Varieties of Knowing in Science and Religion

with Pat Bennett and John A. Teske, "The Road Is Made by Walking: An Introduction"; J. Wentzel van Huyssteen, "Can We Still Talk about 'Truth' and 'Progress' in Interdisciplinary Thinking Today?"; Jonathan Marks, "What If the Human Mind Evolved for Nonrational Thought? An Anthropological Perspective"; Phillip Cary, "Right-Wing Postmodernism and the Rationality of Traditions"; Margaret Boone Rappaport and Christopher Corbally, "Human Phenotypic Morality and the Biological Basis for Knowing Good"; Christian Early, "Philosophical Anthropology, Ethics, and Love: Toward a New Religion and Science Dialogue"; Warren S. Brown, "Knowing Ourselves as Embodied, Embedded, and Relationally Extended"; and John A. Teske, "Knowing Ourselves by Telling Stories to Ourselves."

WHAT IF THE HUMAN MIND EVOLVED FOR NONRATIONAL THOUGHT? AN ANTHROPOLOGICAL PERSPECTIVE

by Jonathan Marks

Abstract. Our knowledge of the evolution of human thought is limited not only by the nature of the evidence, but also by the values we bring to the authoritative scientific study of our ancestors. The tendency to see human thought as linear progress in rational (i.e., problem-solving) capacities has been popular since the Enlightenment, and in the wake of Darwinism has been extended to other species as well. Human communication (language) can be used to transmit useful information, but is rooted in symbolic processes that are nonrational—that is, they involve choosing among functionally equivalent alternatives, any of which is as good an option as any other. The evolution of human thought cannot be realistically isolated from the evolution of human society or human communication, neither of which is rooted in obvious rationality.

Keywords: anthropology; cultural evolution; evolution; human nature; language; science

---

Human thought is rational thought, as scholars since Aristotle have noted. Yet obviously people do stupid things. Perhaps that is a result of the Fall in Eden, as a strain of early Christian thought had it; Eve's disobedience was not only the origin of sin and immorality, but of foolishness and error as well. And thus one might hold the natural human state to

Jonathan Marks is Professor in the Department of Anthropology, University of North Carolina at Charlotte, Charlotte, NC, USA; e-mail: jmarks@uncc.edu.

 ISSN 0591-2385

be reason, and unreason to be its corrupt, post-Edenic taint (Harrison 2007).

Reasoning about our own direct past, as we do in biological anthropology, is scientifically fraught, since our knowledge of it is so limited. We have bones and context, but we have lost phylogeny, physiology, society, language, and even taxonomy—relying on the judgments of experts to tell us what species were present in our ancestry, and what their relationships were. This science differs from the science of life generally in that our ancestors are always sacred—that is about as solid a generalization as one can make in anthropology—and consequently to imagine a society of scientists able to regard their own ancestors dispassionately, logically, and value-neutrally would be to imagine them as fundamentally nonhuman.

We think about our ancestors as we think about other things—symbolically and meaningfully—only more so, since they are our ancestors, and it is through them that we have families and relatives generally. Human scientists are of course capable of confronting their intellectual biases (especially after they are pointed out). In the present essay, I explore a widespread assumption in thinking about human evolution—that our brains evolved to produce ever-increasing amounts of reason, our basic thought processes being rational, the most extreme such thought in the animal kingdom. I would like to consider the coevolution of human thought, human society, and communication. Human thought, in this view, evolved to be rational, irrational, and nonrational simultaneously.

If we understand rationality to refer to formal syllogistic logical reasoning, then we define much of our species out of it, and introduce apparent discontinuities into our species (Lévy-Bruhl 1922). If we understand rationality more broadly to refer to intellectual coherence, then we are more ethnographically inclusive, but introduce apparent discontinuities at the boundary of our species (Lévi-Strauss 1962). And if we understand rationality yet more broadly as making proper decisions about what to do and how to behave, in order to successfully live and breed, then we blur the discontinuities at the boundaries of our species (de Waal 1982).

"Rational" in this latter sense means adaptive—that is, directed toward facilitating one's survival or reproduction or general well-being. If we take "culture" to refer to our "extra-somatic means of adaptation" (White 1959; Binford 1962), then it follows that culture is fundamentally rational and its apparent irrationalities require explanation. This becomes a scientifically secularized version of the medieval "fall of man" narrative.

And yet culture is not reducible to its material elements, for it consists in large measure of the construction of imaginary worlds. These imaginary worlds—of rules, taboos, obligations, stories, remembrances, and possibilities—are only partly rational, in that they constitute a local intellectual framework within which any social human can survive and

breed. But these worlds are mostly nonrational, in the sense that they are arbitrary and fictitious, and not directly related to the Darwinian imperatives.

