THE HUMAN INSTINCT

How We Evolved *to* Have Reason, Consciousness, *and* Free Will

KENNETH R. MILLER

Also by Kenneth R. Miller

Only a Theory

Finding Darwin's God

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To my teachers, especially the incomparable Mr. Paul Zong,
who first led me to discover the wonders of biology.

Contents

Prologue

Our Story

Stories matter. And once, we had one.

We knew our place. We were the first fruits of creation, stewards of the Earth, masters of the living world. Whether we traced our kind to a rebellious first couple or the upward climb of the Dineh, our people, into the Fourth World, we had a story. That story, or more properly those many stories, confirmed the dignity and value of human existence. They set us apart from the animals. They assured us that our actions mattered, our choices were real, and our lives fit into a fabric of significance.

To be sure, those visions were not all sweetness and light. Many were filled with darkness, many reflected the depths of the human spirit, and many served to spark savage excesses of passion, greed, and even murder. Yet, even in the worst of ages, those narratives filled one of the most basic human needs. They fashioned a sense of place, mission, and value that set our species, for better or for worse, at the pinnacle of the living world. Our Earth was not only the center of the universe; it was home to the only species in that universe that truly mattered.

And then we lost it. Our stories seemed to vanish, and with them our souls, our place in the heavens, and in many ways, ourselves.

The story of that loss has been told many times, sometimes in the context of the enlightenment, of the scientific revolution, or of the great

age of discovery. In retrospect, it was surely more triumph than tragedy. The perplexing movements of planets through space yielded to a mathematics of elegance and precision. The bewildering chemistry of matter was reduced to a table of elements, and the elements themselves to aggregates of simple particles. Electricity and magnetism were united, and new tools fashioned to probe ever deeper into the heart of existence.

But of all these great advances, one stood apart in the way it spoke directly to the human conception of self. It was, of course, the theory of evolution by natural selection. To many, it seemed that Charles Darwin's ideas on the origin of species had drained the lifeblood from our comforting self-portraits. The old certainties were truly gone, and something new had to take their places. But what? In a sense, we had become "Darwin's people," but what could that possibly mean?

Not surprisingly, many were not willing to let the old stories go quietly. While some, like Harvard botanist Asa Gray, were quick to accept Darwin's great idea, others fought back as though civilization itself were at stake. Books were censored, teachers put on trial, and laws passed to prevent students from learning of any theory teaching that "man has descended from a lower order of animals." One such law, in the state of Tennessee, led to the infamous Scopes "monkey trial" in 1925. That law stood until the Supreme Court struck it down in 1968, but even that great court could not strike down popular resistance to so subversive and revolutionary an idea as evolution.

Even today, many fight back by attacking evolution itself, casting themselves as "creationists" who reject broad areas of consensus in modern science. To them, cosmology, astronomy, physics, and even geology have conspired to spin an evolutionary epic that is, as one American politician recently claimed, a "lie from the pit of hell." Others advance an idea known as "intelligent design" in which the mechanisms of evolution are rejected as inadequate to account for the complexity of living things. Instead, the actions of a "designer" are invoked, an intelligent agent standing outside of nature while serving as the grand architect of life. In 2005, this was exactly the argument made in *Kitzmiller v. Dover*, a highly publicized federal trial in Pennsylvania, a trial in which I served as lead witness against "intelligent design."

What both these lines of attack have in common is the call for

evolutionary theory to be discarded and replaced by something radically different. The motivations in each case, sometimes expressed quite openly, are not so much to "correct" a scientific error as they are to replace science itself with a view of human origins consistent with certain religious teachings.

