Reflections on Human Origins

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ABSTRACT: The evolutionary literature treats the evolution of humans from ape-like ancestors as overwhelmingly confirmed. Moreover, this literature defines evolution as an inherently material process without any guidance from an underlying intelligence. This paper reviews the main lines of evidence used to support such a materialist view of human evolution and finds them inadequate. Instead, it argues that an evolutionary process unguided by intelligence cannot adequately account for the remarkable intellectual and moral qualities exhibited among humans. The bottom line is that intelligence has played an indispensable role in human origins.

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1 William James Sidis

William James Sidis (1898-1944) is by some regarded as the most intellectually gifted person who ever lived. His IQ is estimated to have been between 250 and 300. At eighteen months he could read the *New York Times*. At two he taught himself Latin. At three he learned Greek. At four he was typing letters in French and English. At five he wrote a treatise on anatomy and stunned people with his mathematical ability. At eight he graduated from Brookline High School. He was about to enter Harvard, but the entrance board suggested he take a few years off to develop socially. So he entered Harvard at eleven. At sixteen he graduated cum laude. He became the youngest professor in history. He inferred the possibility of black holes twenty years before Subrahmanyan Chandrasekhar did. As an adult, he could speak more than forty languages and dialects.

Yet the stress of possessing such an amazing intellect took its toll on Sidis. Instead of being appreciated and admired for his intellectual gifts, he was regarded as a freak—an intellectual performer to be stared at rather than a fellow human being to be cherished. As a teenager at Harvard, he suffered a nervous breakdown. As a professor at Rice University, he was unable to bear the constant media attention. In his early twenties, he resigned his professorship and withdrew from all serious intellectual pursuits. In 1924, a reporter found him working a low-paying job at a Wall Street office. Sidis told the reporter that all he wanted was anonymity and a job that placed no demands on him. Sidis spent the rest of his life working menial jobs.[1]

What does the story of William James Sidis have to do with human origins? A constant theme in the evolutionary literature is that humans evolved from ape-like ancestors and therefore share many key features with modern apes. Some evolutionists go so far as to claim that human capacities merely extend capacities already incipient in evolutionary ancestors. Darwin himself took this line in *The Descent of Man*. Although important similarities between humans and apes exist, there are also far-reaching differences, most notably differences in intellectual and moral capacities. Extravagant abilities like those of William James Sidis suggest that the difference between humans and other animals is radical and represents a difference in kind and not merely a difference in degree.[2]

2 Our Fossil Ancestors?

Why do evolutionists think that humans evolved from ape-like ancestors? Humans are classified as belonging to the genus *Homo* and the species *sapiens*. The genus *Homo* in turn falls within the family *Hominidae*, which includes the apes, and, in particular, the chimpanzees (genus *Pan*). Among extant apes, chimpanzees are thought to be the closest evolutionary cousin of humans. Thus, if humans evolved from ape-like ancestors, their evolution would be entirely at the genus-level. Compare this to the evolution of reptiles into mammals, which represents a class-level transition. If, as they do, evolutionists think it plausible that reptiles evolved into mammals (which represents a much higher-level transition), then, a fortiori, they think it even more plausible that ape-like creatures evolved into humans.

Nevertheless, when one examines the actual data and arguments, the case for human evolution becomes less obvious. Take the fossil record. The fossil record contains several extinct species within the genus *Homo*:

most recently *Homo neanderthalensis* (the Neanderthals); then *Homo erectus*; and, going even further back, *Homo habilis*. Each of these had many distinctly human characteristics (for instance, the ability to make tools whose sophistication far exceeds any tools employed by apes). And yet, there is no clear genealogical evidence demonstrating the evolution from *Homo Habilis* to *Homo erectus* to *Homo neanderthalensis* to ourselves, *Homo sapiens*. To be sure, there are similarities. *Homo neanderthalensis* is, by any criterion (anatomical, physiological, cultural) closer to *Homo sapiens* than *Homo erectus*, and the same goes for *Homo erectus* in relation to *Homo habilis*. At best, this shows that *if* humans evolved, then the common ancestor of *Homo sapiens* and *Homo neanderthalensis* is more recent than the common ancestor of *Homo sapiens* and *Homo erectus*. And this common ancestor, in turn, is more recent than the common ancestor of *Homo sapiens* and *Homo habilis*. But such an argument presupposes rather than establishes that humans evolved.

The same problem recurs when we try to argue for human evolution at the genus level. The usual date for the formation of our genus, *Homo*, is about 2.5 million years (*Homo habilis* and *Homo rudolfensis* get the ball rolling). Moreover, the usual date at which the line leading to our genus, *Homo*, is said to have diverged from the line leading to our closest ape cousins, the chimpanzees, is at least 5 million years. In the interim are the *Australopithecines*, which constitute an extinct genus within the *Hominidae*. There's *Australopithecus anamensis* (circa 4 million years ago), *Australopithecus afarensis* (circa 3.5 million years ago), and *Australopithecus africanus* (circa 2.5 million years ago). As before, one can argue on the basis of structural similarity in the fossil record that our common ancestor with *Australopithecus africanus* is more recent than our common ancestor with *Australopithecus afarensis*, and that this common ancestor, in turn, is more recent than our common ancestor with *Australopithecus anamensis*. But, again, this reasoning is based on the assumption that humans evolved in the first place. Structural similarity, as exhibited in the fossil record, is by itself not enough to establish this. What's needed is independent evidence.