Consequently, the assumption that human culture is adaptive is certainly true, but only partly so. Culture involves, for example, taboos. Why prohibit edible foods, like human corpses? Indeed, why prohibit a loving sexual partner, like a first cousin? Nevertheless, all human societies place limits on what can be eaten, and who is an appropriate sexual partner. A first cousin is culturally as much a preferred spouse (like Charles Darwin and Emma Wedgwood) as a taboo one, regardless of the elevated inbreeding coefficient. Chimpanzees eat dead baby chimpanzees, but humans are generally repelled by such a thought, regardless of the nutritional value of the meat. An ape mother eats the placenta after giving birth; but (with the exception of some modern-day Americans) humans universally treat the placenta ritualistically, not naturalistically, for it is more like a corpse than like a steak. On the face of it, this metaphorical thought makes little Darwinian sense, if our *raison d'être* is to eat and breed. If it is edible, and the apes eat it, then it seems irrational for us not to. The human strategy, however, transcends the caloric value of dead babies and the family-directed libido. Rather, the human strategy is to create imaginary, portable worlds—in this case, rules or prohibitions or taboos—as buffers between the organism and nature, red-in-tooth-and-claw. This aids in maintaining a fit between the organism and its surroundings (i.e., adaptation), yet also enmeshes the human in "webs of significance he himself has spun" (Geertz 1973, 4), which are often arbitrary and silly.

Humans are thus not "in" culture, but are co-constructed by culture; any attempt to abstract a specific human mind from its social context, and to study its properties independently of the culture that formed it, is necessarily limited by the simplicity of that assumption. Human thinking, human relationships, and human language are connected in complex ways with one another, and possess distinct properties.

Culture Is Not Rational Behavior

Anthropology was born in the nineteenth century as a contrast between the irrational ways of the savage and the rational ways of the Euro-American. It matured toward the end of the century with the recognition that there was plenty of irrationality in our own behavior (Tylor 1871): rituals' holdovers, ideas of politeness, dress codes, myths, food taboos, or merely calling your mother's sister and your father's brother's wife the same thing, even though one is a blood relative and the other is not.

And thus we transformed a literary trope as least as old as Montesquieu's *The Persian Letters* (1721)—how arbitrary and bizarre our own customs must seem to an outsider—into a science. But it is still an important and

often underappreciated fact that so much of what we—and everybody else—do in the minutiae of our daily lives is largely arbitrary, and due to the vicissitudes of history, and not to the deterministic, optimizing hand of nature.

This recognition has set anthropology apart from other sciences that have interests in human behavior. Ethnography shows that human behavior is universally inefficient and nonrational. Nor is it clear that any society is fundamentally more rational than another. After all, why eat a cow or chicken, but not a horse or a grasshopper or a cat, when they are all edible? The answer lies not in the caloric world, but in the symbolic world (Beattie 1964). Thus, when the geneticist Charles Davenport (1911) promoted a scientific program for breeding a better form of citizen by having people "fall in love intelligently," the anthropologist Franz Boas (1911) was obliged to point out the ridiculous self-contradiction implied in that goal. Decades later, when first-wave sociobiologists tried to apply kin selection to human behavior (Wilson 1975), the anthropologist Marshall Sahlins (1976) was obliged to point out that no known human society understands or interacts with their relatives in the mathematized way that sociobiologists expected them to. More recently, anthropologist David Graeber (2011) has shown that economic interactions where both parties try to "get the most for the least" do not characterize human societies generally, and consequently that economic models which presume such rational goals as basic human nature are flawed.

To the extent that we are rational beings, then, it is a constrained rationality. People simply cannot be counted on to make the adaptively right decision, as, for example, a Vulcan or a computer might. When Margaret Mead (1928) gave Samoans an IQ test that asked them to choose the best path from point A to point B, she noted that they generally chose not the shortest path (which was the right answer), but the prettiest. To value precision and efficiency as desiderata in human behavior is an ethnocentric assumption, regardless of its rational basis.

There is always logic and reason, to be sure, but it is based on local premises about how the world works. Early anthropologists observed, for example, that natives could explain quite sensibly why having sex and making babies were unrelated (Malinowski 1929), or why witchcraft caused buildings to collapse (Evans-Pritchard 1937). Moreover, these unscientific beliefs might function in adaptive ways that participants do not even realize; there might be a subconscious rationality to the functions of diverse human beliefs and rituals (Durkheim 1912; Rappaport 1966).

In addition to witchcraft, early anthropologists were at pains to explain the seemingly ridiculously irrational economic behavior of native peoples. British anthropologists analyzed "cargo cults" in Melanesia and later Polynesia (Worsley 1957), while American anthropologists grappled with the "potlatch" of the northwest coast (Boas 1888). In both cases, economically

counterproductive behaviors resulted from complex political, religious, and social circumstance.

Indeed, in the wake of World War I, it was hard to see human cultural behavior as very rational at all. Thus, Alfred Louis Kroeber writes:

> As long as [people] are concerned with their bodily wants, those which they share with the lower animals, they appear sensible and adaptable. In proportion however as the alleged products of their intellects are involved, when one might expect foresight and reason and cool calculation to be influential, societies seem swayed by a conservatism and stubbornness the strength of which looms greater as we examine history more deeply.
> . . . . Of course, most individual men and women are neither idiotic nor insane. The only conclusion is that as soon and as long as people live in relations and act in groups, something wholly irrational is imposed on them, something that is inherent in the very nature of society and civilization. There appears to be little or nothing that the individual can do in regard to this force except to refrain from adding to its irrationality the delusion that it is rational. (Kroeber 1923, 276–77)

Group life and group think here impose a superorganic irrationality upon a fundamentally rational organic human thought. Humans, in this view, are fundamentally motivated to maximize their chances for survival and reproduction, and yet as group members, they may have that basic rationality stifled. Certainly one can contest the degree to which a person's properties and interests may conflict with group properties and interests, and the extent to which individual choices and actions may affect social and political history, but the crucial point is that group-level properties and histories of human societies are neither reducible to, nor predictable from, those of the individuals that compose them. However naturally rational a human being may be, a society composed of such beings is not necessarily constrained by that rationality. Thus, the rationality of the human mind and the rationality of the human group are phenomenologically disconnected from one another. Group membership not only allows us to do things we *cannot* do as individuals, it allows us to do things we *would not* do as individuals.