As interesting as it might be to take these arguments apart, point by point, that has already been done, not just in the *Kitzmiller* trial[1] but in a host of popular books by scientists and science writers. No point in beating that poor horse again. But I don't think the concerns of all who resist evolution should be dismissed as naïve, trivial, or uninformed. In fact, the passionate unease with which some of evolution's critics regard many of its messages proclaimed in the name of science speaks to the humanist within many scientists, including myself. I believe this unease derives not so much from how we came to be, but rather from what we should make of ourselves as creatures of evolution. In other words, such discontent arises from a fear that accepting the theory of evolution suggests that we are mere *products* of evolution, neither God's people nor Darwin's, but just another of a multitude of creatures pointlessly struggling for existence.

To many, there is a sense that accepting evolution also means accepting a worldview that denies the significance of the human species, explains away our social institutions as artifacts of natural selection, and depicts individual thought and behavior as robotic responses to inputs from the environment. As Sam Harris puts it in his book on free will, "the idea that we, as conscious beings, are deeply responsible for the character in our mental lives and subsequent behavior is simply impossible to map onto reality."[2] However we may regard ourselves, we are driven, according to Harris, by forces over which we have no real control. In Harris's interpretation of the evolutionary narrative, we seem to be nothing more than casual throw-offs, byproducts of a universe far greater than our imagination, a universe in which we are no more than thoughtless works of nature.

Evolution, this line of thinking goes, is driven entirely by natural forces, by principles that apply to living and nonliving matter alike. If, as Stephen Pinker writes, science has exposed "the absence of purpose in laws governing the universe,"[3] then clearly it means that there is an

"absence of purpose" in the evolutionary process itself. In our modern, sophisticated, rational world, those who hold this view of evolution regard the human presence as nothing special. They see us as cosmic accidents of no significance, depict human art and creativity as the pointless byproducts of natural selection, and regard purpose, self, and even consciousness as chemical illusions that signify nothing, whatever their sound and fury. They, in short, grimly accept the view that we humans matter very little in the grand scheme of things. The story of human evolution, according to those who spin this narrative, is one of pointless accident, dark struggle, and ultimate meaninglessness. No wonder so few want to hear the bad news.

But there is something both illogical and unsound with any narrative that depicts a species able to unravel the story of evolution as insignificant carbon-based fuzz on the surface of a small blue planet. In fact, I emphatically believe there is something special about *Homo sapiens*, something that truly sets us apart. So it is imperative to ask if we need a fundamental revision of evolutionary theory to account for the specialness of human nature. As we will see, I don't think so. What we really need is to understand and appreciate the beauty and subtlety of evolution in greater depth than ever.

We are living creatures, to be sure, one species among countless millions that have come and gone in our planet's lifetime. But we are also uniquely the creatures of music and art, of poetry and laughter, of science, reason, and mathematics. We are the children of evolution in every sense, but we are children of the universe as well, and from that realization comes a new and exhilarating way to see our place among other living things and our home among the stars. It is exactly that place I propose to explore in the pages that follow.

Chapter 1

Grandeur

I think Charles Darwin might have seen his critics coming. Unlike most nineteenth-century works of science, *On the Origin of Species* is still read today. Much of that attention has been earned by the logical power and simplicity of Darwin's argument. He begins with a chapter on variation among domestic animals and plants, something that every animal and plant breeder in the England of his time would have been familiar with. Chapter 2 points out that similar variation exists in wild species. Having established that individual members of a species vary in their characteristics, chapter 3 then describes a "struggle for existence" occurring everywhere in the natural world, producing forces that work remarkably like the hand of a breeder to shape the characteristics of every living species. At that point, the stage is set for the theory of evolution by natural selection, which he introduced by name in chapter 4. The remaining ten chapters enlarge and expand upon the evidence for this theory. The book has been called "one long argument," and so it is. A powerful and elegant argument.