3 The Ninety-Eight Percent Chimpanzee?

The most widely cited evidence for human evolution outside the fossil record is genetic. Human and chimpanzee DNA are 98 percent similar. This fact is taken as decisive confirmation of ape to human evolution. But what does this genetic similarity really mean? Consider, first, that because there are only four nucleotide bases, whenever one lines up distinct strands of DNA, even entirely random strands will, on average, be 25 percent similar. Consider, further, that humans and chimpanzees don't have exactly the same number of DNA base-pairs. In the 1980s, when the 98 percent similarity figure was first proposed, it was also thought that the genome of chimpanzees was 10 percent larger than that of humans.[3] But in that case, if one lined up *all* of human DNA with *all* of chimpanzee DNA, 10 percent of the chimpanzee DNA would have no human counterpart. Looked at in this way, initial reports of the similarity between human and chimpanzee DNA should have noted at least a 10 percent difference. This difference in genome size, however, has now largely vanished: current estimates for the length of human and chimpanzee genomes are much closer, with 3.1 billion base-pairs for chimpanzees and 3.2 billion base-pairs for humans.[4]

Where, then, does the 98 percent figure come from? In 1984, Charles Sibley and Jon Ahlquist performed a DNA-DNA hybridization experiment in which the DNA of each species was heated in order to separate the individual strands, and the strands from the two species were mixed together and allowed to recombine.[5] The human DNA was allowed to combine with chimpanzee DNA and vice versa. The degree of matching between the strands was measured by heating the human-chimp DNA combination and measuring the temperature at which the strands re-separated. Thus, on thermodynamic grounds, Sibley and Ahlquist found a 1.63 percent difference between the two species, and thus a 98.4 percent identity.

There's a paradox here that parallels the Hox gene paradox: the Hox genes are so similar that in many cases they may be interchanged between extremely divergent species. The paradox, therefore, is how to reconcile the *observed differences* with the *genetic similarity*. There are so many gross morphological similarities between humans and chimpanzees that it's hardly surprising these similarities should be reflected genetically. In the eighteenth century, before evolution was widely accepted, Linnaeus classified the chimpanzee as *Homo troglodytes* ("primitive man").

According to Jonathan Marks, “When the chimpanzee was a novelty in the 18th century, scholars were struck by the overwhelming similarity of human and ape bodies. And why not? Bone for bone, muscle for muscle, organ for organ, the bodies of humans and apes differ only in subtle ways.”[6] With so many obvious physical similarities, genetic similarities between humans and chimpanzees are hardly surprising.

Even so, to say that human and chimpanzee DNA are 98 percent similar can be seriously misleading. That’s because we tend to think of DNA in terms of written language. There is a crucial difference in the way humans line up parallel texts and molecular biologists line up parallel strands of DNA. DNA strands form sequences from a four-letter alphabet (usually represented by A, T, C, and G). Likewise, books written by humans form sequences from a twenty-six-letter alphabet. Now, if two books written by humans are 98.4 percent similar, they are essentially the same book. To see this, consider the following sidebar. Here we present Hamlet’s famous soliloquy as originally written by Shakespeare. This text is about 1200 characters in length (including spaces and punctuation). Thus, a text at least 98 percent similar to Hamlet’s soliloquy will introduce no more than 24 changes. Even if those changes are entirely random, they do not substantially alter the text. To see this, look at the following sidebar, which gives Hamlet’s original soliloquy as well as a modified version that introduces 24 random changes (signified by boldface **X**s). Except for one or two words that might be in question, Hamlet’s actual soliloquy can be readily recovered from the version with random **X**s. That’s because written language incorporates redundancy and contextual cues that enable us to determine the words and meaning of a text even when it has been corrupted.

=====BEGIN SIDEBAR #1=====

<u>Hamlet’s Soliloquy:</u>
To be, or not to be: that is the question:
Whether ’tis nobler in the mind to suffer
The slings and arrows of outrageous fortune,
Or to take arms against a sea of troubles,
And by opposing end them? To die: to sleep;
No more; and by a sleep to say we end
The heart-ache and the thousand natural shocks

That flesh is heir to, 'tis a consummation
Devoutly to be wish'd. To die, to sleep;
To sleep: perchance to dream: ay, there's the rub;
For in that sleep of death what dreams may come
When we have shuffled off this mortal coil,
Must give us pause: there's the respect
That makes calamity of so long life;
For who would bear the whips and scorns of time,
The oppressor's wrong, the proud man's contumely,
The pangs of despised love, the law's delay,
The insolence of office and the spurns
That patient merit of the unworthy takes,
When he himself might his quietus make
With a bare bodkin? who would fardels bear,
To grunt and sweat under a weary life,
But that the dread of something after death,
The undiscover'd country from whose bourn
No traveller returns, puzzles the will
And makes us rather bear those ills we have
Than fly to others that we know not of?
Thus conscience does make cowards of us all;
And thus the native hue of resolution
Is sicklied o'er with the pale cast of thought,
And enterprises of great pith and moment
With this regard their currents turn awry,
And lose the name of action. - Soft you now!
The fair Ophelia! Nymph, in thy orisons
Be all my sins remember'd.

98 Percent of Hamlet's Soliloquy (changes marked with bold **X**s):
To be, or not to be: that is the question:
Whether 'tis nobler in the mind to suffer
The slings and arrows of outrageous fortune,
Or to take arms against a sea of tro**X**ble**X**,
And by opp**X**sing end them? To die: t**X** sleep;
No more; and by a s**X**eep to say we end
The heart-ache and the thousand natural shocks
That flesh is heir to, 'tis a consummatio**X**
Devoutly to be wish'd. To die, to sleep;
To sleep: perchance to dream: ay, there's the rub;
For in that sleep of death what dreams m**X**y**X**come
When w**X** have shuffled off this mortal coil,

Must give us pause: there's the respect
That makes calamity of so long life;
For who would bear the whips and scorns of time,
The oppres**X**or's wro**X**g, the proud man's contumely,
The pangs of despised love, the law's delay,
The insolence of o**X**fice and the spurns
That patient merit of the unworthy takes,
When he hi**X**self migh**X** his quietus make
With a bare bodkin? who would fardels bear,
To grunt **X**nd sweat under a weary life,
But that the dread of something after d**X**at**X**,
The undiscover'd country from whose b**X**urn
No traveller returns, puzzles the will
And makes us rather be**X**r those ills we have
Than fly to others tha**X** we know not of?
Thus conscience does make cowards of us all;
And thus the native hue of res**X**lution
Is sicklied o'er with the pale cast of thought,
And enterprises of great pith and moment
With this regard their currents turn awry,
And lose the name of action. - Soft you no**X**!
The fair Ophelia!**X**Nymph, in thy orisons
Be **X**ll my sins remember'd.

