as the analysis of individual human behavior.

Organization and Hypotheses of the Book

Following this introduction, the book is organized into three sections to ask: what governs human behavior and how do we know? This opening chapter has introduced the Human System we live in – the multiple levels and accelerating change of its functioning, but also its troubles in environmental degradation and social conflict. It proposes the task of explaining the evolution of human society and the Human System.[22] The book's remaining three sections are a narrative that documents three geological ages of transformations in human society: the Pleistocene epoch from nearly 3 million years ago to 12,000 years ago (Chapters 2 through 5); the Holocene epoch from 12,000 years ago to 1800 CE (Chapters 6 through 8); and the Anthropocene epoch of the past two hundred years (Chapters 9 and 10). In the latter, humanity became the dominant force for change on Earth.

Chapter 2 begins my narrative with the biological and cultural evolution of hominin species in the Pleistocene epoch, up to 70,000 years ago, in the context of ecological change, documenting these hypotheses:

1. *Hominin brain size*. Hominin brain size grew rapidly, beginning 2 million years ago, through coevolution of genetic, epigenetic, cultural, and environmental processes.
2. *Expanding hominin capacities*. Expanding brains enabled individual-level advances in hominin capabilities, through varying mechanisms: new capabilities advanced reasoning, learning, communication, imagination, and emotional expression.
3. *Individual-level human nature*. The sum of these hominin capabilities may be defined as "individual-level human nature," including personality; emotions; family-level behavior; and capacities for reasoning, learning, nonverbal communication, and cooperation.

Chapter 3, the most fully theorized, presents three hypotheses arguing for the sudden rise of spoken, syntactic language in Northeast Africa and the formation of the Human System, roughly 70,000 years ago:

4. *Syntactic speech*. Syntactic speech emerged through a complex process to become the first community-scale institution, as it relied on explicit group behavior. Spoken language enabled the creation of other institutions and it accelerated the benefits of individual-level human capabilities.
5. *Group behavior and group-level human nature*. Group behavior, reinforced by spoken language, arose and facilitated construction of social institutions to perform needed tasks. The community of speaking humans, substantially larger than preceding family groups, emerged to sustain language. The sum of these emerging capabilities may be defined as "group-level human nature," including language, discourse, collective intentionality, emotional expressions, ideology, cultural production, and networking.
6. *Social evolution and emergence of the Human System*. The Human System emerged, linking all human activities and communities through coevolution among biological, cultural, and social evolutionary processes, in interplay with the environment. It expanded geographically and in its activities.

The narrative continues with the expansion of the Human System to the end of the Pleistocene in Chapter 4 (from 65,000 to 25,000 years ago) and Chapter 5 (from 25,000 to 12,000 years ago). The hypotheses for these two chapters are:

7. *Representation*. Early speaking communities emphasized representation of their world and group-based development of their group-level culture.
8. *Cross-community migration*. Human migration into multiple habitats brought networks of connection among communities.

9. *Incorporation of nonspeaking humans*. Nonspeaking humans (including *Homo sapiens*, Neanderthals, and Denisovans) were incorporated in significant numbers into communities of speaking humans.
10. *Production and confederation*. During the severe cooling and rapid warming of the Last Glacial Maximum, communities sought to protect themselves by combining to expand their numbers and adding productive activities to their foraging lifestyle. Confederation of communities built larger-scale social groupings to coordinate production.

For the early and mid-Holocene epochs, from 12,000 years ago to 1000 years ago, Chapter 6 traces the innovative expansion of social institutions, advancing these hypotheses:

11. *Expanded production.* Institutions of artisanal, agricultural, and pastoral production arose in the Holocene epoch, relying on new technology and elaborated social organization.
12. *Societies.* Societies arose out of communities and confederations in the Holocene epoch, coordinating production with substantially larger populations than the preceding social groupings.
13. *Network and hierarchy*. Networks and hierarchies grew in tension with each other during Holocene-era production and institutional change. As institutions of urbanism, commerce, religion, and empire arose, expanding hierarchy modified group-level human nature, encouraging a mix of coordination, conflict, oppression, and revolt.

The late Holocene epoch, 1000–1800 CE, brought contractions that ended human growth for a time, followed by growth. Chapter 7, on the years from 1000 to 1600 CE, traces collisions of populations and institutions, within humanity and Gaia. Chapter 8, on the years from 1600 to 1800, analyzes expansion and transformation in commerce and group-level culture. The hypotheses advanced for the late Holocene are

14. *Collisions and contractions*. Gaia brought warming then cooling while hierarchy in the Human System brought warfare and social oppression. The two met through migration of living things by terrestrial and oceanic routes, reducing human population while expanding environmental diversity.
15. *Global economic network*. Commercial links nevertheless tightened in regional economies. A global economic network arose in the Old World from 1200, circulating textiles, slaves, and silver. This network spread by 1500 to Africa and the Americas. Knowledge and cultural practice spread by the same network.
16. *Capitalism*. Capitalism – a regional mix of socioeconomic institutions and hierarchies – arose in Western Europe, especially in the

seventeenth century. It expanded in wealth and power during the eighteenth century, relying on ties throughout the world.

The Anthropocene epoch, from roughly 1800, brought unparalleled success and excess. Chapter 9 traces growth and crisis in the Human System. Chapter 10 identifies two social processes that may enable limitation of the crises.

