TO BE HUMAN

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Who are we? The question of human nature seems to haunt all disciplines. That may tell us how very "human" the question is.

Answers vary widely. Yet scientists – anthropologists, geneticists, ethologists, and developmental and evolutionary biologists – rely on observations and empirical data. Their conclusions thus seem more objective.

Biologically, humans are primates. Linnaeus perceived that, even before Darwin. We share our anatomies and physiologies with apes and chimps. But Darwin gave this relationship special meaning. He transformed abstract taxonomy into material genealogy. Ever since, we have characterized our species by its ancestry. Identity and history have merged. "Who we are" is now also the story of human origins: where we came from, how and why.

Each new finding in human evolution seems to fascinate us. The sequencing of the human and chimpanzee genomes was big news (Culotta, 2005), appearing on the cover of *Time* magazine (Lemonick & Dorfman, 2006). Then came the Neanderthal genome (Gibbons, 2010). Ardi (*Ardipithecus ramidus*) created a sensation by replacing Lucy as the earliest known complete hominid skeleton, displayed dramatically on the cover of *Science* (2 October 2009). Then the human-like ape *Australopithecus sediba* sparked new controversy (*Science*, 9 April 2010). Every new discovery generates public sensation.

Add to this buzz new exhibit halls on human origins at both the American Museum of Natural History (Tattersall & DeSalle, 2007) and the Smithsonian (Potts & Sloan, 2010b). And at least seven major books in the last five years, which range from surveying new fossils, vestigial traits and genomes, to profiling the uniqueness of our brains, bones, genome, and behavior (Walter, 2006; Zimmer, 2007; DeSalle & Tattersall, 2008; Gazzaniga, 2008; Röska-Hardy & Neumann-Held, 2008; Shubin, 2008; Taylor, 2009; Potts & Sloan, 2010a). And television specials (Rubin, 2008; Discovery Channel, 2009; Townsley, 2009; Chedd et al., 2010). We always seems eager for new perspectives.

But perhaps it is time to reassess this sacred bovine: that each new finding yields more complete understanding of human nature. We might well reflect on our *past* efforts – with their notable errors and flawed assumptions. What might we learn from those missteps instead?

Seeking Uniqueness

Benjamin Franklin was reportedly among the first to celebrate humans as the only tool-making animal. Later, evolution seemed to make sense of that. Our hands – especially with their opposable thumbs – once used for climbing trees, seem to have found a new adaptive function: to grasp tools, to shape them, to modify the environment and so enhance survival. Tool-use also fit with the distinctive trait of walking upright: bipedalism apparently freed the hands to do their important work (Darwin, 1871, I., pp. 51–53, 138–143; Moon, 1921, pp. 336–339). By the early 1960s, at least, the uniqueness of humans as tool-users was well ensconced (for example, Smith, 1961, p. 178; Dobzhansky, 1962, p. 194; Tattersall, 1998, pp. 49–57, 126–134). Thus, when Louis and Mary Leakey identified the first fossil associated with tools in 1960, they gave it the landmark status as the first of our genus, naming it *Homo habilis*, or "handy man."

Yet with new discoveries, humans could not maintain their unique status as tool-users. Egyptian vultures use rocks to crack open tough ostrich eggs, California sea otters to break mussel shells. The Galápagos "woodpecker" finch uses cactus spines to probe holes and collect ants. New Caledonia crows use twigs in a similar way. Even *Ammophilia* wasps can use small pebbles to pack earth around nest entrances. *Polyrachis* ants can use secreted thread to fasten leaves together (Dobzhansky, 1962, p. 194; Mason, 1972; Linden, 2003, pp. 91–108). Human tool-use was not so unique after all.

Still, humans, like the early *Homo habilis*, seemed the only animals to *make* tools. The Duke of Argyll, Darwin observed, claimed that "the fashioning of an implement for a special purpose is absolutely peculiar to man." He further contended "that this forms an immeasurable gulf between him and the brutes" (Darwin, 1871, I., p. 52). Renowned evolutionist Theodius Dobzhansky, too, noted that tool-*using* may be instinctual, but "tool-making is a performance on a psychologically higher level" (1962, p. 194). And so human uniqueness was redefined: from tool-use to tool-making.

Yet (we have discovered since) other animals, notably our primate cousins, do indeed make tools. Chimps crush leaves to make sponges to collect water from hollows in logs. They strip leaves from branches to use as probes for insects. They sharpen branches with their teeth for hunting and spearing bush babies. They arrange two stones as "hammer and anvil" to open very tough panda nuts. Sometimes, they even use a third wedge stone to level the pounding surface. What's more, chimps sometimes combine tools in complex sequences. In Gabon, they use a "tool set" of five tools to obtain honey: to pound, to perforate, to enlarge the hole, to collect, and to swab. Various chimp groups leave behind complete "tool kits," generally of about 20 tool types, distinctive of each group's culture. Primatologists now comfortably discuss "chimpanzee technology" (Gibbons, 2007; McGrew, 2010). Well, so much for the uniqueness of *making* tools.