=====END SIDEBAR #1=====

The similarity between human and chimpanzee DNA is nothing like the similarity between these two versions of Hamlet's soliloquy. This is because of the complex ways that genetic information is utilized within cells. Biological function can depend crucially upon extremely small changes in proteins as well as in how they are utilized over time and in space. The way proteins interact forms a higher order network that is not visible from nucleotide or amino-acid sequences alone and thus is opaque to sequence analyses. It's like going through the works of William Shakespeare and John Milton, and finding that almost all the words and short phrases they used are identical. Such a similarity would not be surprising since what separates Shakespeare from Milton is not so much their vocabulary but how they used their vocabulary to express their thoughts. Different authors might use nearly identical sets of words. The crucial difference is in how those words are utilized in their respective contexts. The overall meaning only emerges from the way the words are put together. Likewise, two organisms might have nearly identical sets of genes, and even situate those genes in roughly the same order; and yet they can utilize those genes so differently as to produce markedly different organisms.

To see that the genetic changes separating humans and chimpanzees are more complex than the 98-percent similarity figure suggests, consider the publication of the chimpanzee chromosome 22 sequence in *Nature*.[7] Consistent with past studies, the overall sequence divergence was found to be 1.44 percent. Nevertheless, the researchers were surprised to find 68,000 places where the sequences of humans and chimpanzees could not be aligned because the corresponding place was simply missing in one species or the other. These regions are called insertions/deletions, or *indels*, and represent places where DNA has been added or removed in one of the organisms being compared. The DNA annealing experiments by Sibley and Ahlquist cannot detect indels and therefore underestimate the true amount of divergence between humans and chimpanzees. One of the pioneers of the DNA annealing process, Roy Britten at Caltech, argues that the true genetic divergence between humans and chimpanzees is closer to 95 percent once indels are accounted for.[8]

Not only is there more sequence divergence than expected between human and chimpanzee genomes (due to indels), but this divergence was found to have significant effects both on the amino-acid sequences of proteins and on the ways those proteins are regulated. A direct comparison of protein coding regions of 231 genes shared between humans and chimpanzees revealed that 47 were significantly different in amino-acid sequences. Among the genetic changes observed in those 47 genes, 15 contain insertions or deletions of amino acids and 32 genes have different translation start or stop signals. Additionally, it was found that many genes made several different RNA transcripts, and these transcripts varied between humans and chimpanzees. Some transcripts present in humans were lacking altogether in chimpanzee, suggesting that the genes are being utilized differently in the two species. Overall, the paper reports that 20.3 percent of proteins are substantially different between humans and chimpanzees, which suggests that the seemingly few genetic differences between humans and chimps disproportionately affect protein sequences and regulation.[9]

A study in *Science* illustrates in detail how the genetic differences between humans and chimpanzees result from genes being utilized differently in each organism. Titled "Intra- and Interspecific Variation in Primate Gene Expression Patterns," the work by researchers at the Max-Planck-Institute for Evolutionary Anthropology used gene chip technology to measure expression levels of different genes in humans and chimpanzees.[10] They found little difference in genes expressed in blood cells and liver cells of the two species, but when brain cells were compared, massive differences were evident. The difference was so extreme that if humans and chimps are assumed to have shared a common ancestor, humans have accumulated 5.5 times the changes that accumulated in chimps over the same time period. In other words, the rate of change must have been 5.5 times faster in humans than in chimpanzees.

Another aspect of the study utilized a sophisticated 2-dimensional gel electrophoresis technique to separate out proteins from human and chimpanzee brains. Using this technique, the researchers were able to separate out the proteins on the basis of their size and charge. By comparing the data from two species' brains, two kinds of data can be gathered: qualitative, measuring the differences in types of proteins, and quantitative, measuring the differences in amounts of proteins. The researchers compared the proteins expressed in two mouse species' brains and found the relative measures were approximately the same: qualitative and quantitative data both showed around a 7 percent difference between the two species. For humans and chimpanzees the researchers also found around a 7 percent qualitative difference; nevertheless, the quantitative difference in this case was over four times higher than expected, namely, 31 percent. This differing pattern of protein quantity reflects the vastly different patterns of gene expression occurring in the neuronal cells of humans versus chimpanzees. This means that even though the genes are remarkably similar, they are being used in very different ways in each species. Indeed, the researchers found specific gene regulatory sites that are different between humans and chimpanzees, suggesting that genes are expressed differently because they are regulated by different transcription factors.

The differential usage of genes in humans and chimpanzees stems from two fundamental types of genetic changes: (1) re-wiring of portions of the gene regulatory network (i.e., changing how genes regulate each other) and (2) changing how key regulators interact with their targets. The difference here is that in (1) the topology of the network is fundamentally altered, whereas in (2) the connections stay the same but the connection strengths are altered in ways that ramify throughout the network. For example, one might imagine altering a key repressor protein so that it no longer represses a host of downstream targets, thereby allowing the activation (upregulation) of those genes, which may in turn regulate other genes. The study of chimpanzee chromosome 22 confirms both types of genetic changes: protein sequences showed significantly more changes than expected, potentially altering their ability to regulate other genes; and regulatory sites also contained alterations, showing directly that the regulatory network was altered.

While the extent of regulatory network re-wiring between humans and chimpanzees is not known, the holistic nature of the gene expression system means that large-scale re-working of the network would require multiple coordinated changes to avoid producing a disconnected mess rather than a coherent, interwoven whole. The important point is that small changes can have very significant effects on biological systems *if those changes are just the right changes*. One clear implication is that humans and chimpanzees somehow acquired precisely those changes that make a difference, while not simultaneously acquiring a host of functionally irrelevant genetic changes (because, overall, our DNA sequences are almost identical). Indeed, the combination of broad genetic similarity and precise functional changes suggests that the genetic alterations that occurred make the most sense as the product of intelligence and planning.

=====BEGIN SIDEBAR #2=====

Physical Differences between Humans and Chimpanzees[11]

How similar are humans and chimpanzees when we look not at the level of genes but at the level of gross morphology? Consider the following differences:

(1) The feet of chimpanzees are prehensile, in other words, their feet can grab anything their hands can. Not so for humans.

(2) Humans have a chin, apes do not.

(3) Human females experience menopause; no other primates do (the only known mammal besides humans to experience menopause is the pilot whale).

(4) Humans have a fatty inner layer of skin as do aquatic mammals like whales and hippopotamuses; apes do not.

(5) Humans are the only primate whose breasts are apparent when not nursing.