17. *Accelerating growth.* Accelerating growth – unevenly distributed – expanded population, capitalist production, knowledge, the scale of warfare, and environmental degradation. Hierarchies and networks both expanded.
18. *Institutional and environmental crises.* Success and crisis, based on narrow self-interest, reached new extremes. Ideological disputes reached a global level. Crises broke out, highlighting environmental degradation and social inequality.
19. *Popular culture network worldwide.* Networks of global popular culture created new alliances, perhaps enabling reorganization of the Human System.
20. *Knowledge network worldwide; democratic discourse worldwide.* Exchange of knowledge brought a trend toward the sharing of knowledge through expanding worldwide literacy and the efforts of some scientific specialists. Democratic discourse may enable widespread consensus on social objectives. In it, a modified group-level human nature might rely on a larger scale of community to regulate institutions intended to fit the general welfare.

In the conclusion to this work, I suggest a certain parallel between humanity's current crises and the moment, long ago, when humans created a speaking community. Present-day creation of human networks – unified for the common good by popular culture and sharing available knowledge – would be quite a surprise. But it would be a surprise not much bigger than the rapid and imaginative creation of a community of speaking humans, 70,000 years ago, in which individuals and groups brought change to themselves and the world.

Pleistocene Evolution

development (epigenetics), and the documentation of hominin species through genomic analysis.[2] Then the analysis turns to the expanding capabilities of hominin species in the era of expanding brain capacity, from 2 million to 100,000 years ago. These growing capabilities included the emerging processes of learning through cultural evolution and multi-level selection, growth in hominin group size, types of communication by gesture or by sound, expanded capability for reasoning, underlying language abilities, and new knowledge about the character of human emotions and motivations.[3] In the third section, the chapter compares the communities of Neanderthals, Denisovans, and *Homo sapiens* as of 100,000 years ago. In sum, the chapter displays the new thinking that goes beyond skeletal phenotype to account for biological and cultural evolution of capabilities that were to enable learning, deeper logic, communication, and a wider range of emotions. Such extensions in analysis of individual-level behavior have brought an understanding that hominin life in mid-Pleistocene times was more elaborate and advanced than previously understood. This lifestyle provided a platform for a quite different sort of social and cultural change – to be explored in Chapter 3 – on the emergence of spoken, articulated language among *Homo sapiens*.

Evolving Hominin Phenotype: Pliocene and Early Pleistocene

We begin with the biological evolution of bipedal primates or *hominin* – a term that includes the genus *Australopithecus* in the Pliocene and the genus *Homo* in the Pleistocene.[4] The various species of the genus *Australopithecus*, all of them bipedal, lived in eastern and southern Africa during the Pliocene geological epoch (5 million to 2.6 million years ago). The succeeding Pleistocene epoch began 2.6 million years ago; at much the same time, the first species of the genus *Homo* arose: *Homo habilis*. In the next few paragraphs I provide phenotypical descriptions of successive hominin species, discuss the effects of climate and other environmental changes on hominin evolution, and then turn to the genotypical changes underlying what can be observed in the record of paleontology.

The genus *Australopithecus*, which emerged some 4 million years ago, was the first to become bipedal, though australopithecines did not walk as smoothly as the humans of today. The most famous skeletal remains are those of Lucy, a young female *Australopithecus afarensis* who lived 3.2 million years ago. Her skeleton shows clearly that she walked upright, and that her brain capacity was 380 to 430 cubic centimeters (cc). A recent comparison of australopithecine remains shows that their sexual

dimorphism was relatively modest. That is, males exceeded females in weight by about 15% – much the same as for humans today – in contrast with the much greater disparities between males and females in other primate species. This result suggests that the main mating pattern among australopithecines (and for virtually all subsequent hominins) has been monogamy.[5] Males averaged heights of 1.2 to 1.5 meters (3.9–4.9 ft) and weighed between 30 and 55 kg (66–121 lb). *Australopithecus* continued to about 1.4 million years ago.[6] The 1960 archaeological discoveries by Louis and Mary Leakey brought to light both skeletal remains and tools of *Homo habilis*. The Oldowan or pebble tools of these small beings remain the oldest confirmed type of tools. Further discoveries now suggest that *Homo habilis* lived from 2.4 million years ago to 1.4 million years ago, in East and Southern Africa, with male dimensions averaging 1.00 to 1.35 meters in height, 32 kg in weight, and a brain capacity of 550 to 687 cc. Given this brain size, researchers believe that *Homo habilis* had no more social learning skills than apes living today. Tool knowledge, therefore, was transmitted not by imitation but by other learning mechanisms.

As more individual hominin remains have been recovered, and as they have shown to be widely varied according to several criteria, a controversy has persisted among paleontologists as to whether they should be classified in broad or specific categories. At one limit, the late Louis Leakey argued that broad categories should be employed, so that the small individuals who lived up to 2 million years ago should be classified within the genus *Homo*, as *Homo habilis*. At an opposite limit are scholars who prefer to identify numerous categories in both genus and especially species for the various hominin remains. These discrepancies in labeling human remains make it difficult for readers to trace the broad evolutionary patterns. I have tried to adopt terms in the middle range of those used.[7]

Processes of Biological Evolution. Biological evolution for humans today is, in its biochemical process, the same as it was for australopithecine individuals including the famous Lucy. The elements of Darwin's theory hold across time. One of the three pillars in Darwinian analysis is natural selection: the varying fortunes of individuals within their environment help determine which have the most numerous offspring to carry forth their genome (modified by sexual reproduction) into the next generation. A second pillar is variation: in the time of Lucy as in our own, there has been substantial variation in the characteristics of individuals (at levels from the genetic to the phenotypical) arising from genetic inheritance, genetic mutation, and the interaction of individuals and their environment. The third pillar is inheritance: at conception, each human

individual receives a genome combined from the genomes of her or his parents, and the genes on those 23 chromosomes guide the individual throughout life. A further point in Darwin's analysis is that the individuals with the greatest "fitness," especially as measured by the number of their surviving offspring, will be able to sustain the lineage and will pass on their individual characteristics.

