THE CULTURAL ORIGINS OF HUMAN COGNITION

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Individual human beings are able to create culturally significant artifacts only if they receive significant amounts of assistance from other human beings and social institutions. In my case, I was able to write this book—whatever its faults and however limited its cultural significance—only because I received direct assistance from the following people and institutions (and, of course, indirect assistance from all the other people over the past 2,500 years of Western civilization who have thought and written about the basic puzzles of human cognition).

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CONTENTS

1

A PUZZLE AND A HYPOTHESIS

All the greatest achievements of mind
have been beyond the power of unaided individuals.

—Charles Sanders Peirce

Somewhere in Africa, sometime about 6 million years ago, in a routine evolutionary event, a population of great apes became reproductively isolated from its conspecifics. This new group evolved and split into still other groups, leading eventually to several different species of bipedal ape of the genus *Australopithecus.* All of these new species eventually died out except one that survived until about 2 million years ago, by which time it had changed so much that it needed not just a new species designation but a new genus designation, *Homo.* Compared with its australopithecine forebears—who were four feet tall with ape-sized brains and no stone tools—*Homo* was larger physically, had a larger brain, and made stone tools. Before long, *Homo* began to travel the globe widely, although none of its early forays out of Africa succeeded in establishing any populations that survived permanently.

Then, somewhere still in Africa, sometime about 200,000 years ago, one population of *Homo* began on a new and different evolutionary trajectory. It began living in new ways in Africa and then spread out across the world, outcompeting all other populations of *Homo* and leaving descendants that are known today as *Homo sapiens* (see Figure 1.1). The individuals of this new species had a number of new physical characteristics, including somewhat larger brains, but

most striking were the new cognitive skills and products they created:

- They began to produce a plethora of new stone tools adapted to specific ends, with each population of the species creating its own tool-use "industry"—resulting eventually in some populations creating such things as computerized manufacturing processes.
- They began to use symbols to communicate and to structure their social lives, including not only linguistic symbols but also artistic symbols in the form of stone carvings and cave paintings—resulting eventually in some populations creating such things as written language, money, mathematical notation, and art.
- They began to engage in new kinds of social practices and organizations, including everything from the burying of the dead ceremonially to the domestication of plants and animals—resulting eventually in some populations creating such things as formalized religious, governmental, educational, and commercial institutions.

The basic puzzle is this. The 6 million years that separates human beings from other great apes is a very short time evolutionarily, with modern humans and chimpanzees sharing something on the order of 99 percent of their genetic material—the same degree of relatedness as that of other sister genera such as lions and tigers, horses and zebras, and rats and mice (King and Wilson, 1975). Our problem is thus one of time. The fact is, there simply has not been enough time for normal processes of biological evolution involving genetic variation and natural selection to have created, one by one, each of the cognitive skills necessary for modern humans to invent and maintain complex tool-use industries and technologies, complex forms of symbolic communication and representation, and complex social organizations and institutions. And the puzzle is only magnified if we take seriously current research in paleoanthropology suggesting that (a) for all but the last 2 million years the human lineage showed no