(6) Apes have a bone in their penis called a baculum (10 millimeters in chimpanzees); humans do not.

(7) Humans have a protruding nose.

(8) Humans sweat; apes do not.

(9) Humans can consciously hold their breath; apes cannot.

(10) Humans are the only primate to weep.

These are just a few of the more obvious physical differences between humans and chimpanzees. But the key difference, of course, resides in the intellectual, linguistic, and moral capacities of humans.

=====END SIDEBAR #2=====

4 Language and Intelligence

Do evolutionists have any other reasons, besides the fossil record and genetic similarity, for thinking that humans evolved from ape-like ancestors? They do, but these other reasons suffer the same defect of overemphasizing similarity and underemphasizing difference. Take, for instance, the capacity of apes for simple symbol manipulation. Apes are capable of acquiring a rudimentary communication system. For instance, Barbara King, a biological anthropologist at the College of William and Mary, describes an ape that developed a taste for champagne and learned to refer to it symbolically.[12] King interprets this capacity as further confirmation of our common ancestry with the apes.[13] But what does this ape really know about champagne other than “that bubbly yellow liquid that tastes good"? And even this goes too far, tacitly attributing linguistic practices to apes that they give no evidence of possessing.[14]

Does the ape have any concept of what champagne actually is, namely, an alcoholic beverage made by fermenting grapes, turning it into wine, and then carbonating it? Can the ape acquire this concept as well as the related concepts needed to understand it? Can the ape deploy this concept in an unlimited number of appropriate contexts, the way humans do? Not at all. The difficulty confronting evolution is to explain the vast differences between human and ape capacities, not their similarities. Human language is not on a continuum with the communication systems of apes or any other animals. The premier linguist of the 20th century, Noam Chomsky, argued this point at length:

> When we study human language, we are approaching what some might call the "human essence," the distinctive qualities of mind that are, so far as we know, unique to man and that are inseparable from any critical phase of human existence, personal or social.... Having mastered a language, one is able to understand an indefinite number of expressions that are new to one's experience, that bear no simple physical resemblance and are in no simple way analogous to the expressions that constitute one's linguistic experience; and one is able, with greater or less facility, to produce such expressions on an appropriate occasion, despite their novelty and independently of detectable stimulus configurations, and to be understood by others who share this still mysterious ability. The normal use of language is, in this sense, a creative activity. This creative aspect of normal language use is one fundamental factor that distinguishes human language from any known system of animal communication.[15]

Chomsky is here responding to a standard move in the evolutionary literature: many evolutionists, upon identifying a similarity between humans and apes (or other animals more generally), use this similarity not to elevate the apes but, rather, to lower the humans. In particular, such evolutionists downgrade the feature of our humanity that is the basis for the similarity. We've just seen this in the case of human language: because humans and apes both have communication systems, human language is said to be just a more sophisticated (more highly evolved) version of ape communication. Not so. Human language, with its infinite adaptability to different contexts and its ability to create novel concepts and metaphors, has no counterpart in the communication systems of other animals.

In the same way, evolutionists tend to downgrade human intelligence when comparing it with ape and animal intelligence. From the vantage of contemporary evolutionary theory, intelligence is not a fundamental feature of reality but a product of evolution given to us and other animals because of its value for survival and reproduction. But is that all intelligence is? Might it not be, instead, that intelligence is a fundamental feature of the world, a principle that animates the whole of reality, that is responsible for the marvelous designs we see throughout the biophysical universe, and that is reflected in the cognitive capacities of animals, and preeminently so in humans? The very fact that the world is intelligible and that our intelligence is capable of understanding the world points to an underlying intelligence that adapted our intelligence to the world.

Evolutionists resist this conclusion by attributing the fit between our intelligence and the world to natural selection. But in that case, intelligence becomes merely a tool for survival and reproduction, and such a tool is under no obligation to give us a true understanding of the way the world actually is. Indeed, a good delusion could easily be better than the truth for fostering survival and reproduction. But in that case, how do we know that evolutionary theory is not itself one of those delusions? Darwin put it this way: "With me the horrid doubt always arises whether the convictions of man's mind, which has been developed from the mind of the lower animals, are of any value or are at all trustworthy."[16]

To appreciate the full significance of Darwin's remark, apply the doubt he has just expressed to evolutionary theory itself. It follows that any theory of evolution that rules out intelligence from the evolutionary process is self-referentially incoherent—in other words, it logically defeats itself. Thus, to the degree that we repose confidence in such a theory as a true account of our human origins, to that degree we have no basis for reposing confidence in it. Put differently, unless intelligence played a crucial role in human origins, the convictions of our mind are inherently untrustworthy and can provide us with no reliable understanding of human origins.

To sum up, evolutionists, when they note some similarity between humans and animals, tend not to elevate animals by seeing in them a partially developed trait that finds fulfillment in humans. Rather, they tend to demote humans by dismissing their marvelous gifts as products of a blind evolutionary process that merely embellishes capacities already present in animal ancestors. Instead of stressing human distinctiveness, the stress is on commonality with animals. From an intelligent design perspective, the study of human origins needs to pay proper attention to both human distinctiveness and commonality with animals.

5 Morality, Altruism, and Goodness

The most determined move by evolutionists to undercut a human quality that is also reflected in apes concerns our moral sensibilities. Apes, like us, are social creatures. We live in societies structured by moral norms. Those norms facilitate cooperation. They get us to help each other and behave altruistically. Why are we altruistic? According to evolutionary ethics and evolutionary psychology (currently two of the hottest evolutionary subdisciplines), altruism is not a designer's gift to us and the apes; it does not reflect a designer's benevolence. Instead, altruism is a strategy for facilitating survival and reproduction. Altruism, even though it may require sacrificing oneself, nonetheless benefits the survival of the society, and therefore is likely to be favored by evolution. Alternatively, altruism is not really a sacrifice at all but a form of exchange in which one scratches another's back in the expectation that one's own back will, in turn, be scratched. The first of these falls under what is known as *kin selection*, the second under *reciprocal altruism*.