From our distance in time and space, we are unable as yet to see the biological details of the australopithecine genome or its processes, but we may have information on the *phenotype* – information on the physical type and behavior of the individual. Paleontologists, looking at skeletal remains and their surroundings, have focused on identifying such characteristics as height; weight; skeletal structure; teeth, skull shape; brain capacity; and information about diet, tools, and activities. The process of selection among variant individuals can take place at several levels – an incorrectly coded gene might fail to reproduce, or incorrectly coded proteins might not perform their metabolic processes, or the phenotypical function might be performed at a level that does not match up to that of competing individuals.

Modern laboratory work tells us that DNA, with copies in the nucleus of cells throughout the body, serves as the archive of evolutionary information. The DNA molecule can reproduce itself, whenever a cell reproduces. And the DNA is able to dispatch its information to cellular processes by serving as a template to create RNA, which moves from the nucleus to the cytoplasm of the cell and then creates specific proteins for each of the many metabolic processes. The extension of this work means that researchers have advanced steadily in documentation of human DNA and its history. Rebecca L. Cann, Mark Stoneking, and Allan C. Wilson led with a 1987 study by relying on mitochondrial DNA to document the African origins of modern humans through the female line. Later work expanded to analyzing polymorphisms of Y-chromosomes to trace the male line and somatic DNA, and most recently to whole-genome analysis of ancient DNA.[8] In addition, some of the proteins participate in epigenetic processes, alternately encouraging and restricting the production of RNA and new proteins. The interplay of these factors adds up, eventually, to the phenotype of an individual who lives from infancy through childhood and adulthood, where that phenotype constitutes the physical characteristics and the behavior patterns of that individual.[9]

In another long-term environmental pressure, the East African System of monsoons (in which summer heat on the continent forced winds north and south, alternating from one side of the equator to the other) brought alternations, every few thousand years, in the relative temperature and humidity of northeast and southeast Africa. This recurring pattern may

have encouraged periodic hominin migrations back and forth to the most fertile region – a pattern that may have built into hominin species a proclivity to migrate.[10]

Genus* Homo*: Early Days to 500,000 Years Ago. The earliest known remains of the genus *Homo*, from the Afar region of northeastern Africa, are dated to 2.3 million years ago. More complete fossils that are now labeled as *Homo ergaster* date to 1.8 million years ago, especially in eastern and southern Africa. The most recent remains of *H. ergaster* are dated to 1.4 million years ago. It is generally argued that this period of relatively rapid growth in brain size was a time at which hunting and consumption of meat had expanded significantly. The rate of development from infancy to adulthood for *Homo ergaster* was similar to that for modern apes, slower than for australopithecines, and much faster than for modern humans. Early specimens of *Homo ergaster* were associated with Oldowan tools.

Homo ergaster, in its relatively brief history, appears to have undergone a number of phenotypical and cultural changes. The brain size of known African *Homo erectus* individuals averaged 700 cc.[11] (Figure 2.1 portrays the distribution of skulls for which the brain capacity is known, showing age and brain capacity over 3 million years; the top graphic shows the decline of temperature and its increasing fluctuation with time.) High-yield foods were necessary to achieve brain growth and, at the same time, reduce the size of the gut, where digestion took place. Fishing contributed to a high-protein diet, and it is possible that fire began to be controlled in this era. Then from 1.6 to 1.4 million years ago, the industry of Acheulian tools appeared in Africa, presumably among African *Homo erectus*. This industry, centering on tear-shaped hand-axes, continued in Africa and also in western Eurasia for the next million years. Gradual modifications of the Acheulian tools, though small, have been documented. In East Asia, however, Oldowan tools continued to be used. Further, at some point in hominin evolution, most body hair disappeared. While there is no direct evidence, recent work suggests that, as brain size grew, it became advantageous for hominins to lose most of their body hair at about 1.7 million years ago, in the era of African *Homo erectus*. Evidence for the timing of this change comes from genomic analysis of body lice and pubic lice.[12]

In addition to Darwinian genetic evolution, epigenetic changes are now argued to have been significant in the rapid phenotypical changes of *Homo ergaster*. Ian Tattersall makes a detailed argument for this interpretation, based especially on a single skeleton: the remains of Nariokotome Boy, the nearly complete skeleton of a youth who lived 1.6 million years ago at