The brain is thus not simply an organ of rationality, but an organ of many kinds of thought. After all, whether it is in dreaming of a better life, praying to invisible powers, crying over fictitious events, or just basic insecurities and phobias, humans have far more *irrational* thoughts than other kinds of animals do, as much a product of our large brain as the rational kind. And since human history shows quite well that people can be very highly motivated by those irrational thoughts, it becomes difficult to argue that they would have been less of an impetus in our evolution than the rational thoughts are.

Human evolution, though, is a story that tends to be told as an ascent of rational thought. The brains enlarge, the tools improve—both

strikingly evident in the archaeological record—and together they produce better solutions to bigger problems. It seems hard to deny the adaptive consequences of natural selection at work, making us cleverer and better philosophers than our ancestors, possibly wiser, and even approximating the admirable properties that we may attribute to God (van Huyssteen 2006). Nevertheless, we also know that nonadaptive evolutionary change is a statistical consequence of demographic factors, and that early human populations composed of small, mobile bands of foragers possessed exactly the kinds of demographic factors that promote genetic drift, the agent of nonadaptive change to the gene pool (Harris 2010; Schroeder et al. 2014). The existence in local gene pools of genetic variants that are neutral or that cause disease (Cavalli-Sforza 1969) is ample testimony to the work of random factors in our evolutionary ancestries.

WALKING:FOOT::THINKING:BRAIN

Where the evolution of cognition has traditionally stimulated philosophers and psychologists, the evolution of bipedalism generally has not. Bipedalism is less interesting, and consequently thinking about its evolution is simpler and less encumbered by the assumptions and mythologies we bring to the origins of human thought. Since the 1970s, with the discovery of "Lucy" (*Australopithecus afarensis*), bipedalism has constituted the paradigmatic case for how we think about human evolution (Johanson and Edey 1981).

Around 6 million years ago (mya), a distant ancestor who had the ability to walk on two legs a bit (clumsily and for short distances, as the living apes do) committed to doing it more frequently. Its terrestrial descendants, by about 4 mya, could do nothing but. At 3.2 mya, Lucy had long arms, curved fingers, and strong shoulders for arboreality, but when on the ground she walked upright (with a pelvis and knee unlike an ape's) and did not use her hands in locomoting, as apes do.

We can tell you a lot about how this transformation happened, because the relevant body parts are bones, which fossilize. The pelvis changed shape to support the weight of the upper body; in response to the new distribution of weight and biomechanics of striding, our ancestors developed the lumbar curve in the spine, the enlargement and alignment of the big toe, the inward-pointing knee, the large heel, and even moved the head atop (rather than in front of) the spine (Tuttle 2014). But we do not have a sense of *why* it happened. Or more precisely, we have a lot of conjectures, any or all of which might be true. We became bipedal

(1) To survive deforestation.

(2) To see over tall grass.

(3) To intimidate predators.

(4) To carry things.
(5) To run.
(6) As a sexual display.
(7) To trek over long distances.

It had to be good for something; after all, it slowed us down. If a chimpanzee is chasing you, it will catch you. Not only that, but as Wilton Krogman (1951) noted, bipedalism has also affected us adversely in other ways. Various sorts of afflictions, from hemorrhoids to varicose veins to hernias, all seem to be consequences ultimately of taking a brachiating ape's body and standing it upright on *terra firma*.

We can talk sensibly about the process, but not about the cause. So, we generally take a page from Isaac Newton ("*Hypotheses non fingo*") and we tend to ignore cause. We focus on the questions that we can possibly answer, not on the ones that we cannot.

When we compare human and ape, two body parts seem to be the most different—conserved across the apes, but specialized in humans: the foot and the brain. The human foot is composed of more or less the same parts in more or less the same relationships as the chimpanzee foot, yet the chimpanzee foot is adapted for grasping (like the feet of other apes) and the human foot for weight-bearing. A human foot can be trained to grasp to a certain extent, but that is not its primary function. With very similar forms, the human foot and chimpanzee foot have quite distinct functions.

Nearly anything you can say about the evolution of the foot you can also say about the brain. Thomas Huxley successfully demonstrated over a century ago that there is no part of the human brain that is absent from the ape's brain (Cosans 2009). They are homologous and similar; there are differences of size, shape, and orientation of parts (Preuss 2016). The most glaring difference is that our cerebral cortex is close to three times as big as the ape's. This is analogous to the enlargement and reorientation of the big toe, the most obvious difference between the human and ape feet.