The point to realize is that altruism, the kindness we display toward others at cost to ourselves, is, on evolutionary principles, merely the grease that keeps the evolutionary skids running smoothly. Indeed, evolutionary theorists reinterpret all our moral impulses in this light. Michael Ruse and E. O. Wilson are remarkably straightforward in this regard:

> The time has come to take seriously the fact that we humans are modified monkeys, not the favored Creation of a Benevolent God on the Sixth Day. In particular, we must recognize our biological past in trying to understand our interactions with others. We must think again especially about our so-called "ethical principles." The question is not whether biology—specifically, our evolution—is connected with ethics, but how. As evolutionists, we see that no [ethical] justification of the traditional kind is possible. Morality, or more strictly our belief in morality, is merely an adaptation put in place to further our reproductive ends. Hence the basis of ethics does not lie in God's will.... In an important sense, ethics as we understand it is an illusion fobbed off on us by our genes to get us to cooperate. It is without external grounding. Like Macbeth's dagger, it serves a powerful purpose without existing in substance.

> Ethics is illusory inasmuch as it persuades us that it has an objective reference. This is the crux of the biological position. Once it is grasped, everything falls into place.[17]

Although this view of morality makes perfect sense within an evolutionary worldview, it quickly disintegrates once one realizes just how slender the evidence for evolution, apart from intelligent guidance, actually is. More significantly for this discussion, however, is that this evolutionary view of morality cannot be squared with the facts of our moral life. Within traditional morality, the main difficulty is to come to terms with the problem of evil. For evolutionary ethics, by contrast, the main difficulty is to come to terms with the problem of good. It is a fact that people perform acts of kindness that cannot be rationalized on evolutionary principles. Altruism is not confined simply to one's in-group (those to whom one is genetically related). Nor is altruism outside one's in-group simply a quid pro quo. People are in fact capable of transcending the self-aggrandizement and grasping for reproductive advantage that evolutionary theorizing regards as lying at the root of ethics.

To see this, consider holocaust rescuers. These were people who aided Jews and others persecuted by the Nazis at great cost and risk to themselves. Jeffrey Schloss writes:

> Holocaust rescuers exhibited patterns of aid that uniformly violated selectionist [i.e., evolutionist] expectations. Not only was the risk of death clear and ongoing, but it was not confined to the rescuer. Indeed, the rescuer's family, extended family, and friends were all in jeopardy, and recognized to be in jeopardy by the rescuer. Moreover, even if the family escaped death, they often experienced deprivation of food, space, and social commerce; extreme emotional distress; and forfeiture of the rescuer's attention. What's more, rescuing was unlikely to enhance the reputation of the rescuer: Jews, Gypsies, and other aided individuals were typically despised, and assisting them so violated the laws and prevailing social values that the social consequences included ostracism, forfeiture of possessions, and execution. While it is possible to speculate that reputation and group cohesion within subcultural enclaves could have been enhanced by rescuing, there is little evidence that such enclaves existed, and most rescuers do not testify to belonging to, or knowing of a group that would have extended support or approval, much less reward or esteem for their actions. Moreover, the overwhelming majority were absolutely secretive about their behavior, not even disclosing it to closest friends or family members outside their immediate dwelling. Finally, the "most unvarying" feature of the behavior and attitudes

> of all the rescuers was the complete absence of group or individual connections to those aided.[18]

What is the response of evolutionary ethics to people who transcend their selfish genes? Genuine human goodness is an unresolvable problem for evolutionary ethics. Its proponents have only one way of dealing with goodness, namely, to explain it away. Mother Teresa is a prime target in this regard—if Mother Teresa's acts of goodness on behalf of the poor and sick can be explained away in evolutionary terms, then surely so can all acts of human goodness. For E. O. Wilson, goodness depends on "lying, pretense, and deceit, including self-deceit, because the actor is most convincing who believes that his performance is real."[19] Accordingly, Wilson attributes Mother Teresa's acts of goodness to her belief that she will be richly rewarded for them in heaven. In other words, she was simply looking out for number one, acting selfishly in her own self-interest. As Wilson puts it, "Mother Teresa is an extraordinary person but it should not be forgotten that she is secure in the service of Christ and the knowledge of her Church's immortality."[20]

And if that explanation doesn't work, evolutionary ethics can always argue that Mother Teresa's genetic program misfired, distorting her ethical sensibilities so that she became an evolutionary dead-end, one that evolution would be sure to weed out because it has no use for such extreme do-gooders (note that as a Catholic nun, Mother Teresa took a vow of celibacy and therefore left no offspring). Thus, instead of treating Mother Teresa as a model of goodness to which we should aspire, evolutionary ethics regards Mother Teresa as a freak of nature with no future. Such rationalizations of human goodness are now standard fare in the evolutionary literature.[21] Certainly, they denigrate our moral sensibilities. More significantly, however, they don't square with the facts.

6 The Benefits of Bigger Brains

The question therefore remains, how does evolution produce humans with remarkable moral and intellectual capacities like Mother Teresa and William James Sidis? First off, let's be clear that evolutionists have no detailed explanations for how such capacities evolved. Indeed, evolutionists never get very far beyond noting that our cognitive capacities require organisms with sizable brains. Take a recent report in *Nature* by Michael Hopkin titled "Jaw-Dropping Theory of Human Evolution: Did

Mankind Trade Chewing Power for a Bigger Brain?" According to Hopkin, "Researchers have proposed an answer to the vexing question of how the human brain grew so big. We may owe our superior intelligence to weak jaw muscles, they suggest. A mutation 2.4 million years ago could have left us unable to produce one of the main proteins in primate jaw muscles.... Lacking the constraints of a bulky chewing apparatus, the human skull may have been free to grow, the researchers say."[22]

Think of what is being argued here. Evolutionists are not simply arguing that a very modest mutation affecting jaw muscles gives brains room to grow. Rather, they are arguing that given room to grow, brains will in fact grow, getting bigger and bigger till—*presto!*—intelligence, language, culture, and amazing people like Mother Teresa and William James Sidis emerge. This isn't an argument; this is wishful speculation. Indeed, evolutionists never rise above such speculation in accounting for human cognitive capacities. Usually they don't even get that far. Usually they can't even identify a concrete biological feature that might be implicated in the distinctly human aspects of cognition. That's why the jaw-dropping theory of bigger brains aroused so much excitement among evolutionary biologists—here, at least, was an actual genetic mutation that might be implicated in bigger brains and, thus, in human cognition.