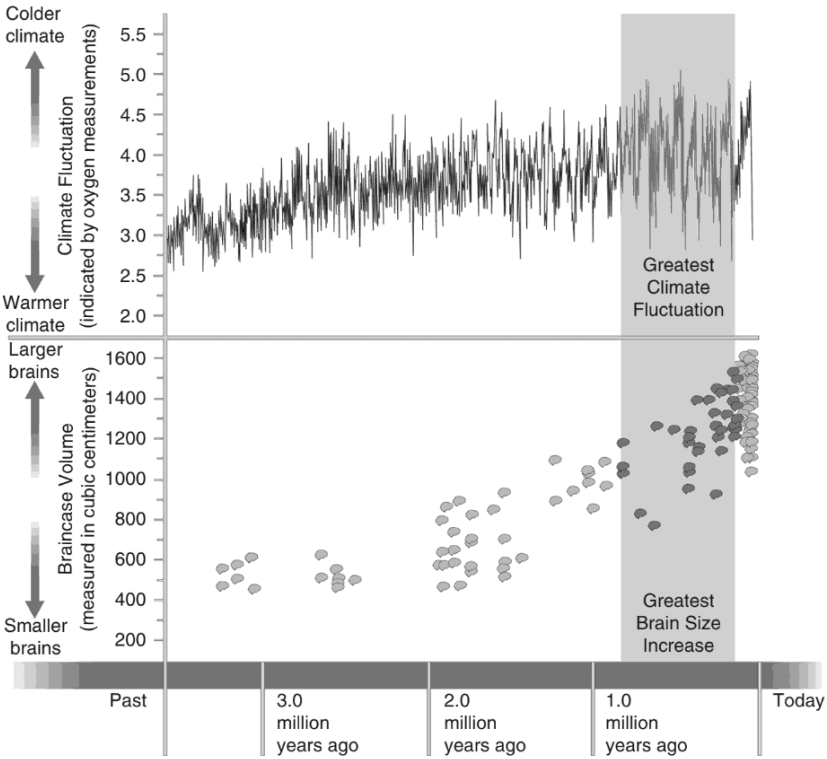

Figure 2.1 Range of brain sizes in hominin specimens. (Courtesy of the Human Origins Program, Smithsonian Institution.)

Lake Turkana in Kenya. This individual, with a height of 1.6 meters and now estimated to have been 8 years old at death, was "a hominid that grew up fast but physically was like nothing we know from earlier in time, and a creature that was clearly at ease away from the ancestral forest" (105).[13] The long legs imply adaptation to grasslands and an ability to carry out some hunting activities. Tattersall suggests that the sudden appearance of this significantly different phenotype may have resulted from epigenetic change, in which "a minor mutation that occurred in the Boy's lineage that, through altering gene timing and expression had radically changed its possessor's morphology – and had, entirely accidentally, opened new adaptive avenues to them."[14] Based on this example, Tattersall argues that the size of family groups or bands changed with the function of a species in the food chain. That is, earlier australopithecines, as foragers

term event of major developmental reorganization, even if that event was likely driven by a rather minor structural innovation at the DNA level."[25] Overall, the Eastern Hemisphere, as of about 200,000 years ago, included various hominin populations, with at least some of them undergoing both physical and cultural-technical changes. They included *Homo sapiens* in northeast Africa, *Homo heidelbergensis* or successor species in other parts of Africa, *Homo neanderthalensis* from Europe to Central Asia, Denisovans in Central Asia and perhaps regions to the south, *Homo erectus* in eastern and southeastern Asia, and even the diminutive *Homo floresiensis* in island Southeast Asia.[26]

Advances in Hominin Capabilities

The foregoing picture of hominin evolution up to 200,000 years ago draws especially on paleontology, which conveys its increasingly clear picture of the physical evolution of hominin species – especially the growth in brain capacity – based on physical remains but also on growing understanding of epigenetics. We turn now to the strong likelihood that expanded capabilities arose along with the size of the human brain. Four more areas of advances in research need to be added into this still-speculative overview of hominin evolution in the times before language and speech. Two of these areas, the fields of cultural evolution and evolutionary linguistics, have expanded impressively since 1980. Three other areas of analysis – visual communication, the size of hominin social groups, and emotions – have shown themselves to be worthy of deeper investigation. Altogether, these research efforts show that the expansion in hominin neocortex had complex and interconnected implications for hominin capabilities.

Cultural Evolution. Cultural evolution has become a discipline linking social science, ecology and biology, hypothesizing a "dual inheritance" of biological and cultural change to "clarify the logical relationships between cultural transmission and other Darwinian processes."[27] Scholars in cultural evolution assume significant advances in human capabilities, somewhere in the time from the rise of *Homo erectus* 1.4 million years ago to the disappearance of *Homo heidelbergensis* 200,000 years ago. Robert Boyd, Peter J. Richerson, and their colleagues trace the steps by which, from this base, social learning took place, expanding to cultural learning and the coevolutionary development of population properties. They use the term "culture" to refer to any imitation, teaching, and learning that transmits behavior from one generation to the next. (As a matter of world-historical scale, I label this as "individual-level culture"

to distinguish it from "group-level culture."[28]) Their theory includes identifying ways in which individuals within small groups developed patterns of cooperation, the basis for all future development of the processes in cultural evolution. The initial vision of social learning came from the psychologist Albert Bandura.[29] The process of cognition "in a social context" enables the individual to learn in a context of exposure to a variety of behaviors. At a more complex level, that of cultural evolution, the individual has the option of explicitly imitating a model behavior, likely but not necessarily that of a parent. The social-learning effects of cultural evolution are changes in behavior, not any changes in the physical form of the organisms. As a result, researchers have modeled changes in cultural evolution in a search for logically consistent hypotheses of changes. Researchers in cultural evolution turn to archaeology in an effort to trace the use of physical techniques, such as in tool production, that could have come only from social learning. The process of social learning arguably continues in the present; studies for recent times focus on cooperation.[30]

Such cultural evolution is a process for creating and inheriting learning. It emphasizes learning from one another, and there is no doubt that it could proceed, at least in part, without spoken language. The mechanisms of cultural evolution are assumed to be adaptive for fitness that will maximize the number of the individual's offspring. The evolving characteristics, in the case of cultural evolution, are a type of behavior, such as a technique for making a stone tool. According to the theory, when the individual successfully learns, the result is encoded in that individual's brain – the brain thus becomes the archive for the characteristic (in contrast to the biological genome). In this case, since learning goes to the brain, there is no distinction parallel to that of phenotype versus genotype. The characteristic must be heritable, but the inheritance takes place through the individual learning of the characteristic by persons in the next generation – most obviously from parent to child, though other paths of transmission could just as well be followed. The characteristic must be variable – in the example, there must be varying techniques for tool making that can be compared in effectiveness.