Once again, we can describe the transformation, at least to a degree. We have fossil evidence on the size of the brain, and some impressions of the cortical surface, preserved on the inside of fossil skulls, but much of what we are interested in is soft tissue and that only rarely fossilizes. (The australopithecine known as the Taung child, found in South Africa in the 1920s, actually includes a fossil impression of the external features of its brain).

Yet we cannot say *why* the brain grew, only *how* it grew. We just tend to assume that it was for thinking better thoughts, thus permitting more vexing problems to be solved. But of course our divergent brain does

something else as well, which often lurks in the background because it does not fossilize at all, yet crucially disconnects us from the apes: It gives us a zoologically unprecedented way of communicating. Or at least, if such a precedent exists, it is certainly not revealing itself to us readily.

Language, like bipedalism, was apparently such a good thing that it evolved despite creating certain problems, requiring other solutions. The most glaring complication is the coevolution of a cognitive apparatus for language with a sound-production anatomy for speech (de Saussure 1916). While the causal chains are difficult to establish securely, the anatomical features are correlated, and the connection among them is at least plausible.

(1) One cannot speak intelligibly through large, interlocking canine teeth. Reducing them may have involved lessened or modified forms of classical sexual selection, but would also leave an ancestor relatively defenseless. This dental feature—small, nonsexually dimorphic canine teeth—seems to have evolved relatively early in our lineage.

(2) To make these sounds, our larynx is positioned lower than an ape's, which makes our food and air passages crisscross. It is far easier for a human to choke than for an ape.

(3) The structure of the throat and tongue is subtly altered, reflecting the use of the tongue for speech and control of breath. (Chimps vocalize while inhaling or exhaling; humans vocalize only while exhaling.) More importantly, chimps dissipate heat by panting. Our ancestors, using their tongue for speech, thus compromising their thermoregulation, evolved a different method of heat dissipation: evaporative cooling—we have a much higher density of sweat glands than chimps. Yet evaporative cooling only works efficiently if the skin is exposed to air, which prompted our body hair to degenerate, and to become thin and wispy. (We have the same density of hair follicles as an ape.)

(4) Language is learned over the course of one's life. At what age is it mastered? A colt can locomote properly a half-hour after being born. A human takes a couple of years before it can locomote reliably. It takes even longer to learn to communicate reliably. This reflects a tremendous investment in immaturity (Konner 2010); it takes nearly twice as long for a human to grow wisdom teeth as for a chimp. This commitment to adapting by learning over an extended period of immaturity is the behavioral hallmark of our species, and what is most important to learn is our unique form of communication. It is certainly reasonable to suppose that this is in large measure why our neonatal heads are so big, and thus why parturition is so difficult compared to an ape.

Symbolic Thought and Speech

Language requires a big brain because it is very difficult. Chimpanzees are about as good at it as they are at walking on their hind limbs; that is to say, they can be trained to do it a little. But they are not built for either walking or talking, as we are (Corbey 2005). It is also axiomatic that human language and human thought are intimately connected (Bloomfield 1914). They are both in a broad sense symbolic, by which I mean that they arbitrarily associate things that have no necessary or obvious connection to one another.

A fundamental example is pointing, which a human child is doing by six months, but a chimpanzee never does. There is no connection between your fingertip and the object, except the one that you make, and that creatures with similarly wired brains make. It is a nonexistent connection, not present in the real world, the physical world. The connection between fingertip and object is entirely imaginary and metaphorical. (Technically, pointing may be considered indexical, rather than fully symbolic, since the pointer is usually making the imaginary connection to the thing itself, rather than to an abstraction of the thing. The crucial element, however, is the nature of the connection between fingertip and object: nonphysical yet specific, imaginary yet real.)

We rarely stop to think just how weird language really is, being likewise rooted in the arbitrary, invisible, and the imaginary. Classically, there are four nested symbolic processes at work in language, of which apes can barely scratch the surface.

First, the many sounds made by the human mouth are assigned meaning, and the meanings are local. The "zh" in Zsa-Zsa, the "ch" in Chanukah, and the "rr" in perro (Spanish for "dog") are all meaningless and foreign to a native English speaker. French nasal vowels and southern African clicks help to demonstrate that only a small range of human sounds are actually used by any language. These meaningful sound elements are often called phonemes.

Second, combinations of sounds are assigned meaning. There is no necessary connection between a book and the sounds of "book." One could just as easily refer to the object as *libro* or *sefer* or *biblos*. The arbitrary sounds are thus assigned arbitrary meanings; for the sake of simplicity, let us call them words. But the fact that you could call a book literally anything, and that there are hundreds, perhaps thousands, of things a book indeed is called in different languages, bespeaks an incredibly inefficient, redundant system. As the authors of the Tower of Babel story in Genesis 11 realized, if everyone had the same lexicon, they could get a lot more done. (As far as I am aware, we have no better scientific answer to the question, "Why are there different languages, rather than just one really good hard-wired language?" See below.)

Third, diverse rules constrain the order of words. "John hit the ball" means something different from "the ball hit John." This is familiar as grammar or syntax, and again consists of locally specific rules. The idea that the human mind is "hard-wired" for grammatical structure (Berwick and Chomsky 2016) is tangential to the fact that any grammatical form is ultimately an arbitrary option, for there are simply many equally effective ways of being grammatical.