Typically, however, evolutionists are content simply to assume that evolution is able to produce bigger brains. And why not? Evolution, after all, is said to have produced everything else of biological significance. Attributing bigger brains to evolution is therefore hardly a stretch. And once bigger brains have evolved, spectacular cognitive abilities are supposed to follow as a matter of course. But how exactly? Unfortunately, evolutionists have no exact answers here. Instead, they propose three types of hypotheses (or combinations of them) to account for the correlation between increased brain size and increased cognitive ability: the adaptationist hypothesis, the byproduct hypothesis, and the sexual-selection hypothesis.

7 Explaining Human Mathematical Ability— Three Evolutionary Hypotheses

Let's consider these hypotheses in turn, but let's do so with respect a specific cognitive ability, namely, mathematics. How did humans acquire their amazing talent for mathematics? According to the adaptationist hypothesis, mathematical ability conferred a clear advantage on our evolutionary ancestors. Those with better mathematical abilities were thus better able to survive and reproduce. In other words, they were better able to "adapt" to their environments (which is the point of calling this an "adaptationist hypothesis"). The adaptationist hypothesis has a certain plausibility when it comes to the acquisition of rudimentary mathematical abilities like simple arithmetic.

Consider, for example, one of our hunter-gatherer ancestors who earlier in the day counted five lions and now sees four of those lions dead from hunting. If he knows basic arithmetic, he can subtract four from five and conclude that one lion is still on the loose. He will thus exercise appropriate caution, which will translate into a survival and reproductive advantage. But rudimentary mathematical abilities are one thing; developing four-dimensional Riemannian geometries that describe a curved spacetime manifold, as Albert Einstein did, is quite another. Here the adaptationist hypothesis breaks down, and other hypotheses are required.

According to the byproduct hypothesis, higher cognitive functions like mathematics are not evolutionary adaptations. Instead, they are unintended byproducts of traits that are adaptive. Spectacular mathematical abilities are thus said to piggyback on the adaptiveness of other capacities. Pascal Boyer offers such an argument. According to him, some rudimentary quantitative ability is adaptive. Boyer then suggests that the capacity to do higher-level mathematics is a byproduct of this rudimentary ability. The higher-level capacity is not adaptive by itself; rather, it emerges as a free rider on abilities that are adaptive. But how, exactly, does rudimentary quantitative ability turn into the ability to develop curved spacetime Riemannian geometries or mathematical theories of comparable sophistication? Boyer doesn't say.[23]

This is always the problem with byproduct hypotheses, namely, bridging the gap between what can be explained in standard evolutionary terms (adaptations) and the unexpected "freebies" (byproducts) that come along for the ride. Some free lunches are just too good to be true. And precisely when they are too good to be true, they require explanation. That's doubly the case with mathematics: here we have a human capacity that not only emerges, according to the byproduct hypothesis, from other capacities, but also provides fundamental insights into the structure of the physical universe (mathematics is, after all, the language of physics).[24]

How could a capacity like that arise as the byproduct of a blind evolutionary process, one unguided by any intelligence? It will not do here simply to say that it could have happened that way. Science does not trade in sheer possibilities. If our mathematical ability is the byproduct of other evolved traits, then the connection with those traits needs to be clearly laid out. To date, it has not.

Finally, we turn to the sexual-selection hypothesis. Sexual selection is Darwin's explanation for how animals acquire traits that have no direct adaptive value. Consider a stag whose antlers are so large that they are more dead-weight than defense. Or consider a peacock whose large colored tail makes it easy prey. Why do such structures evolve? According to Darwin, they evolve because they help to attract mates—they are a form of sexual display. Thus, even though these features constitute a disadvantage for survival in the greater environment, the reproductive advantage they provide in attracting mates more than adequately compensates this disadvantage and provides an evolutionary justification for the formation of these features.

Geoffrey Miller has taken Darwin's idea of sexual selection and applied it to explain the formation of our higher cognitive functions.[25] According to him, extravagant cognitive abilities like those exhibited by mathematical geniuses are essentially a form of sexual display. Once some capacity begins to attract mates, it acts like a positive feedback loop, reinforcing the capacity more and more. In the case of cognitive functions, such a positive feedback loop can run unchecked because there are no environmental constraints to rein it in: unlike stag antlers or peacock tails, which can only get so large before their environmental disadvantage outweighs their ability to attract mates, higher cognitive functions can essentially increase without bound. This, for Miller, is the origin of our higher cognitive functions, and our talent for mathematics in particular.

Leaving aside whether mathematical ability really is a form of sexual display (most mathematicians would be surprised to learn as much), there is a fundamental problem with this and the other two hypotheses we are considering. The problem is not that these hypotheses presuppose evolution, though that in itself is problematic. The problem, rather, is that each of these three hypotheses fails to provide a detailed, testable model for assessing its validity. If spectacular mathematical ability is adaptive, as the adaptationist hypothesis claims, how do we determine that and what precise evolutionary steps would be needed to achieve that ability? If it is a byproduct of other abilities, as the byproduct hypothesis claims, of which abilities exactly is it a byproduct and how exactly do these other abilities facilitate it? If it is a form of sexual display, as the sexual-selection hypothesis claims, how exactly did this ability mushroom from unspectacular beginnings? The devil is in the details. Certainly, if evolution is true, then one of these hypotheses or some combination of them is likely to account for our ability to do mathematics. But even if evolution is true, apart from a detailed, testable model of how various higher-level cognitive functions emerged, these hypotheses are scientifically sterile.

8 The Benefits of Smaller Brains

It will be helpful here, briefly, to return to the issue of brain-size. In the evolutionary literature, all of our spectacular cognitive abilities—mathematical genius, musical genius, poetic genius—presuppose big brains. Regardless of whether those abilities are adaptations, byproducts, or the result of sexual selection, evolutionary theory regards big brains as a necessary evolutionary precursor to these abilities. Now, it's certainly true that big brains are correlated with increasing intelligence. But correlation, as anyone who has taken a course in research methods knows, is not causation. Moreover, the correlation here is far from perfect.