Further, because cultural evolution takes place at the level of the individual organism, it is evidently in competition with genetic evolution, which also focuses on the individual level. What is the consequence of competing evolutionary processes? The theorists of cultural evolution have conducted modeling to demonstrate that the two processes are opposed in a zero-sum game.[31] Ideally, the result is an "equilibrium" of cultural and genetic fitness – thus, a stable and balanced degree of genetic and cultural characteristics, which must work out even though the two

evolutionary processes are quite different. For instance, the timing of transmission is different: genetic character is received from both parents by the individual only at birth; cultural character is contributed over the course of a lifetime, the contributions of parents can vary, and persons other than parents may contribute. Overall, however, cultural evolution can be modeled so that it will not permit individual-level culture to reduce individual genetic fitness.[32]

Three key analytical points in cultural evolution are known as inclusive fitness, the Price Equation, and multilevel selection. W. D. Hamilton argued that in "inclusive fitness," the genetic success of an individual can be treated not only as an organism's direct descendants but also includes the descendants of siblings and other close relatives.[33] This raised the possibility of inheritance of altruistic behavior among individuals. The Price Equation, based on the work of George Price and John Maynard Smith, extended this reasoning to groups of similar individuals, focusing on the coevolution of the frequency of a characteristic with the fitness of the individual.[34] The concept of multilevel selection is that selection can be assessed at the personal level, the level of inclusive fitness, and as multilevel selection. This facilitates analysis of such cases as sickle cell anemia and the inheritance of altruism, showing how it could be that inheritance of altruism would reduce the fitness of each individual yet increase the fitness of a group of such individuals.[35]

Further, it is argued that cultural transmission of this sort can become cumulative and can become a population characteristic.[36] Is cultural transmission really a population variable? This is important for whether the mechanism can indeed work for larger populations. Joseph Henrich argues that social learning began as early as 1.8 million years ago with *Homo erectus*, in the form of individual imitation. An individual develops one innovation; another person (likely a child) imitates it. Then the imitator arranges for the next generation to imitate it. In this way, each innovation gradually becomes more frequent in the population. If it can be dependably passed on, and if one can teach the innovations one has imitated plus one new innovation, overall technology advances. Henrich uses the term "Crossing the Rubicon" to refer to the tipping point at which the cumulation of innovations becomes self-reinforcing.[37] Henrich argues that there was cumulative cultural evolution at least for a while around 750,000 years ago at the site of Gesher Benot Ya'aqov in Israel, then argues that at about 450,000 years ago, *Homo heidelbergensis* in general had achieved that level of cumulative cultural evolution.[38]

In multidisciplinary work, the issue of "reductionism," discussed throughout the sciences, eventually came to studies of human evolution. The general strategy of reductionism is to use a simplified model, often

taken from a work at a lower level of aggregation, to explain an apparently complex phenomenon. Thus, modeling from physics was important in the rise of molecular biology; here, biological modeling is used to explain social phenomena and the question is whether human group behavior can be reduced to equivalent individual behavior. The limits on reductionism are reached when new dynamics appear that cannot be accounted for in the reduced theory. That is, as I argue, the individual-level analysis of cultural evolution, while it can explain some group cooperation, is not able to account for the dynamics of group social behavior.[39]

Linguistics, Reasoning and Internal Language. The identification of the *FOXP2* gene, known to affect the ability to speak, initially raised hopes that a gene for speech had been discovered. But it came to be understood that the full complex of language and speech requires the interplay of numerous genes, so that the single *FOXP2* gene was not the key to language.[40] For the evolution of language, Berwick and Chomsky trace steps parallel to those proposed by the cultural evolution theories, from a parallel base, in rather explicit detail. They label the capability for syntax of an internal language as a "CPU" which computes the unspoken internal language (i-language), drawing on an available *lexicon* of word-like meanings, and linking them to an *interface* with the system of thought, which carries out the processes of reasoning, inference, and planning. This is their statement of the initial conditions, the basis from which their analysis of language begins – all within the mind of the individual. In addition, they allow for the existence of a "sensorimotor" system that connects the individual to the rest of the world. The CPU thus connects with two interfaces: the internal interface with thought, which combines to create internal language, and the interface with the sensorimotor system, which has the potential to include spoken language and which also is the interface through which learning takes place.[41] Berwick and Chomsky then propose a second biological change: a small-scale mutation that adds to the power of the CPU. This is the Merge function, which provides a simple way to combine words into hierarchical groupings. As a result, the interaction of CPU, lexicon, and the system of thought became far more sophisticated. They assume that the Merge function, once it emerged, spread rapidly throughout the population by natural selection. They emphasize that the benefits of Merge for the internal thinking processes (i-language) were greater than the benefits of the later development of speech.[42] Nonetheless, under this reasoning, the later emergence of e-language, syntactical speech, would have enabled the exchange of

higher-level thinking among individuals, leading to creation of new sorts of group behavior.