And fourth, mastering the sounds, the vocabulary, and the grammar still does not permit you to speak the language like a native. The tone of voice can impart meaning, as can gestures. A sarcastic comment might mean the exact opposite of what it sounds like, so you have to know how to detect sarcasm from the tone and context (Basso 1979). This dimension of language is often known as pragmatics.

This is quite a lot of symbolic thought. It is not that apes are not smart enough to learn human language; it is rather that their brains simply do not work that way (White 1962; Deacon 1997). Quite analogous, I think, to the fact that their feet do not support their body weight well.

Certainly language permitted our ancestors to communicate valuable and useful information: "Don't eat that purple plant; it's poisonous!" But we also rarely confront the fact that much of the information communicated by language is useless or false or evil or stupid or just irritating. The same referential faculty that permits us to instruct also permits us to mislead. The same faculty that permits us to praise also permits us to insult. The same faculty that allows Og to gain useful real knowledge about that purple plant, also allows you to imagine Hamlet imagining his dead father imploring, "If thou didst ever thy dear father love, revenge his foul and most unnatural murther."

Suffice it to say, there is a lot more to language than useful information, to help you survive and procreate in a Darwinian universe (Noble and Davidson 1996). The dance of a bee or song of a gibbon is far more efficient, for its meaning is real and clear. In fact, to extract the useful information from the mass of useless jibber-jabber that constitutes human communication probably requires a high degree of intelligence—a sophisticated spam filter, so to speak. Indeed, for every true statement that could now be communicated linguistically, there were many more false statements that could be communicated just as easily. A bigger brain might well have been simply necessary to tell them apart.

A chimpanzee, after all, has to navigate a complex social hierarchy on a daily basis, being appropriately dominant or affiliative, making transient alliances, and trying not to be beaten up by the alpha male. But one thing a chimpanzee does not have to do is to decide whom to believe when one friend says, "Trust me"; another says, "You can't trust that one; I'm your real friend"; and a third says, "You can't trust either of them; I'm the only

true friend you've got." Language complicates social relations (Barnard 2016; Marks 2016).

We do not know why language evolved, but it is certainly a zoologically unusual form of communication. Its properties are very different from those of scent-marking, bird calls, pheromones, and pant-hoots. It enables us to talk about the world as it is, continuous with the communication systems of other species—but it also enables us to talk about what is not, what was, what might be, and what ought to be. It thus opens up a world of story, of remembrance, of possibility, and of morality. But it also opens up the world of having conversations with ghosts, formal terms of address, advertising, evangelism, uninformed opinions, tasteless jokes, boring anecdotes, and offensive profanity. What strange things to preoccupy the mind of an intelligent ape, who principally needs to know, as all creatures do, how to eat and mate successfully!

To the extent, then, that the structure of language reflects the structure of human thought, we are led to see it as unconscious "choices" from a host of options, any of which is as good as any other (Sapir 1921). The sounds we make, the meanings we assign to their combinations, the organization of those meaningful sounds, and the tones, facial expressions, and gestures that we associate with them, all seem to work just as well—for the purposes of expressing any thoughts that one human might intend to convey to another—as their alternatives. Where no option is superior to any other, it seems as though rationality itself is irrelevant or superfluous. If anything, the structure of human symbolic thought seems to be profoundly nonrational, while nevertheless being capable of producing ideas, statements, and deeds that may be used or deployed rationally.

Language thus supersedes two classically rational primate behaviors: threatening and grooming. Without large canine teeth, a typical primate threat coming from an early human would be very unimpressive, and ineffectual. Language, however, permits us to replace primate "threat displays" with actual threats. The nature of this threat is less immediate than those communicated by the canine teeth, for the verbal threat can suggest retaliation, and the possibilities and future planning it implies. The social function of grooming in primates may be replaced by praise (Dunbar 1996), substituting auditory stimuli for tactile stimuli. In both cases, though, the message is very clear and effective, but only to those who know the meaning of the relevant sounds.

Making the Imaginary Real

This new world of story, remembrance, possibility, and morality is an imaginary world. That is to say, it does not exist in any tangible or perceptible way, except indirectly, as artifacts. This is essentially what anthropologists

mean by "culture." Like the imaginary connection between your fingertip and the object you are pointing at, humans inhabit a largely imaginary world—one of law, obligation, marriage, political inequality, aesthetics, values, and hope. Ethologists use the term "culture" in a different way, to facilitate cross-species comparisons, by removing the imaginary and replacing it with "learned behavior" (e.g., Whitehead and Rendell 2015). What that does, however, is to conceal what is particularly human about human evolution. Human evolution increasingly involves the ability to imagine things into existence.

The most fundamental things that our ancestors imagined into existence were social bonds not found in the apes. The difficult human parturition, a result of the large-headed infant programmed to learn a difficult but valuable way to communicate, creates a problem that humans solve socially. Where an ape generally squats alone, has the baby, and moves on (after eating the placenta!), a human almost invariably has someone else around. We make birthing social (Trevathan and Rosenberg 2016). Moreover, where other adult apes are a significant threat to a newborn, a human mother needs others, and consequently has a far more tolerant attitude toward others handling her baby (and arguably, toward others in general) than an ape does (Hrdy 2009).