For instance, the term "bird-brain" has worked itself into our popular vocabulary and come to signify someone with a small brain and low intelligence. Some birds, however, possess remarkable intellectual abilities far beyond anything we might expect on the basis of brain-size. Consider Irene Pepperberg's research with Alex, one of four African Grey parrots that she has trained:

> Alex, the oldest, can count, identify objects, shapes, colors and materials, knows the concepts of same and different, and bosses around lab assistants in order to modify his environment. [The researchers] have begun work with phonics and there is evidence to suggest that, someday, Alex may be able to read.[26]

Given such anomalies, why should we think that big brains are required for higher cognitive functions? In fact, there are reliable reports of people exhibiting remarkable cognitive function with very much reduced brain matter. For instance, the December 12, 1980 issue of *Science* contained an article by Roger Lewin titled "Is Your Brain Really

Necessary?" In the article, Lewin reported a case study by John Lorber, a British neurologist and professor at Sheffield University:

> "There's a young student at this university," says Lorber, "who has an IQ of 126, has gained a first-class honors degree in mathematics, and is socially completely normal. *And yet the boy has virtually no brain*." The student's physician at the university noticed that the youth had a slightly larger than normal head, and so referred him to Lorber, simply out of interest. "When we did a brain scan on him," Lorber recalls, "we saw that instead of the normal 4.5-centimeter thickness of brain tissue between the ventricles and the cortical surface, there was just a thin layer of mantle measuring a millimeter or so. His cranium is filled mainly with cerebrospinal fluid."[27]

Or consider the case of Louis Pasteur. As Stanley Jaki remarks,

> A brain may largely be deteriorated and still function in an outstanding way.... A famous case is that of Pasteur, who at the height of his career suffered a cerebral accident, and yet for many years afterwards did research requiring a high level of abstraction and remained in full possession of everything he learned during his first forty some years. Only the autopsy following his death revealed that he had lived and worked for years with literally one half of his brain, the other half being completely atrophied.[28]

Evolutionists, when confronted with such anomalies, will often remark that the brain contains lots of redundancy. Lorber himself concludes that "there must be a tremendous amount of redundancy or spare capacity in the brain, just as there is with kidney and liver."[29] But that raises another problem. If much of the brain is redundant, then why didn't we evolve the same cognitive abilities with smaller brains? Redundancy is all fine and well if there are no hidden costs. But big brains also make it difficult for human babies to pass through the birth canal, which, historically, has resulted in heavy casualties—many mothers and babies have died during delivery. Why should the selective advantage of bigger brains with lots of redundancy outweigh the selective advantage of easier births due to smaller brains that, nonetheless, exercise the same cognitive functions, though with lowered redundancy?

There are many deep questions here. The evolutionist may well be right that big brains have an inherent selective advantage. But that has yet to be established. More significantly, it remains an open question how cognitive function relates to neurophysiology. The materialist assumption, entertained by many evolutionists, that mind is reducible to brain remains for now without empirical support. What we have are correlations between brain images and conscious mental states. What we do not have is a causal mechanism relating the two. Quite the contrary, there are now good reasons for thinking that no such causal mechanism exists and that mind is inherently irreducible to brain.[30]

9 Modified Monkey or Modified Dirt?

Where does that leave us with regard to human evolution? In responding to criticisms of evolution on biblical grounds, Thomas Henry Huxley once remarked, “It is as respectable to be modified monkey as modified dirt.”[31] From an intelligent design perspective, the crucial issue is not the respectability of humanity’s physical precursors (monkeys vs. dirt) but what was producing the modifications that brought us about. In particular, is the source behind those modifications intelligent or simply the outworking of blind material forces? Regardless of whether one is a biblical creationist or an atheistic Darwinist or anything in between, all are agreed that humans did not magically materialize out of nothing. Humans arose from preexisting physical stuff. Indeed, the very word “human” refers to the dirt (humus) that lies beneath our feet. In this respect, monkeys and humans are both modified dirt, and that is true regardless of whether humans are, in addition, modified monkeys.

Evolution, as the term is typically used, refers to a process of modification that explicitly rules out intelligence. In other words, evolution by intelligent design is not typically what is meant by evolution. Nevertheless, once intelligence is permitted a role in the modifications responsible for humans, it becomes an open question whether humans are both modified monkeys and modified dirt or merely modified dirt. We can ask the same sort of question about an archeological artifact. For instance, is an engraved metal bowl the result of reworking an existing bowl or was it made from scratch by first casting liquid metal in a mold?

There may be good reasons for thinking that humans are redesigned monkeys. Even so, a design-theoretic perspective does not require that novel designs must invariably result from modifying existing designs. Hence, there may also be good reasons for thinking that a redesign process didn’t produce humans and that, instead, humans were built them from the ground up (pun intended). Design theorists have yet to reach a consensus on these matters. Nevertheless, they have reached a consensus about the indispensability of intelligence in human origins. In particular, they argue that an evolutionary process unguided by intelligence cannot adequately account for the remarkable intellectual gifts of a William James Sidis or the remarkable moral goodness of a Mother Teresa.

Notes

[1]For more about Sidis, see Jim Morton, “Peridromophilia Unbound,” available through http://www.sidis.net/WJSJourLinks.htm, and Grady M. Towers, “The Outsiders,” http://www.prometheussociety.org/articles/Outsiders.html. Both websites last accessed June 4, 2004.

[2]For this distinction, see Mortimer Adler, *The Difference of Man and the Difference It Makes* (New York: Fordham University Press, 1993).

[3]C. Pellicciari, D. Formenti, C. A. Redi, and M. G. Manfredi Romanini, “DNA Content Variability in Primates,” *Journal of Human Evolution* 11 (1982): 131–141.

[4]See respectively http://genomebiology.com/researchnews/default.asp?arx_id=gb-spotlight-20031215-01 and http://www.nature.ca/genome/03/a/03a_11a_e.cfm (both websites last accessed August 18, 2004).

[5]Charles G. Sibley and Jon E. Ahlquist, “DNA Hybridization Evidence of Hominid Phylogeny: Results from an Expanded Data Set,” *Journal of Molecular Evolution* 26 (1987): 99–121.

[6]Jonathan Marks, “98% Alike? (What Our Similarity to Apes Tells Us About Our Understanding of Genetics),” *The Chronicle of Higher Education* (May 12, 2000): B7. See also Jonathan Marks, *What It Means to Be 98% Chimpanzee: Apes, People, and Their Genes* (Berkeley, Calif.: University of California Press, 2002).