Berwick and Chomsky assume that the advanced i-language, relying on Merge, persisted and expanded among hominins for at least several thousand years without leading to the invention of speech. They assume that the higher skills in hierarchical reasoning gave great advantages to those who had that capability, and that they grew and spread in influence. Yet once the Merge function had established itself, they assume that speech was sure to follow. In time frame, Berwick and Chomsky estimate that the Merge function arose about 80,000 years ago, and that the development of spoken language had taken place before 60,000 years ago, when groups of *Homo sapiens* began migrating from Africa into Asia. They choose 80,000 years ago because of the archaeological investigations of Blombos Cave in South Africa, which show illustrations drawn on the wall that suggest an unprecedented skill in representation.[43] So I emphasize the importance of the emergence and spread of the Merge function, as described here, and I follow up in Chapter 3 with analysis of the next step, the invention of speech.[44]

Visual Communication. Evolutionary psychologist Michael Tomasello drew on the turn to epigenetics, emphasizing ontogeny or development of the young. Tomasello had already begun work on "cultural learning."[45] Starting in 1998, he conducted detailed comparisons of development of young primates: humans, chimpanzees, and bonobos, with attention to visual communication. He concluded that perception of the physical world developed in parallel for all three species but that perception of social relations developed to a much higher level in humans. He hypothesized that early hominins began food sharing, which opened the door to cooperation; that 400,000 years ago humans began to work closely in pairs (especially as mates); and that population rose 150,000 years ago, requiring humans to work in groups.[46] While Tomasello's work paralleled that of Boyd and Richerson in some ways, the two groups pursued different agendas. Boyd and Richerson emphasized dual heritage and group selection, yielding genetically supported advance in cooperative outlook. In this model, groups and tribes grew slowly but at expanding rates. Tomasello emphasized ontogenic processes of development, giving more attention to intimate social interaction.

Groups of Hominins. Efforts to document the size of hominin social groups focus, in part, on brain size. Leslie Aiello and Robin Dunbar studied primates of all sizes to compare their brain capacity with the size of common social groups for each species; they concluded that group sizes increased linearly with brain size. Projecting this relationship to the brain

sapiens settlers occupied the cave. But they were unable to sustain their occupation of the region: Neanderthals occupied the cave at a later and cooler time. Yet there were other hominins, whose remains were left in Moroccan caves 110,000 years ago, who used a technology known as Aterian. For a slightly later time, remnants were found at Qafzeh Cave and also at the nearby site of Skhul, which might have been hybrids of Neanderthals and *Homo sapiens*, or which might have been hybrids of Aterians and *Homo sapiens*.[54] In these and other remains of North Africa, South Africa, Israel, and Congo, indications are found of the gradual development of decorative material culture, including the piercing of marine snail shells, the heating of pigments to deepen their color, the creation of bone harpoons and, in the most striking item, the ochre plaques, geometrically engraved, found in Blombos Cave of South Africa. Such evidence supports the argument by Sally McBrearty and Alison Brooks for early and gradual development of decorative material culture in Africa.[55]

The lifestyles of the widely dispersed hominin populations must have been broadly similar. The populations lived particularly along waterways, produced and used stone tools with the Middle Stone Age technology, and had a foraging lifestyle – gathering vegetable and animal matter from land and water, gaining meat primarily by scavenging, but also hunting. They shared ways of learning, though speech was not central to their life.[56] The bodies of the various species were virtually identical; the brain size and cranial shape varied somewhat among them. Each population, in order to sustain itself, required at least several thousand individuals, in the view of population geneticists. In addition, these hominin populations found themselves in competition for resources with other medium- to large-sized mammals.

What was the nature of the psychology and behavior of these hominin individuals and families? While we have no direct observations on them, what we know about modern humans and other animal species enables us to assume that they had individual personalities and temperaments, and that they were active agents in the lives they lived. The families in which they lived, mostly small groups that were rarely as large as 30, interacted according to patterns that provided roles for family members by age and sex; mating was commonly monogamous.[57] The balance of violence, collaboration, submission, love, and ambition cannot be known for sure, but all of these and other motivations were surely in play.

The research on cultural evolution, evolutionary linguistics, and other behavior gives us additional questions to ask about these hominin species. According to recent research, we are left with parallel possibilities for each of these issues: that someplace in the time from the emergence of *Homo*

erectus to *Homo sapiens*, as brain size grew rapidly, human mutations or developmental shifts may have provided these beings with additional capability for social learning, for enhanced emotional expression, for communication (via gesture, music, or basic lexicon), for internal language that heightened logical abilities, and for variations in the size of their communal groups. Which of these species had achieved the level of basic capability for cultural evolution and for internal language? Which of them had advanced in processes of cultural evolution to the point where "cumulative cultural evolutionary products were driving the genetic evolution of our genus, shaping our feet, legs, guts, teeth, and brains"?[58] Which of them had benefited from the mutation that brought the Merge function, leading to advances in hierarchical construction of sentences in an internal language? Which of them gained the capability of developing further behavioral predispositions, such as the need to symbolize, to explain, or to act, that would influence the evolution of human behavior? To the degree that any of these changes took place in the era of *Homo heidelbergensis*, up to 500,000 years ago, these advanced capabilities would have been passed on to all of the hominin species. To the degree that these changes took place after 200,000 years ago, only individuals among *Homo sapiens* had access to these new capabilities. Further analysis of available information should help sort out the possibilities. For instance, the remains of *Homo sapiens* at Qafzeh, 115,000 years ago, and their disappearance thereafter, may indicate that they were then lacking some capabilities that had been gained by 60,000 years ago.