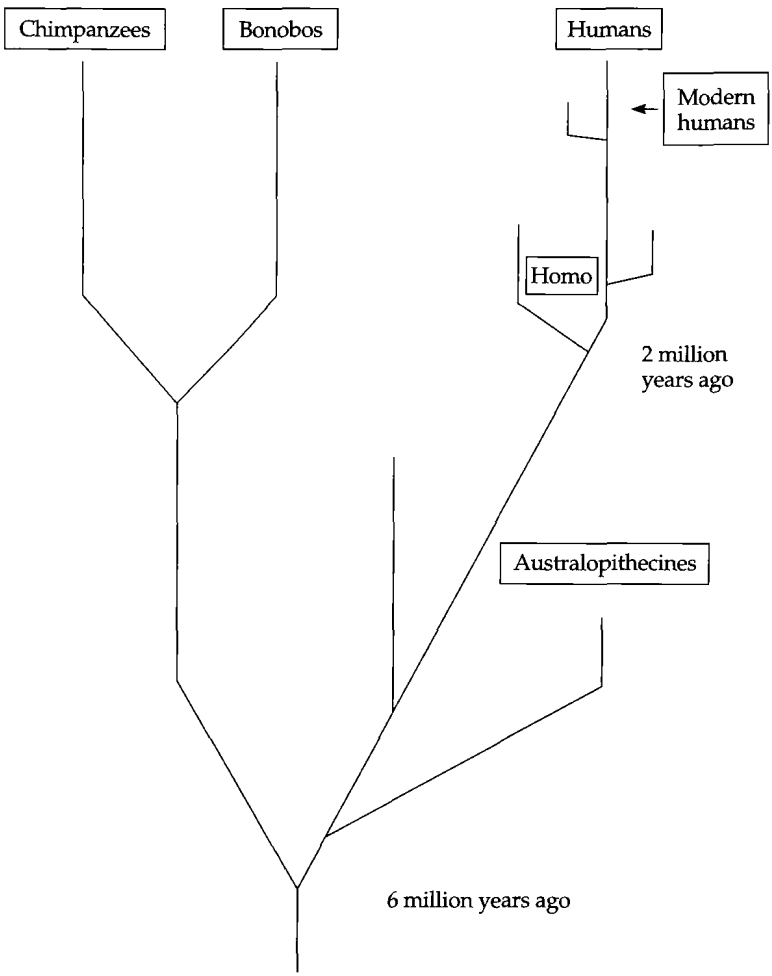

Figure 1.1 A simplified depiction of the time scale of human evolution.

signs of anything other than typical great ape cognitive skills, and (b) the first dramatic signs of species-unique cognitive skills emerged only in the last one-quarter of a million years with modern *Homo sapiens* (Foley and Lahr, 1997; Klein, 1989; Stringer and McKie, 1996).

There is only one possible solution to this puzzle. That is, there is only one known biological mechanism that could bring about these kinds of changes in behavior and cognition in so short a time—whether that time be thought of as 6 million, 2 million, or one-quarter of a million years. This biological mechanism is social or cultural transmission, which works on time scales many orders of magnitude faster than those of organic evolution. Broadly speaking, cultural transmission is a moderately common evolutionary process that enables individual organisms to save much time and effort, not to mention risk, by exploiting the already existing knowledge and skills of conspecifics. Cultural transmission includes such things as fledgling birds mimicking their species-typical song from parents, rat pups eating only the foods eaten by their mothers, ants locating food by following the pheromone trails of conspecifics, young chimpanzees learning the tool-use practices of the adults around them, and human children acquiring the linguistic conventions of others in their social groups (Mundinger, 1980; Heyes and Galef, 1996). However, despite the fact that all of these processes may be grouped under the general rubric of cultural transmission, the precise behavioral and cognitive mechanisms involved in the different cases are numerous and diverse, including everything from parents eliciting fixed action patterns from their offspring to transmission of skills by imitative learning and instruction—which suggests the possibility of significant subtypes of cultural transmission processes (Tomasello, 1990; 1994). One reasonable hypothesis, then, is that the amazing suite of cognitive skills and products displayed by modern humans is the result of some sort of species-unique mode or modes of cultural transmission.

The evidence that human beings do indeed have species-unique modes of cultural transmission is overwhelming. Most importantly, the cultural traditions and artifacts of human beings accumulate

modifications over time in a way that those of other animal species do not—so-called cumulative cultural evolution. Basically none of the most complex human artifacts or social practices—including tool industries, symbolic communication, and social institutions—were invented once and for all at a single moment by any one individual or group of individuals. Rather, what happened was that some individual or group of individuals first invented a primitive version of the artifact or practice, and then some later user or users made a modification, an "improvement," that others then adopted perhaps without change for many generations, at which point some other individual or group of individuals made another modification, which was then learned and used by others, and so on over historical time in what has sometimes been dubbed "the ratchet effect" (Tomasello, Kruger, and Ratner, 1993). The process of cumulative cultural evolution requires not only creative invention but also, and just as importantly, faithful social transmission that can work as a ratchet to prevent slippage backward—so that the newly invented artifact or practice preserves its new and improved form at least somewhat faithfully until a further modification or improvement comes along. Perhaps surprisingly, for many animal species it is not the creative component, but rather the stabilizing ratchet component, that is the difficult feat. Thus, many nonhuman primate individuals regularly produce intelligent behavioral innovations and novelties, but then their groupmates do not engage in the kinds of social learning that would enable, over time, the cultural ratchet to do its work (Kummer and Goodall, 1985).

The basic fact is thus that human beings are able to pool their cognitive resources in ways that other animal species are not. Accordingly, Tomasello, Kruger, and Ratner (1993) distinguished human cultural learning from more widespread forms of social learning, identifying three basic types: imitative learning, instructed learning, and collaborative learning. These three types of cultural learning are made possible by a single very special form of social cognition, namely, the ability of individual organisms to understand conspecifics as beings *like themselves* who have intentional and mental lives like their own. This understanding enables individuals to

imagine themselves "in the mental shoes" of some other person, so that they can learn not just *from* the other but *through* the other. This understanding of others as intentional beings like the self is crucial in human cultural learning because cultural artifacts and social practices—exemplified prototypically by the use of tools and linguistic symbols—invariably point beyond themselves to other outside entities: tools point to the problems they are designed to solve and linguistic symbols point to the communicative situations they are designed to represent. Therefore, to socially learn the conventional use of a tool or a symbol, children must come to understand why, toward what outside end, the other person is using the tool or symbol; that is to say, they must come to understand the intentional significance of the tool use or symbolic practice—what it is "for," what "we," the users of this tool or symbol, do with it.