But there is another reason *The Origin* is not only read today, but also widely quoted. While much of the book is mired in scientific minutiae and arcane speculation, as it moves toward a conclusion, *The Origin* shines with a clarity—even a kind of poetry—rarely seen in a

scientific document. In particular, having brought his many arguments to their logical conclusions, Darwin seems compelled to tell us what a wonderful vision of nature he has set before us:

> When I view all beings not as special creations, but as the lineal descendants of some few beings which lived long before the first bed of the Silurian system was deposited, they seem to me to become ennobled.[1]

And why are they "ennobled"? To Darwin, it is because living species are linked to an almost endless history of struggle and success, often against great odds. So distant is that past, so persistent are the triumphs of those shaped by natural selection, that we may look at them with pride, confident of an equally long and glorious future.

> As all the living forms of life are the lineal descendants of those which lived long before the Silurian epoch, we may feel certain that the ordinary succession by generation has never once been broken, and that no cataclysm has desolated the whole world. Hence, we may look with some confidence to a secure future of equally inappreciable length. And as natural selection works solely by and for the good of each being, all corporeal and mental endowments will tend to progress towards perfection.[2]

Every day, in every way, they're getting better and better—and so are we. The future is secure, and we're getting closer to perfection. Fine words, even though most biologists today, myself included, would argue that evolution never produces "perfection." In fact, it never even gets close. Success in the struggle for existence is all that matters, so being just good enough to get by is good enough. Always has been, always will be. But Darwin spun things differently.

As stirring as these words about perfection may have seemed to nineteenth-century readers, the final paragraph of *The Origin* reaches even higher. Darwin wants us to find beauty in the apparent chaos of nature, using the metaphor of a tangled bank alongside a stream to represent the creativity of the evolutionary process:

> It is interesting to contemplate an entangled bank, clothed with many plants of many kinds, with birds singing on the bushes, with various insects flitting about, and with worms crawling through the damp earth, and to reflect that these elaborately constructed forms, so different from each other, and dependent on each other in so complex a manner, have all been produced by laws acting around us.[3]

And finally, just in case his readers might be a bit distressed by the realizations that they are merely the products of "laws acting around us," he assures us that there is indeed something special, something glorious about the whole process:

> There is grandeur in this view of life, with its several powers, having been originally breathed into a few forms or into one; and that, whilst this planet has gone cycling on according to the fixed law of gravity, from so simple a beginning endless forms most beautiful and most wonderful have been, and are being, evolved.[4]

It's a stirring sentence. I have often quoted it in my own writings and lectures, and I'm not alone. But if his ideas were on such firm footing, as they clearly were, why did Darwin find it necessary to describe his vision as one of "grandeur"? I think it may have been because he recognized full well that many, if not most, of his readers would surely think otherwise. If we find our origin in the natural world by means of natural laws, then how can we possibly consider humankind as something apart from the beasts of the field, or even the slimy critters of the soil? *Punch*, the humor magazine, picked up on this much later with a satirical cartoon on its cover, stating "Man is but a worm."[5] Building on Darwin's own writings, the cartoon depicted an earthworm-like creature first arising out of chaos, then morphing into a series of monkeys, next a cave man, then an English aristocrat, and finally into Darwin himself. Hardly a vision rooted in grandeur.

Darwin clearly realized that a little polishing of the human ego would go a long way toward encouraging acceptance of his ideas, and that is exactly what we see in the concluding paragraphs of *The Origin*.

He understood that most would not find this vision "grand" and decided to do what he could to convince them otherwise. But I'm not sure this appeal to his readers to recognize the "grandeur" of evolution ever took hold. And I believe that remains the case today, even among many who fully accept the evolutionary story of our origins.