The framework of these new non-ape social relationships is the study of kinship—that is to say, an imaginary network of reciprocal obligations that allows you know immediately, without even having met someone, what you can expect from them and what they can expect from you (Lowie 1920; Malinowski 1930). In the last few hundred years, that kind of information has been supplanted by other kinds of cultural information—for example, nationality, or religion, or neighborhood, or alma mater—that feed us shorthand knowledge of how akin we feel to someone else (Franklin and McKinnon 2001; Carsten 2004). In remote times, our ancestors gauged how akin they felt toward someone by literally establishing them as kin—as so-and-so's *spouse*, so-and-so's *descendant*, so-and-so's *clan or tribe*, so-and-so's *fifth cousin*, so-and-so's *in-laws*, bearing so-and-so's *name*. Importantly, none of these is necessarily a natural status; all are at least partly imaginary (Zerubavel 2012). It may help to unpack these imaginary statuses a bit.

(1) Spouse: Modern anthropologists do not restrict their use of the term "marriage" to heterosexual monogamy, but rather use it to encompass the many ways in which families are ritually created and legitimized in human societies (Coontz 2006). Marriage is not pair-bonding; it is an agreement, not an instinct. And that is important because it takes two parties to have an agreement, but only one to have an instinct. The parties here are often not simply individuals, but their families. The agreement involves mutual understandings, social networks and

statuses, economic obligations, and possible future generations; there is little of "nature" that is strictly comparable (i.e., homologous) to the social bonds of nonhuman primates here.

(2) Descendant: There are many ways that people fool Mother Nature in the area of descent, for example, by adoption, assimilation, and name-changing. Remote ancestry is biologically negligible, like genetic homeopathy: 300 years ago, you had well over a thousand lineal ancestors; 1,200 years ago, you had a quadrillion ancestors (Hitt 2005)—so frankly, we might as well both be remote descendants of the same ancestral eagle.

(3) Clan or tribe: Tribal membership is notoriously flexible; even though it may mean the difference between life and death, a binary assignment invariably misrepresents the natural relations among neighboring groups who trade and intermarry.

(4) Fifth cousin: A fifth cousin is a negligible biological relationship. To put it in perspective, two first cousins have a 12.5% chance of both receiving the same allele from the same common ancestor. (Hence the recognition of cousin marriage as a risk factor for many genetic diseases). The corresponding probability for a fifth cousin is 0.05%, about 250 times smaller, and for all intents and purposes, zero. There is nothing significantly natural about a fifth cousin, except to a genealogist.

(5) In-laws: These are established by agreement, and are socially united through the biological bodies of offspring. Mother-in-law is a meaningful (and often dangerous) relationship cross-culturally. The premodern anthropologist James Frazer observed, "The awe and dread with which the untutored savage contemplates his mother-in-law are amongst the most familiar facts of anthropology" (Frazer 1900, I, 288). Chimpanzees have neither mothers-in-law nor jokes about mothers-in-law.

(6) Namesake: Since apes do not give one another names, being a namesake is meaningless to them—naming is a distinctively human practice, and subject to local rules. Obviously other animals can tell one another apart—by smell, looks, voice, or behavior—but, as far as we know, associating a particular body or object with an arbitrary combination of sounds (as opposed to simply memorizing the association they have already been given, as other species can do) is a uniquely human act. But of course, names are not part of the real world; they are arbitrary fictions of the human collectivity. To survive as a human, you need to know what's what and who's who, and the way we do it is by the reciprocal processes of naming (i.e., individual identification) and grouping (classification).

My point is that all of this makes no sense from the standpoint of biology, or nature, or rationality. It is a make-believe world, a fantasy, a bunch of rules that we are born into, and which end up structuring and giving meaning to our lives (Fortes 1983), often largely in defiance of biology. In the family we have the origins of obligations, rule-governed behavior, and the transcendence of death, since the relationships that constitute your family, your relatives, and your lineage were there before you were born, and will be there after you die. A bright chimpanzee has to deal effectively with other chimpanzees; a wise human must deal effectively with fathers, mothers-in-law, teachers, traders, sworn enemies, distant relatives, dead ancestors, unborn descendants, ghostly apparitions, and gods. Yet these emergent human social relations are not organic properties; the important developments in human evolution here are not going on *within* human brains, but *between* human brains (Teske 2013; Marks 2015).

Conclusion

As human beings, we traffic in image (Hedley 2016), story (Gottschall 2012), metaphor (Lakoff and Johnson 1980), and in sets of arbitrarily assigned, yet mutually understood, sounds and motions. This is a symbolic universe, a step removed from natural relations, fictive and imaginary, yet as real and as distinctively human as the bipedal stride. This is culture, as elusive as the "species" or the "gene" to define or to identify satisfactorily, yet nevertheless also representing a fundamental concept for scholars to work with.