3 Speech and Social Evolution

This chapter presents my hypothesis of the sudden rise of spoken, syntactic language in Northeast Africa, between 70,000 and 65,000 years ago. It follows up with the resulting process of social evolution; the formation of the Human System; and the initial coevolution of the social, cultural, and environmental aspects of human life. At the conclusion of the preceding chapter, we left *Homo sapiens* as one of three or perhaps more foraging hominin populations. Today, *Homo sapiens* alone has become the dominant species on Earth. Was this transformation sudden or gradual? In an important 2001 article entitled "The Revolution that Wasn't," archaeologists Sally McBrearty and Alison Brooks argued for slow and steady transformation within Africa's *Homo sapiens* population.[1] Most forcefully, they argue against the thesis of a "human revolution" that took place about 40,000 years ago, during which humans might suddenly have gained advanced conceptual skills (reflected, for instance, in cave paintings). Specifically within African hominin populations, McBrearty and Brooks argue for continuing development in technology, behavior, and skeletal structure from 250,000 years ago, rather than a long wait before a "human revolution" 40,000 years ago. Instead, McBrearty and Brooks rely on the continuous African fossil record to document a succession of developments beginning with Middle Stone Age technology and including the early development of decorative practices relying on ochre for coloring and on ostrich shells for making beads.[2] Since publication of their 2001 article, archaeological advances have confirmed the recurring changes and developments in African social practices.[3]

In this chapter, however, I offer a picture of sudden and revolutionary change, though I argue that such change took place within the framework proposed by McBrearty and Brooks. Change did take place at a revolutionary pace – not with the arrival of *Homo sapiens* in Europe 40,000 years ago but with the emergence of speech in Northeast Africa at about 70,000 years ago. As a result, *Homo sapiens* expanded to occupy all of the Eastern Hemisphere by 25,000 years ago – by which time all other

hominin species had disappeared as independent communities (though with individuals absorbed into the expanding *Homo sapiens* population). My approach is to embrace the results reported by McBrearty and Brooks, but to argue that revolutionary change still took place. I emphasize articulation of speech rather than the emergence of cognition; and I hypothesize complex relationships between an initial community of speaking humans and the other humans with whom they interacted. I argue that the initial commitment to creation of a speech community laid the groundwork for other instances of explicit cooperation. Such cooperation – distinctive from earlier forms of cooperation because it involved an explicit, voiced commitment to a group – yielded the formation of social institutions, beginning with language, community, rituals, and migration, and more thereafter.

Language and Speech

"The Founders" is the label that I give to the initial community of speaking humans.[4] "Speech" is the term I give to the syntactic language that the Founders created.[5] The apparently sudden changes and expansion of this founding community, occurring from about 70,000 years ago, set the pattern for human expansion ever since.[6] Physically, the Founders were virtually the same as humans today – their average height and the size of their brains were very much like those of today and similar to those of other hominins in their time. They were good at walking and running – foragers who lived in savannas (grasslands) and did some hunting. They relied on a standard set of Middle Stone Age tools, of a type that had been in use in Africa by 300,000 years ago.[7] In such a speaking community, its members commit themselves to the group through the effort of learning their shared language.

We lack direct evidence to confirm the dating I propose for this transformation: 70,000 years ago.[8] The timing of my hypothesis relies on a triangulation of genetic, archaeological, and linguistic data plus the assumption that the documented human demographic and migratory expansion began soon after the rise of speech communities. Specifically, I propose that the rise of syntactic speech communities was as early as 70,000 years ago and as late as 65,000 years ago. My overall hypothesis proposes a process by which speech, representation, community, and migration combined to create a process of social evolution. I then argue that social evolution brought about the emergence of the Human System, encompassing all speaking humans, the dynamics of their community life, and the processes of their expansion and change. The preeexisting processes of individual-level, cultural evolution persisted and contributed to

overall coevolution of human behavior. But new processes of group-level evolution emerged along with the construction of syntactic language. From this point on, the overall coevolution of humanity was to depend increasingly on group behavior, focused on the evolution of institutions.

In linguistics, I rely on work documenting elements of a proto-human spoken language to support the argument that syntactic speech arose within a single community and did so rapidly rather than slowly. Continuing research, notably by Christopher Ehret, reaffirms the argument that a proto-human language arose in a single community, and that all languages of today are descended from it. The language has by no means been reconstructed, but Ehret has made advances in showing substantial commonality in basic vocabulary for such terms as pronouns (first and second person singular), words for mother and grandmother, and for *deictics,* terms such as "this" or "that." Thus, he reports the term "**mai" for first-person singular, the terms "**wai" and "*mue" for second-person singular, and the terms "*ina" and "*aya" for mother. Ehret's data on vocabulary of proto-human language are reconstructions, drawn from languages all over the world. These words give evidence that all languages today are descended from a single stock.[9]

Relying on this assumed creation of spoken language by the Founders, I assume that, at some point, a small and localized group of people – perhaps a mix of adults and children – began sharing their thoughts by assembling vocalized sentences to represent specific and even complex meanings. I assume, as I have emphasized, that the Founder population lived in Northeast Africa.[10] Yet there were prerequisites to be satisfied before the Founders could gather to undertake their path-breaking verbalization. To begin with, they required the conceptual capability to speak. Where did the logic of speech come from? Was spoken language necessary for survival or for thriving? Linguists and philosophers have considered this question in depth for the past 50 years. Noam Chomsky long led the discussion, arguing that the complex logic of language was somehow inbuilt into the human mind, waiting for the practical opportunity to apply it. No one could find a specific organ prepared to handle language: the debates were ferocious, but research advanced only slowly.[11] Scholars of collective learning came to suggest that, even without special suborgans within the brain, tool-making hominins had been gradually expanding their logical capabilities. As described in the previous chapter, linguists Berwick and Chomsky have developed the notion of the Merge capability – a simple but crucial logical step, enabled by a genetic shift, that enabled individuals to link two ideas into a conceptual bundle and then link the bundle to a third idea, in a process that could be extended for several steps. This enhanced capability for reasoning took place within

connect the two speech communities. These properties of language arise not from some grand design, but from the interplay of the sounds and meanings in the practice of speaking. The inherent characteristics of language generated dynamics within speaking communities: we will see parallels to this pattern in the dynamics of other social institutions. My third point is that, however speech got started, it unleashed discourse, social reorganization, and innovation. Which words were created first? The labeling of family roles and the naming of individuals are good candidates. For instance, naming and categorizing family members meant being able to speak explicitly about hierarchy and interplay of male and female, of inside and outside the family. In addition, the naming of parts of the body and the most basic elements of material culture are also good candidates: hands, feet, eyes; food and water. All of these are nouns.[20] Further, the most common actions of humans are also good candidates for early words. Along with the invention of nouns and verbs, people would soon have developed modifying terms for what is big or small, fast or slow, hot or cold. The invention of language was a unique step in itself; it also set a paradigm for social evolution.