The unique trait then retreated to *teaching* tool use. Until adult chimps were observed to help younger chimps learn how to use the hammer-anvil technique. The chimps not only conspicuously demonstrated the method, but also sometimes corrected the orientation of the learner's stone hammer (Boesch, 1991; video at http://www.youtube.com/watch?v=AElmAJH2G00).

Did concession ensue? Hardly. George Schaller observed, "there still appears to be a wide mental gap between preparing a simple twig for immediate use and shaping a stone for a particular purpose a day or two hence" (Mason, 1972, p. 388). Only humans *plan* tool-use. Or so it seemed at the time. Bonobos and orangutans have now demonstrated in tests that they can select appropriate tools, save them, and retrieve them for later use (Mulcahy & Call, 2006).

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Well then, perhaps, as Tim Allen has quipped, humans are the only animal to *borrow* tools.

The history of successive claims about tools exhibits an informative pattern: when observations falsify their hypothesis, scientists do not abandon the hypothesis. They change it. One unique trait simply segues to another. They have persistently sought to characterize humans as *unique*. Not just different in degree. But qualitatively distinct, or unmatched.

This pattern also appears in the history of interpretations of language – another feature frequently profiled as uniquely human (Darwin, 1871, I., pp. 53–62; Dobzhansky, 1962, pp. 208–210; Simpson, 1967, pp. 287–288; Diamond, 1992, pp. 137–167; Tattersall 1998, pp. 58–68). At first researchers noted that chimps, despite extended efforts, could not learn to speak. In the 1940s–50s Keith and Catherine Hayes trained a chimp, Viki, to say "cup" and three other words. (Filmed while dressed anthropocentrically in a nice smock, one may note.) But that was all: proof, apparently, that chimps could not manage speech or language. However, in the late 1960s Allan and Beatrix Gardener successfully taught another chimp, Washoe, American Sign Language, or ASL (about 250 signs). The faulty assumption of the earlier work became painfully obvious. Chimps do not have the appropriate vocal apparatus. This does not mean they cannot communicate effectively or understand language. Why had no one noticed the conflation of language with human speech sounds at the outset?

One can easily imagine the sequel: "yes, but chimps don't…" *Teach* language? Later, Washoe taught signs to her adopted son, Loulis. Use language *on their own*? Eventually, other chimps who learned ASL were observed signing to each other without humans present. Boundaries of uniqueness are always being pushed back. And scientists always seem to finesse the uniqueness to something new.

So focus shifted elsewhere. To language structure. "The meanings of our sentences are composed from the meanings of the constituent parts (e.g., the words). This is obvious to us," noted one linguist (Hurford, 2004, p. 551). Who then continued, ironically, "but no other animal communication system (with honeybees as an odd but distracting exception) puts messages together in this way." Why dismiss the exception peremptorily as "odd" and "distracting," rather than pursue it as potentially significant?

Others retreated to defending the specific roles of symbols or of grammar (for example, Tattersall, 1998, pp. 226–233; Tattersall & DeSalle, 2007; Gazzaniga, 2008, pp. 54–66; Potts & Sloan, 2010b). Researchers then dutifully documented that chimps can interpret abstract lexigrams on keyboards and arrange them in meaningful sequences. And so on (Jones, 1994). One need not subscribe to some Dr. Dolittle-type fantasy to acknowledge that animals (or even plants or slime molds) have some extraordinary systems of communication. Nor does one need any sophisticated science to know that humans communicate with remarkable complexity, significantly shaping their collective behavior. The question is why anyone feels a need to characterize human language as *unique*, rather than as an evolutionary derived variant.

One finds similar prejudices in other claims about human uniqueness. About the nature of play (Dobzhansky, 1962, pp. 213–214; Mason & McCarthy, 1995, pp. 124–132; Linden, 2003, pp. 57–67). Or laughter (Panskepp, 2005). Or art (Dobzhansky, 1962, pp. 214–218; Tattersall, 1998, pp. 14–28; and Gazzaniga, 2008, pp. 203–245; compared to Mason & McCarthy, 1995, pp. 192–211; George, 1995; Lenain, 1997; Linden, 2003, pp. 167–176). Or empathy and perspective-taking (de Waal, 2009). Even the assumption that humans alone are moral creatures (Darwin, 1871, Ch. 3; Gazzaniga, 2008, pp. 113–157) now seems untenable. Macaques, capuchin monkeys, and vampire bats, seem to express moral sentiments, reason about fairness, or act against cheaters (Allchin, 2009).