In Ian McEwan's novel *Saturday*, his contemporary protagonist begins the single day of the story's title by contemplating Darwin's use of that very word. As Henry Perowne, a London neurosurgeon, rises, the phrase comes to him over and over again: *There is grandeur in this view of life.* Three times he repeats those words, and then remembers why. Last night, in the bath after a tiring day, he had skimmed a biography of Darwin sent him by his "all too literate" poet daughter, Daisy. He doesn't remember much—he'd never actually read Darwin himself—but that phrase stuck with him. Musing to himself, he contemplates the forces that drove the great naturalist to compose the final sentence of his masterwork:

> Kindly, driven, infirm Charles in all his humility, bringing on the earthworms and the planetary cycles to assist him with a farewell bow. To soften the message, he also summoned up a Creator in later editions, but his heart was never really in it. Those five hundred pages deserved only one conclusion: endless and beautiful forms of life, such as you see in a common hedgerow, including exalted beings like ourselves, arose from physical laws, from war of nature, famine, and death. This is the grandeur. And a bracing kind of consolation in the brief privilege of consciousness.[6]

We emerge from war, famine, and death, and all we have to show for it is the "brief privilege of consciousness"? Having rushed headlong through his medical studies and into practice, Perowne, who describes himself as not having touched a non-medical book for fifteen years, permits himself a brief contemplation of the meaning of Darwin's work. Although a nonbeliever, it leads him to think of religion. He recalls the words of Philip Larkin, where the poet wrote that if he ever needed to "construct a religion," he would make use of water.

Perowne, the rationalist, doesn't hold much stock in Larkin's answer.

But he thinks to himself that if he were ever "called in" to construct a religion, instead of water,

> . . . he'd make use of evolution. What better creation myth? An unimaginable sweep of time, numberless generations spawning by infinitesimal steps complex living beauty out of inert matter, driven on by the blind furies of random mutation, natural selection and environmental change, with the tragedy of forms continually dying, and lately the wonder of minds emerging and with them morality, love, art, cities—and the unprecedented bonus of this story happening to be demonstrably true.[7]

Demonstrably true, but nonetheless often uninspiring. As he goes about his business, Perowne watches a massive demonstration against the invasion of Iraq but is strangely detached from it by his willingness to appreciate arguments on both sides of the debate. The same profound rationality leads him to dismiss "magical realism" in literature, even though his daughter urges him otherwise. As the day wears on, a minor traffic accident followed by an attempt by the other driver at extortion places Henry and ultimately his family in danger.

In what might fairly be called the climax of the novel, Henry's apartment is invaded and his family is held at knifepoint by Baxter, the extortionist. Perowne's daughter is forced to strip naked, at which point Baxter notices a book of poems with the name "Daisy Perowne" inscribed on the cover. Intrigued, he demands she read one of her poems. As she seems to comply, Baxter is so taken by the beauty of the poem that he asks her to read it again—at which point it becomes clear to her father and the reader that Daisy isn't reading one of her own poems at all. Instead, she's recited, from memory, Matthew Arnold's classic "Dover Beach." For Baxter, the second reading is mesmerizing. His mind seems to wander, which leads to a distracted confrontation in which Perowne and his son are able to overpower and disable the intruders. Afterward, the family realizes that Daisy's choice of Arnold's poem, which she had memorized in her youth, had been their literal salvation.

McEwan, the author, clearly wanted his readers to contemplate the particular poem Daisy recited to Baxter. As if to emphasize this point,

he included the full text of "Dover Beach" on two pages following the conclusion of the novel. It makes a fitting afterword to a novel that began with ironic references to Darwin's view of the grandeur of life. The poem's thirty-seven lines contain a deeply thoughtful and melancholy reflection on the onrush of the modern age in mid-nineteenth-century Britain. As Arnold writes:

> The Sea of Faith
> Was once, too, at the full, and round earth's shore
> Lay like the fields of a bright girdle furled.
> But now I only hear
> Its melancholy, long, withdrawing roar,
> Retreating, to the breath
> Of the night-wind, down the vast edges drear
> And naked shingles of the world.

To Arnold, the world has changed, changed utterly. The roar of the ocean at Dover seems only to "bring the eternal note of sadness in," and the modern age, with all its wonders and delights, "Hath really neither joy, nor love, nor light, nor certitude, nor peace, nor help for pain." The same is surely true of the day that Henry Perowne, the successful neurosurgeon, has just endured. The disruptions of the modern age, as described in *Saturday*, intrude despite one's best efforts to find certitude, joy, and peace. And that promise of grandeur seems to fade away as surely as the ebbing waves at Dover Beach.