Processes of cultural learning are especially powerful forms of social learning because they constitute both (a) especially faithful forms of cultural transmission (creating an especially powerful cultural ratchet) and (b) especially powerful forms of social-collaborative creativeness and inventiveness, that is, processes of sociogenesis in which multiple individuals create something together that no one individual could have created on its own. These special powers come directly from the fact that as one human being is learning "through" another, she identifies with that other person and his intentional and sometimes mental states. Despite some observations suggesting that some nonhuman primates in some situations are capable of understanding conspecifics as intentional agents and of learning from them in ways that resemble some forms of human cultural learning, the overwhelming weight of the empirical evidence suggests that only human beings understand conspecifics as intentional agents like the self and so only human beings engage in cultural learning (Tomasello, 1996b, 1998; Tomasello and Call, 1997; see Chapter 2). It is also worth noting in this connection that there is a very specific and biologically based syndrome in human ontogeny, namely autism, in which the most severely afflicted individuals are incapable both of understanding other persons as intentional/mental agents like the self and also of engaging in species-typical

skills of cultural learning (Hobson, 1993; Baron-Cohen, 1993; Sigman and Capps, 1997; Carpenter and Tomasello, in press).

The complete sequence of hypothesized evolutionary events is thus: human beings evolved a new form of social cognition, which enabled some new forms of cultural learning, which enabled some new processes of sociogenesis and cumulative cultural evolution. This scenario solves our time problem because it posits one and only one biological adaptation—which could have happened at any time in human evolution, including quite recently. The cultural processes that this one adaptation unleashed did not then create new cognitive skills out of nothing, but rather they took existing individually based cognitive skills—such as those possessed by most primates for dealing with space, objects, tools, quantities, categories, social relationships, communication, and social learning—and transformed them into new, culturally based cognitive skills with a social-collective dimension. These transformations took place not in evolutionary time but in historical time, where much can happen in several thousand years.

Cumulative cultural evolution is thus the explanation for many of human beings' most impressive cognitive achievements. However, to fully appreciate the role of cultural-historical processes in constituting modern human cognition we must look at what happens during human ontogeny. Most importantly, cumulative cultural evolution ensures that human cognitive ontogeny takes place in an environment of ever-new artifacts and social practices which, at any one time, represent something resembling the entire collective wisdom of the entire social group throughout its entire cultural history. Children are able to participate fully in this cognitive collectivity from about nine months of age when they, for the first time, begin to make attempts to share attention with, and to imitatively learn from and through, their conspecifics (see Chapter 3). These newly emerging joint attentional activities represent nothing other than the ontogenetic emergence of the uniquely human social-cognitive adaptation for identifying with other persons and so understanding them as intentional agents like the self. This new understanding and these new activities thus form the basis for children's initial entry into the

world of culture. The outcome is that each child who understands her conspecifics as intentional/mental beings like herself—that is, each child who possesses the social-cognitive key to the historically constituted cognitive products of her social group—can now participate in the collectivity known as human cognition, and so say (following Isaac Newton) that she sees as far as she does because she "stands on the shoulders of giants." Importantly, we may contrast this species-typical situation with that of both:

- children with autism, who grow up in the midst of cumulative cultural products but are not able to take advantage of the collective wisdom embodied in them because, for biological reasons, they do not possess the requisite social-cognitive skills; and
- an imaginary wild child who grows up on a desert island with a normal brain, body, and sense organs, but with no access to tools, other material artifacts, language, graphic symbols, writing, Arabic numerals, pictures, people who could teach her things, people whose behavior she could observe and imitate, or people with whom she could collaborate.

For the child with autism there are cognitive shoulders to stand on, if only she could, whereas for the imaginary wild child there are no cognitive shoulders to stand on. In either case the result is, or would be, the same: something other than species-typical cognitive skills.

But growing up in a cultural world has cognitive implications that go beyond even this. Growing up in a cultural world—assuming possession of the social-cognitive key giving access to this world—actually serves to create some unique forms of cognitive representation. Most important to this process, human children use their cultural learning skills to acquire linguistic and other communicative symbols. Linguistic symbols are especially important symbolic artifacts for developing children because they embody the ways that previous generations of human beings in a social group have found it useful to categorize and construe the world for purposes of interpersonal communication. For example, in different communicative

situations one and the same object may be construed as a dog, an animal, a pet, or a pest; one and the same event may be construed as running, moving, fleeing, or surviving; one and the same place may be construed as the coast, the shore, the beach, or the sand—all depending on the communicative goals of the speaker. As the child masters the linguistic symbols of her culture she thereby acquires the ability to adopt multiple perspectives simultaneously on one and the same perceptual situation. As perspectivally based cognitive representations, then, linguistic symbols are based not on the recording of direct sensory or motor experiences, as are the cognitive representations of other animal species and human infants, but rather on the ways in which individuals choose to construe things out of a number of other ways they might have construed them, as embodied in the other available linguistic symbols that they might have chosen, but did not. Linguistic symbols thus free human cognition from the immediate perceptual situation not simply by enabling reference to things outside this situation ("displacement"; Hockett, 1960), but rather by enabling multiple simultaneous representations of each and every, indeed all possible, perceptual situations.