Culture is the way our ancestors survived and thrived, and inheres in the meanings we assign to sounds and acts. It has another function, however, as boundary maintenance, in the formation of identity. One does not learn to speak, think, and act, but to speak, think, and act *properly*, differently from those people over there. That is to say, culture makes difference. "We" are distinct from "them"—although rarely in ways that we would consider genetic or naturalistic. Yet being different for the sake of being different is hardly adaptive or utilitarian. It solves no problem, and reduces the cooperative possibilities. It emerges as a consequence of arbitrary, yet meaningful, decisions—often unconscious—that our ancestors made. While we may focus on human thought as fundamentally rational thought—at least since the eighteenth century—there is no *a priori* reason to take that basic rationality for granted (Boas 1911). We evolved to be at least as nonrational as rational. We think and speak in symbols, but outside of *The Da Vinci Code*, symbols do not solve problems. Symbol systems can be deployed effectively for adaptive or utilitarian ends, but that quality does not inhere in symbolic thought itself. When we speak, it is not even necessarily to other people, much less strategically useful or interesting. Expecting people to behave like calculating machines

is unrealistic; and to model their evolution on that expectation is very unrealistic.

In sum, human thought is fundamentally symbolic and metaphorical, yet capable of producing acts that are rational, nonrational, and irrational. Likewise for the collective institutions it produces. Magical, animistic, or religious thought would thus not be primitive thought (*contra* Tylor 1871 and Dawkins 2006), but simply human thought (Tambiah 1990). What may require a special explanation is the origin, establishment, and privileging of rational, literal, accuracy-driven, utilitarian thought. That is to say, as such an unusual way to think, science probably requires an explanation more than religion does (Marks 2017).

Acknowledgment

I thank Elise Berman and John Teske for comments.

Note

A version of this article was presented at the 62nd Annual Summer Conference of the Institute for Religion in an Age of Science (IRAS) entitled "How Can We Know? Co-Creating Knowledge in Perilous Times" held on Star Island, New Hampshire, from June 25 to July 2, 2016.

References

Barnard, Alan. 2016. *Language in Prehistory*. New York, NY: Cambridge University Press.
Basso, Keith H. 1979. *Portraits of "the Whiteman": Linguistic Play and Cultural Symbols among the Western Apache*. New York, NY: Cambridge University Press.
Beattie, John. 1964. *Other Cultures*. London, UK: Cohen and West.
Berwick, Robert C., and Noam Chomsky. 2016. *Why Only Us? Language and Evolution*. Cambridge, MA: MIT Press.
Binford, Lewis R. 1962. "Archaeology as Anthropology." *American Antiquity* 28:217–25.
Bloomfield, Leonard. 1914. *An Introduction to the Study of Language*. New York, NY: Henry Holt.
Boas, Franz. 1888. "The Indians of British Columbia." *The Popular Science Monthly* 32:628–36.
———. 1911. *The Mind of Primitive Man*. New York, NY: Macmillan.
Carsten, Janet. 2004. *After Kinship*. New York, NY: Cambridge University Press.
Cavalli-Sforza, Luigi Luca. 1969. "Genetic Drift in an Italian Population." *Scientific American* 221:30–37.
Coontz, Stephanie. 2006. *Marriage, a History: How Love Conquered Marriage*. New York, NY: Penguin.
Corbey, Raymond. 2005. *The Metaphysics of Apes: Negotiating the Animal–Human Boundary*. New York, NY: Cambridge University Press.
Cosans, Christopher E. 2009. *Owen's Ape and Darwin's Bulldog: Beyond Darwinism and Creationism*. Bloomington: Indiana University Press.
Davenport, Charles B. 1911. *Heredity in Relation to Eugenics*. New York, NY: Henry Holt.
Dawkins, Richard. 2006. *The God Delusion*. New York, NY: Bantam Books.
de Saussure, Ferdinand. 1916. *Cours de Linguistique Générale*. Paris, France: Payot.
de Waal, Frans. 1982. *Chimpanzee Politics: Power and Sex among Apes*. London, UK: Jonathan Cape.
Deacon, Terrence W. 1997. *The Symbolic Species: The Co-Evolution of Language and the Brain*. New York, NY: WW Norton & Company.