Language itself, however, was not enough to sustain the promise that it held out. One must hypothesize that the institution of *community*, including some 100–300 people, soon arose as a second social institution, with its members speaking a single, original language. Once spoken language was created, it could persist only if a community provided social structures to sustain the shared words and meanings, preserving and expanding them. Such a community of speaking individuals, once it formed, was a new experience.[21] It must have appeared as a massive and formidable social grouping, immensely outsizing the family groups that surrounded it, each with perhaps 20 nonspeaking persons.[22] Family units, of course, continued to exist within the new and larger language community, yet the nature of family life must have undergone transformation because of the ongoing connections through speech to members of other families within the new community. I argue that a speaking population, with its language, community, and rituals, acts according to the plan of the group as a whole. That is, speakers of a language agree to accept pronunciation and meanings of words that are used by the group as a whole. In contrast, informal groups of hunters may pursue similar objectives, but individuals within the group may also take their own path.[23]

The formalized community, providing a common identity to the group whose members spoke the initial syntactic language, still required additional devices with which to give coherence to the expanded community. Thus, a third institution was required – the institution of *ritual* or customs in which community members participated to reinforce their communal

sentiments. Language required commitment to the shared practice of speaking; community required commitment to an expanded social identity; ritual required participation in events that reaffirmed, rationalized, and celebrated the community. As I argue, however, the central element of an institution is a group of people who share an objective. The institution of rituals, therefore, was either the full group that acted out the ritual or a smaller group that planned and directed the ritual. The dynamics of rituals were the movements and sounds of dance and song and the emotions of solidarity evoked by ritual.

In defining institutions, I will offer this type of reasoning at multiple reprises in this book. Other major innovations, large and small, created new institutions in human experience, and the internal logic of each institution brought into play the dynamics necessary to sustain the character of activity in that new institution. For agriculture, the nature of the agricultural calendar arose from the needs for planting, weeding, harvesting, and storing. For ceramics, the need to control both clay and fire developed specific skills of modeling and firing that generated a recurring desire for creativity in design. For migration, as we will see, the combination of the human life cycle and the availability of different language communities both encouraged and required migration and learning among young adults. The distinctive dynamics of speech, agriculture, ceramics, and migration were neither inherited nor invented by the innovators. Instead, they were encountered by those who invented the new institution, as inherent and inescapable elements of this newly formed aspect of life. Such was the case, later on, for libraries, the state, war, and science. Thus, for speech and other big steps in social evolution, human agency launched the innovation but did not determine the details of its dynamics.

From the moment that syntactic speech emerged, there arose the question of whether speaking humans were able to teach language to others. Was the capability to learn to speak determined by biological ancestry or by social learning? Of course, parents taught language to children, as is done today. The question is whether speaking adults (or children) were able to teach language to nonspeaking adults (or children). At least within the earliest days in Northeast Africa, it seems that language could have spread rapidly only by teaching language to new groups. This experience of teaching and learning of language, once adopted at the start, tended to continue. Speaking humans grew in number and, at the frontiers of their communities, other humans learned to speak. Thus, the early days of language necessarily involved processes of both convergence and divergence: people spoke at all levels of proficiency, with varying accents, so that pidgins and creoles emerged along with the

development of standard languages, the divergence of dialects, the rise of new languages, and at the edge of speaking communities.[24] This complexity has characterized the history of language ever since.

Nevertheless, teaching nonspeakers to speak may have required that the learners had already inherited the Merge capability and that their sensorimotor capabilities were adequate for speaking. There is no reason to doubt that sensorimotor capabilities were similar throughout hominin populations, but the Merge capability had not initially been inherited by many. Could those without Merge learn to speak, even at a very basic level? At worst, they simply could not learn, and the spread of language was limited by the pace of biological evolution – for hominins, a rate of about 35 generations per millennium. At best, there were no limits on learning to speak, in which case speech spread as the large communities of speaking people expanded and incorporated people from nonspeaking groups. In between, there is the possibility that those without Merge could learn an inferior sort of speech and could be incorporated as subordinates, inferior in their reasoning and their social capability. The recent attention to interbreeding of hominin groups, however, suggests that learning language might have been possible. An alternative is that early speaking communities included some people who could speak and others who could not. Any such patterns ultimately disappeared as Merge spread through the population, but the inequalities of early days may have instilled certain inegalitarian values and practices that were influential over the longer run.

Social Evolution

Social evolution, as defined here, centers on the creation and change of social institutions, where institutions are defined as structures formed and maintained by members to achieve agreed-upon purposes. These paired definitions of social evolution and social institutions are central to my analysis. The term "institution," however, has two principal meanings in common usage. I adopt the definition commonly used by anthropologists, in which institutions are groups of people and their behavior, rather than the approach of sociologists and economists, who treat institutions as society-wide norms and rules.[25] The advantage of the group-focused anthropological view is that it treats group-based structures as elements of society that are created, transformed, and eliminated according to their strengths and weaknesses. These institutions, while not exactly parallel to the genes within genetic evolution, reproduce themselves and change gradually according to social and environmental pressures; they contribute their behavior to the functioning of a larger Human System. In