[7]The International Chimpanzee Chromosome 22 Consortium, “DNA Sequence and Comparative Analysis of Chimpanzee Chromosome 22,” *Nature* 429 (27 May 2004): 383–388.

[8]R. Britten, “Divergence between Samples of Chimpanzee and Human DNA Sequences Is 5%, Counting Indels,” *Proceedings of the National Academy of Sciences* 99(21) (15 October 2002): 13633–13635.

[9]Ibid.

[10]W. Enard, P. Khaitovich, J. Klose, S. Zollner, F. Heissig, P. Giavalisco, K. Nieselt-Struwe, E. Muchmore, A. Varki, R. Ravid, G. Doxiadis, R. Bontrop, and S. Paabo, “Intra- and Interspecific Variation in Primate Gene Expression Patterns,” *Science* 296 (12 April 2002): 340–343.

[11]Taken from Geoffrey Simmons, What Darwin Didn’t Know (Eugene, Oregon: Harvest House, 2004), 274-278.

[12]Barbara J. King, *Roots of Human Behavior*, 24 part audio course (Chantilly, Va.: The Teaching Company, 2001).

[13]According to her colleague Hans Christian von Baeyer, “Barbara King has even suggested that the human ability to exchange information through speech and gesture is not unique. It evolved, she believes, along with other traits we inherited from primates and should be seen as part of a continuum that extends from an amoeba’s ability to extract information from its environment, through the dance of the honeybee and the song of a bird, to our modern methods of commuinication.” Quoted from von Baeyer, *Information: The New Language of Science* (Cambridge, Mass.: Harvard University Press, 2004), 9.

[14]As an anonymous reviewer has remarked, "This already gives the ape too much credit. The linguistic complexity involved in the expression 'that bubbly yellow liquid that tastes good' is significantly greater than the symbolic communication achieved by the ape. The expression includes ostension, quality ascriptions (bubbly, yellow), value ascriptions (good), etc. These are only intelligible as parts of a larger set of established linguistic practices. That is, the ape lacks the supporting linguistic structures that the expression presupposes. To interpret the symbolic communication of the ape by an English language expression commits the very mistake being criticized—linguistic anthropomorphism." Email sent to William Dembski, 23 June 2004.

[15]Noam Chomsky, "Form and Meaning in Natural Languages," in *Language and Mind*, enlarged edition (New York: Harcourt, Brace, Jovanovich, 1972), 100.

[16]Charles Darwin, Letter to W. Graham, 1881. In F. Darwin, ed., *The Life and Letters of Charles Darwin* (New York: D. Appleton & Co., 1905), 1:285. Available online at http://pages.britishlibrary.net/charles.darwin/texts/letters/letters1_08.html (last accessed 4 August 2004).

[17]Michael Ruse and E. O. Wilson, "The Evolution of Ethics," in *Religion and the Natural Sciences: The Range of Engagement*, ed. J. E. Hutchingson (Orlando, Fl.: Harcourt and Brace, 1991).

[18]Jeffrey Schloss, "Evolutionary Accounts of Altruism and the Problem of Goodness by Design," in *Mere Creation*, ed. W. A. Dembski (Downers Grove, Ill.: InterVarsity, 1998), 251.

[19]Edward O. Wilson, *On Human Nature* (Cambridge, Mass.: Harvard University Pres, 1978), 155–156.

[20]Ibid., 165.

[21]James Rachels, *Created from Animals: The Moral Implications of Darwinism* (New York: Oxford University Press, 1990); Robert Wright, *The Moral Animal: Evolutionary Psychology in Everyday Life* (New York: Vintage Books, 1994); Leonard D. Katz, ed., *Evolutionary Origins of Morality* (New York: Norton, 1998); Benjamin Wiker, *Moral Darwinism: How We Became Hedonists* (Downers Grove, Ill.: InterVarsity, 2002).

[22]Available online at http://www.nature.com/nsu/040322/040322-9.html (published March 25, 2004; last accessed June 17, 2004). For the research article cited in this report, see H. H. Stedman et al., "Myosin Gene Mutation Correlates with Anatomical Changes in the Human Lineage," *Nature* 428 (2004): 415–418.

[23]Boyer makes this argument in *Religion Explained: The Evolutionary Origins of Religious Thought* (New York: Basic Books, 2001). In attempting to account for higher cognitive functions, Boyer is concerned not just with mathematics but also with art, religion, and ethics. For another byproduct approach to higher cognitive functions, see Steven Mithen, *The Prehistory of the Mind: The Cognitive Origins of Art, Religion, and Science* (London: Thames & Hudson, 1996). Mithen sees higher-level functions like mathematics as the byproducts of a "cognitive fluidity" that is adaptive in the sense that it facilitates the coordination and communication of various lower-level cognitive modules.

[24]See especially Mark Steiner, *The Applicability of Mathematics as a Philosophical Problem* (Cambridge, Mass.: Harvard University Press, 1999).

[25]See his book *The Mating Mind: How Sexual Choice Shaped the Evolution of Human Nature* (New York: Doubleday, 2000).

[26]Reported at http://www.alexfoundation.org/index.html (last accessed August 18, 2004). This is the website of the Alex Foundation, Irene Pepperberg's research group dedicated to "psittacine intelligence and communication research."

[27]Roger Lewin, "Is Your Brain Really Necessary?" *Science*, 210 (12 December 1980): 1232.

[28]Stanley L. Jaki, *Brain, Mind and Computers* (South Bend, Ind.: Gateway Editions, 1969), 115–116.

[29]Reported by Ray Kurzweil in Jay W. Richards, ed., *Are We Spiritual Machines: Ray Kurzweil vs. the Critics of Strong A.I.* (Seattle: Discovery Institute, 2002), 193.

[30]David Chalmers, *The Conscious Mind: In Search of a Fundamental Theory* (Oxford: Oxford University Press, 1996). Jeffrey Schwartz and Sharon Begley, *The Mind and the Brain: Neuroplasticity and the Power of Mental Force* (New York: HarperCollins, 2002).

[31]Huxley's letter to Dyster, January 30, 1859. Available online at http://aleph0.clarku.edu/huxley/letters/59.html (last accessed June 18, 2004).