I have erred, too. Yes, I once professed that dental hygiene was uniquely human. We brush our teeth. And floss. What other species advertises competing toothpaste brands? Yet one student chastised me: what about the symbiosis between cleaner wrasses and groupers? Sadly humbled, I now concede that chimps use toothbrushes. They *make* toothbrushes, by chewing the ends of sticks. However, I continue to wonder about the uniqueness of plastic-coated teeth. And dentistry.

Despite the successive "yes, but" failures, scientists continue unabated the grand effort to articulate what makes humans unique (Gazzaniga, 2008, pp. 7–37). Just two years ago dozens convened to explore "Human Uniqueness and Behavioral Modernity" with renewed interdisciplinary vigor (Despain, 2010; http://ihhr.asu.edu/OHU). Alternatively, we might conclude, more "modestly," that the quest for uniqueness itself seems to differentiate humans.

Seeking Distinction

Further lessons are found in the selective nature of the traits typically claimed as unique.

Blushing is usually not high on the list. Darwin, however, called it "the most peculiar and the most human of all expressions" (1872, p. 309). Perhaps Darwin was just preoccupied with his social environment – the Victorian upper class, steeped with propriety. Yet Mark Twain agreed: "Man is the only animal that blushes." "Or needs to," he added (1897, I., p. 226). And therein lies a clue. No one *wants* to be noted for shameful or embarrassing behavior.

The new exhibit on human origins at the American Museum of Natural History in New York is typical. Adjacent to the stunning models, fossil replicas and human family tree, one finds a display on "What Makes Us Human." The answer? Intelligence, creativity, language, symbolic representation, music, art, tools: "the world of human expression." The key concept, according to the educator's guide, is: "Only modern humans create complex culture" (Tattersall & DeSalle, 2007). Note the selective pattern? The distinctions all mark things we value. Humans thus seem inherently privileged. Granted, the exhibit does credit bower birds for their "individual expression" and whales and birds for the "structure" in their songs. But not without underscoring the limits of these abilities and reaffirming human superiority.

So, too, for the Smithsonian's new exhibit on human origins. Just more emphasis on social life and a reminder that "humans change the world" (Potts & Sloan, 2010b; also see Gazzaniga, 2008, pp. 79–112). Again, traits to bolster self-esteem. Why?

A more balanced appraisal might consider other human traits as unique: deceit, theft, murder, armed conflict, disparity in social levels, enslavement. Although one would have to reject these traits, too, since they are all found in other animals, as well. We could revise those traits to: weapons of mass destruction, Ponzi schemes, high-frequency obesity, and large-scale devastation of ecosystems. Those just might pass the test of uniqueness. But would anyone entertain listing them?

Alternatively, one might consider less impressive but still unique traits (Morgan, 1990). Such as the distribution of body hair. Or tears. Or prominent chins, a distinct result of evolving cranial development. Or the capacity to choke on food (Gazzaniga, 2008, p. 45; Shubin, 2008, p. 189). Or back pain and knee injuries, to go along with our walking upright. Or genetically based susceptibility to tuberculosis and malaria (Culotta, 2005, p. 1468). Along with the ability to be rational is the ability to rationalize. We can tell jokes, and we can also tell *bad* jokes. We may not use language exclusively, but we are alone in texting messages while driving motor vehicles. Why do profiles of human identity not highlight these more prominently? Ultimately, human uniqueness is not just about difference. It also implies value.

For an interesting glimpse of general opinion on "what it means to be human," visit the public comment website for the Smithsonian's new exhibit (http://humanorigins.si.edu./about/involvement/being-human). A sample:

> to wonder, to laugh and to cry, to regret and
> to expect, to imagine I'm a horse with my

> friends (age 4), to be capable of the best and the worst, to honor your ancestors and your children, to know more than you should and think less than you could, to seek out the real magic of the world around us.

These responses illustrate how the question is typically interpreted. Not descriptively, but normatively. The meaning is based on what people think humans *should* be. Or what they want themselves to be. Not what we are. While the phrase "human nature" appears objectively neutral, too often it is permeated with ideals.

Scientists are no exception, despite the rhetoric about their objectivity. The history of science on human origins is littered with normative judgments, as profiled above. Indeed, one can often infer a scientist's *personal values* from his or her *scientific claims*. For example, the common emphasis on intelligence, cognition, rationality and culture? Endorsed by (surprise!) scholars. For anthropologist Ian Tattersall, ideology is visible in his unguarded praise of technology and of the "restless innovative spirit" (1998, p. 13). For neuroscientist Michael Gazzaniga, it is betrayed in comments about tools and Maserati cars or bipedalism and Italian designer shoes (2008, pp. 44, 45, 326). For him, human uniqueness seems determined by the criteria for a good date (Ch. 2): conviviality (social networking – Ch. 3, consciousness – Ch. 7, and empathy – Ch. 5), "intelligent" conversation (Ch. 2), appreciation of the arts (Ch. 6), and trust (a "moral compass" – Ch. 4). One would be well advised to take even "scientific" claims about humanness with a grain of salt – or at least with a heavy dose of critical skepticism. That may include the very label *Homo sapiens*, or "wise man."