Later, as children become more skillful with their native language, additional possibilities for construing things in different ways open up. For example, natural languages contain cognitive resources for partitioning the world into such things as events and their participants—who may play many and various roles in these events—and for forming abstract categories of event and participant types. Moreover, natural languages also contain cognitive resources for construing whole events or situations in terms of one another, that is, for creating the various kinds of analogies and metaphors that are so important in adult cognition—such as seeing the atom as a solar system, love as a journey, or anger as heat (Lakoff, 1987; Gentner and Markman, 1997; see Chapter 5). Also, children's growing skills of linguistic communication enable them to participate in complex discourse interactions in which the explicitly symbolized perspectives of interactants clash and so must be negotiated and resolved. These kinds of interactions may lead children to begin to construct something like a theory of mind of their communicative partners, and, in

some special cases of pedagogical discourse, to internalize adult instructions and so begin to self-regulate and to reflect on their own thinking—perhaps leading to some types of metacognition and representational redescription (Karmiloff-Smith, 1992). The internalization of discourse interactions containing multiple, conflicting perspectives may even be identified with certain types of uniquely human, dialogical thinking processes (Vygotsky, 1978).

In this book—for which the foregoing may be seen as a kind of précis—I attempt to spell out this general line of argumentation in some detail. That is, my specific hypothesis is that human cognition has the species-unique qualities it does because:

- *Phylogenetically:* modern human beings evolved the ability to "identify" with conspecifics, which led to an understanding of them as intentional and mental beings like the self.
- *Historically:* this enabled new forms of cultural learning and sociogenesis, which led to cultural artifacts and behavioral traditions that accumulate modifications over historical time.
- *Ontogenetically:* human children grow up in the midst of these socially and historically constituted artifacts and traditions, which enables them to (a) benefit from the accumulated knowledge and skills of their social groups; (b) acquire and use perspectivally based cognitive representations in the form of linguistic symbols (and analogies and metaphors constructed from these symbols); and (c) internalize certain types of discourse interactions into skills of metacognition, representational redescription, and dialogic thinking.

I should emphasize at the outset that my focus is only on the species-unique aspects of human cognition. Of course human cognition is in large measure constituted by the kinds of things that appear as chapter headings in traditional Cognitive Psychology textbooks: perception, memory, attention, categorization, and so on. But these are all cognitive processes that human beings share with other primates (Tomasello and Call, 1997; Tomasello, 1998). My account here simply presupposes them, and then focuses in Vygotskian fash-

ion on the kinds of evolutionary, historical, and ontogenetic processes that might have transformed these fundamental skills into the special version of primate cognition that is human cognition. I should also emphasize that I will deal with the biological and historical processes involved in the evolution of human cognition only briefly and somewhat indirectly—mainly because the events of interest took place deep in the evolutionary and historical past and our information about them is very poor (Chapter 2). On the other hand, I will focus in some detail on human cognitive ontogeny—about which we know a good deal through several decades of direct observation and experimentation—and the processes by which human children actively exploit and make use of both their biological and cultural inheritances (Chapters 3–6).

Unfortunately, in today's intellectual climate my argument may be taken by some theorists to be an essentially genetic one: the social-cognitive adaptation characteristic of modern humans is a kind of "magic bullet" that differentiates human beings from other primate species. But this is an erroneous view that basically ignores all of the social-cultural work that must be done by individuals and groups of individuals, in both historical and ontogenetic time, to create uniquely human cognitive skills and products. From an historical perspective, a quarter of a million years is a very long time during which much may be accomplished culturally, and anyone who has spent time with young children knows how many learning experiences may take place within the course of several years—or even several days or several hours—of continuous, active engagement with the environment. Any serious inquiry into human cognition, therefore, must include some account of these historical and ontogenetic processes, which are enabled but not in any way determined by human beings' biological adaptation for a special form of social cognition. Indeed, my central argument in this book is that it is these processes, not any specialized biological adaptations directly, that have done the actual work in creating many, if not all, of the most distinctive and important cognitive products and processes of the species *Homo sapiens*. And it is worth noting in this context that taking these processes seriously enables us to explain not only the uni-