A SCIENCE OF LIFE

Arnold's poem mirrors much of the popular reaction to Darwin. Once the "sea of faith" was full and round the Earth. But today we see only its "long, withdrawing roar" as evolution displaces the old certainties. Arnold penned "Dover Beach" before *The Origin*, but he published it in 1867, well after Darwin's book had shocked much of Victorian society. Ever since, it has been seen as emblematic of the crisis of faith brought about by the emergence of modern science. And, as McEwan's novel demonstrates, that crisis has not abated.

Setting aside, at least for a moment, the sentiments of artistic intellectuals such as Arnold and McEwan, it's only fair to ask whether and how such concerns have affected the larger culture. In the United States, where outright rejection of evolution is common, one might ask how this came to be. Ironically, one could make a strong argument that it was our country's enlightened drive for universal high school education that brought it on.

Although the United States helped to pioneer free public education, the level of such schooling did not usually extend to the secondary level until the beginning of the twentieth century. Indeed, only one of my four grandparents, all born around the turn of that century, was educated past the eighth grade. But as states began to mandate higher levels of education, schools expanded and with them the demand for teachers and instructional material such as textbooks. As historian Adam R. Shapiro explains in his book, *Trying Biology*,[8] this led New York–based textbook publishers to expand their offerings beyond the basic lessons in botany and zoology that had been part of the curriculum up to that time. Specifically, they offered new books geared to biology itself as a secondary-level discipline. These texts were skillfully marketed by local and regional sales agents, and in line with the social optimism of the times, had a distinct focus on applying scientific knowledge for the betterment of society. The title of one such text, George Hunter's *Civic Biology*, reflected this trend and drew broad conclusions as to how evolutionary principles might be applied to improve society. As such, the book discussed personal hygiene, proper social behavior, and even eugenics. This, of course, was the very textbook used by substitute teacher John Scopes in Dayton, Tennessee.

Compulsory high school education appeared first mostly in urban school districts. This led to a concern that many of the instructional materials clashed with the more rural values of states such as Tennessee, where evolution was regarded as just such an "urban" value. Also, as Shapiro notes, in many states, interactions between local school districts and avaricious publishers persuaded state authorities to wrest control of textbook purchases from individual schools. This led to state oversight of instructional materials and opened the door to legislative battles over the content of textbooks, battles that persist to the present day. It was

in this context that the State of Tennessee passed a law, early in 1925, leading directly to the trial of that substitute biology teacher just a few months later.

The Scopes "Monkey Trial," held in Dayton, Tennessee, in 1925, is widely regarded as one of the key events in the social history of the United States. To many Americans, the Scopes trial represents a heroic battle in which reason and science were pitted against ignorance and superstition. The trial was loosely dramatized in the 1955 play *Inherit the Wind*, which has been adapted for television and motion pictures no less than four times. Evolution, of course, serves as the stand-in for enlightenment and reason in that battle. One of the authors of the play, Jerome Lawrence, made this explicit, admitting in an interview that "we used the teaching of evolution as a parable, a metaphor for any kind of mind control [. . .] It's not about science versus religion. It's about the right to think."[9] In the context of the 1950s, when the play first appeared, that lesson might have been applied to the McCarthy hearings. In more recent revivals, however, it is often seen as a statement about the political power of the religious right in America.

But there is an important aspect to the actual Scopes trial that is often overlooked in the rush to draw contemporary lessons from its history. The Butler Act, the Tennessee statute under which John Scopes was prosecuted, did not actually forbid the teaching of evolution, despite a preamble proclaiming its intent to "prohibit the teaching of the Evolution Theory." Instead, the act merely made it unlawful to "teach any theory that denies the story of the Divine Creation of man as taught in the Bible, and to teach instead that man has descended from a lower order of animals." In other words, it was perfectly okay to teach the evolutionary process as applied to oak trees, spider monkeys, whales, and dinosaurs. But leave *Homo sapiens* out of it!