Naturalizing Values

Historically, then, the science of human nature has proved treacherous. In search of uniqueness, it has shown systematic overstatement. It has discounted similarities as well as differences of degree in securing a special status for humans. By focusing on certain traits, it has excluded others, fostering a misleading portrait that privileges our species. But none of this should surprise us. When values are at stake, science is susceptible to the *naturalizing error*.

Oddly, the features that scientists typically use to characterize humans do not require science at all. No systematic observation. No measurement. No sophisticated training is needed to see that humans dominate the planet, with cultivated land, highways, oil rigs, coal mines, and depleted fisheries; that we form monumental social networks and communicate globally with cell phones and satellite TV; that we create governments, prisons, peace prizes, and disaster relief efforts; etc. Why the science, then? The historical lapses show vividly how *the science functions primarily at a rhetorical level: to "justify" the value-laden claims about human uniqueness and distinction*.

Science here may seem to simply render the facts of nature – or of human nature. But these facts, or images of nature, are not neutral or balanced. They never were. Even if "true" at some level – supported by observations or other evidence – they are highly selective. Identifiable values guided the science. Worse, little vestige or trace of the selectivity remains. Nature is visible; the values are not. Through science, the values have become *naturalized*, and henceforth masquerade as inviolable facts.

The appeal to nature is especially well illustrated in the popular fascination with the genetic basis of evolutionary changes. No one needed a genome project to conclude that humans are closely related to chimpanzees and other primates. But genes are seen as the essential, foundational cause. That's why the comparison between human and chimp DNA makes the cover of *Time*.

Yet we finesse the new genetic findings as much as any other evidence. Our genetic correspondence with chimps is a remarkable 94% to 99.2% (depending on how one measures it), 98.7% based on nucleotide sequences (Culotta, 2005). But our response has not been to embrace the similarity. Rather, we typically underscore the remaining difference and its apparent importance (Taylor, 2009). We simply wonder even more deeply how the dramatic – and obvious – differences can be encoded in so few genes. Bypassing more open-ended behavioral or cultural dimensions.

No one questions Nature. Anything declared natural seems an inherent fixture of the world, transcending human culture and values. Unchangeable and unchallengeable. The "nature" in "human nature" thus functions more as justification than description. Cognitively, our minds all too readily imagine that our personal values express some universal "human nature." When we find evidence that aligns with our values, our critical faculties go on holiday. Accordingly, we cannot regard the role of science in naturalizing human values as mere happenstance, even if subconscious. One may well doubt that a respectable science of human nature is ever possible.

Being Human

In his great system of classification, Linnaeus did not describe humans using standard morphology. Rather, he left readers the Socratic injunction, "know thyself." History may now indicate that this approach is risky. Human values may easily eclipse a fully informed view. Science can rationalize prejudices. (If we could only secure an analysis from another species!)

What, then, does one teach students? Or is it best to avoid the topic of humanness altogether? The appropriate gauge may be, alas, what students will learn from the culture around them, without instruction. There is much to unlearn.

A fruitful strategy might first engage students in their own reflections (MacKenzie, 2007). It will include an encounter with the history of errors, recounted above. The important lessons may be primarily about the nature of science, which in turn inform a critical assessment of scientific claims themselves.

If we are serious about teaching evolution – including human evolution – we should be highlighting the alternative view: not our uniqueness, but our continuity with other animals (Masson & McCarthy, 1995; Linden, 2003). In his recent bestseller, *Your Inner Fish* (2008), Neil Shubin nicely portrays how the human body itself embodies its history, with links to fish, worms, fruit flies, and jellyfish as well as primates. He models how one may convey connectedness, without falling prey to the other, equally inappropriate extreme, the view that we are "nothing but" animals.

The Human Genome Project, properly framed, can echo these lessons by profiling the molecular homologies throughout the evolutionary tree. That is, our similarities are genetic as well as structural. *Noggin*, *hedgehog*, *Hox*, *Pax 2*. The genome gives evidence of our common ancestry with other organisms – our extended genealogy – without diminishing our own humanness in any way.

Most important, perhaps, we can invite students to think about why humans seem to care so deeply about the very question "What does it mean to be human?" And why the science seems to matter. That reflection may well reveal part of the answer.

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