Dunbar, Robin. 1996. *Grooming, Gossip, and the Evolution of Language*. Cambridge, MA: Harvard University Press.
Durkheim, Emile. 1912. *Les Formes Élémentaires de la Vie Religieuse*. Paris, France: Felix Alcan.
Evans-Pritchard, E. E. 1937. *Witchcraft, Oracles, and Magic among the Azande*. Oxford, UK: Oxford University Press.
Fortes, Meyer. 1983. *Rules and the Emergence of Society*. Occasional Paper #39: Royal Anthropological Institute of Great Britain and Ireland.
Franklin, Sarah, and Susan McKinnon, eds. 2001. *Relative Values: Reconfiguring Kinship Studies*. Durham, NC: Duke University Press.
Frazer, James G. 1900. *The Golden Bough* (2nd ed.). London, UK: Macmillan.
Geertz, Clifford. 1973. *The Interpretation of Cultures*. New York, NY: Basic Books.
Gottschall, Jonathan. 2012. *The Storytelling Animal: How Stories Make Us Human*. New York, NY: Houghton Mifflin Harcourt.
Graeber, David. 2011. *Debt: The First 5,000 Years*. New York, NY: Melville House.
Harris, Eugene E. 2010. "Nonadaptive Processes in Primate and Human Evolution." *American Journal of Physical Anthropology* 143:13–45.
Harrison, Peter. 2007. *The Fall of Man and the Foundations of Science*. New York, NY: Cambridge University Press.
Hedley, Douglas. 2016. *The Iconic Imagination*. New York, NY: Bloomsbury.
Hitt, Jack. 2005. "Mighty White of You: Racial Preferences Color America's Oldest Skull and Bones." *Harper's Magazine* (July): 39–55.
Hrdy, Sarah Blaffer. 2009. *Mothers and Others: The Evolutionary Origins of Mutual Understanding*. Cambridge, MA: Harvard University Press.
Johanson, Donald C., and Maitland Edey. 1981. *Lucy: The Beginnings of Humankind*. New York, NY: Simon & Schuster.
Konner, Melvin. 2010. *The Evolution of Childhood: Relationships, Emotion, Mind*. Cambridge, MA: Harvard University Press.
Kroeber, Alfred Louis. 1923. *Anthropology*. New York, NY: Harcourt, Brace.
Krogman, Wilton Marion. 1951. "The Scars of Human Evolution." *Scientific American* 185: 54–57.
Lakoff, George, and Mark Johnson. 1980. *Metaphors We Live By*. Chicago, IL: University of Chicago Press.
Lévi-Strauss, Claude. 1962. *The Savage Mind*. Chicago, IL: University of Chicago Press.
Lévy-Bruhl, Lucien. 1922. *La Mentalité Primitive*. Paris, France: Félix Alcan.
Lowie, Robert Harry. 1920. *Primitive Society*. New York, NY: Liveright.
Malinowski, Bronislaw. 1929. *The Sexual Life of Savages in North-Western Melanesia; an Ethnographic Account of Courtship, Marriage, and Family Life among the Natives of the Trobriand Islands, British New Guinea*. New York, NY: Readers League of America.
———. 1930. "Kinship." *Man* 30:19–29.
Marks, Jonathan. 2015. *Tales of the Ex-Apes: How We Think about Human Evolution*. Berkeley: University of California Press.
———. 2016. "A Tale of Ex-Apes: Whence Wisdom?" *Philosophy, Theology and the Sciences* 3:152–74.
———. 2017. "Anthropology and Science." In *The Routledge Companion to Contemporary Anthropology*, edited by Simon Coleman, Susan B. Hyatt, and Ann Kingsolver, 305–22. New York, NY: Routledge.
Mead, Margaret. 1928. *Coming of Age in Samoa*. New York, NY: Morrow.
Noble, William, and Iain Davidson. 1996. *Human Evolution, Language and Mind: A Psychological and Archaeological Inquiry*. New York, NY: Cambridge University Press.
Preuss, Todd M. 2016. "The Human Brain: Evolution and Distinctive Features." In *On Human Nature: Biology, Psychology, Ethics, Politics, and Religion*, edited by Michel Tibayrenc and Francisco J. Ayala, 125–50. London, UK: Elsevier.
Rappaport, Roy. 1966. *Pigs for the Ancestors*. New Haven, CT: Yale University Press.
Sahlins, Marshall David. 1976. *The Use and Abuse of Biology: An Anthropological Critique of Sociobiology*. Ann Arbor: University of Michigan Press.
Sapir, Edward. 1921. *Language: An Introduction to the Study of Speech*. New York, NY: Harcourt, Brace.

Schroeder, Lauren, Charles C. Roseman, James M. Cheverud, and Rebecca Rogers Ackermann. 2014. "Characterizing the Evolutionary Path(s) to Early *Homo*." *PLoS ONE* 9:e114307. https://doi.org/10.1371/journal.pone.0114307

Tambiah, Stanley J. 1990. *Magic, Science and Religion and the Scope of Rationality*. New York, NY: Cambridge University Press.

Teske, John A. 2013. "From Embodied to Extended Cognition." *Zygon: Journal of Religion and Science* 48:759–87.

Trevathan, Wenda R., and Karen R. Rosenberg. 2016. *Costly and Cute: Helpless Infants and Human Evolution*. Albuquerque: University of New Mexico Press.

Tuttle, Russell. 2014. *Apes and Human Evolution*. Cambridge, MA: Harvard University Press.

Tylor, Edward B. 1871. *Primitive Culture: Researches into the Development of Mythology, Philosophy, Religion, Language, Art and Custom*. London, UK: John Murray.

van Huyssteen, J. Wentzel. 2006. *Alone in the World? Human Uniqueness in Science and Theology*. Grand Rapids, MI: William B. Eerdmans.

White, Leslie A. 1959. *The Evolution of Culture*. New York, NY: McGraw-Hill.

———. 1962. "Symboling: A Kind of Behavior." *The Journal of Psychology* 53:311–17.

Whitehead, Hal, and Luke Rendell. 2015. *The Cultural Lives of Whales and Dolphins*. Chicago, IL: University of Chicago Press.

Wilson, Edward O. 1975. *Sociobiology: The New Synthesis*. Cambridge, MA: Harvard University Press.

Worsley, Peter. 1957. *The Trumpet Shall Sound: A Study of "Cargo" Cults in Melanesia*. London, UK: MacGibbon & Kee.

Zerubavel, Eviatar. 2012. *Ancestors and Relatives*. New York, NY: Oxford University Press.