Incredibly, under the Butler Act, one could have taught Darwin's *On the Origin of Species* cover to cover, since that great work actually said nothing about the origin or descent of man. As Darwin scholars know, his thoughts on those issues would come nearly a decade after *The Origin*. John Scopes, of course, was convicted of violating the Butler Act, and although his conviction was set aside on a technicality,[10] the law remained in force until 1967.

Significantly, the language of the Butler Act was typical of antievolution legislation in many states, including the Arkansas statute invalidated in a landmark 1968 Supreme Court case (*Epperson v. Arkansas*). That law, passed by popular referendum forty years earlier, also focused on the question of human evolution, making it unlawful for any instructor to teach "the doctrine or theory that mankind ascended or descended from a lower order of animal." In retrospect, one might wonder why these statutes were worded in this very precise way, to single out human evolution rather than Darwinian evolution in general. After all, if the history of life on our planet is characterized and explained by evolution, doesn't that mean our own history is as well?

Organized antievolution groups appreciate exactly this point, and for that reason they strongly oppose just about anything in mainstream science that is consistent with the natural history narrative of evolution. That means disputing the big bang, the age of the Earth, the geologic ages, the abiotic origin of life, and especially the notion that the fossil record contains any evidence of speciation or change over time. They recognize, quite logically, that if science can demonstrate the evolution of *anything*, then their whole project of depicting humanity as a unique and special creation is doomed.

Most people, however, look at things a bit differently, and the focus of their attention is indeed squarely on the human animal. A recent poll[11] in the great state of Texas, well and justly known as a hotbed of antievolution sentiment, demonstrates this. When Texas voters were asked whether life had existed in its present form since the beginning of time, just 22 percent agreed. In contrast, 68 percent asserted that life had "evolved over time." That might seem to be a stunning result in such a state, but two elements of this particular question were clearly responsible for the 3:1 margin in favor of evolution. First, the question did not mention human evolution. Second, and just as important, one of the possible answers, which garnered 53 percent support among the respondents, stated life had "Evolved over time, entirely through 'natural selection,' but with a guiding hand from God."[12] By keeping any reference to humans off the table, and by including a response that allowed people to choose evolution without seeming to reject their faith, a large majority of Texans supported evolution by natural selection.

What happened when the same polling group was asked about human evolution? Suddenly the numbers changed. Even when presented with a "God guided the process" explanation, only 50 percent agreed that humans evolved over time, while fully 38 percent asserted that "God created human beings pretty much in their present form about 10,000 years ago." When an even more direct question was asked, support for evolution turned into outright rejection. Did human beings as we know them develop from earlier species of animals? Now just 35 percent agreed, while 51 percent disagreed.

It is true, of course, that nearly all of this resistance is religiously inspired. So, a simplistic analysis of the "problem" might suggest that in the absence of religion, acceptance of evolution would rise to the high levels we see in secular European cultures today. But that assumes that mere acceptance, however grudging, is a goal to be sought, and that secular cultures have a better understanding of what it means to be human. I'm not sure that is true. Still, among many who embrace Darwin's legacy, there remains a pessimism, a deep restlessness regarding its ultimate message. To these folks, evolution subverts the once profound distinction between beast and human, it tells us we do not stand at the pinnacle of the living world, and it bequeaths a legacy not from the gods or the stars, but rather one written by the grim dictates of survival, chance, and reproduction. In this view, there may be truth in evolution, but it seems to be a truth that drags us into the muck of struggle and strife rather than lifting us to the imagined heavens of our noblest selves. To the fictional Henry Perowne, this may have been just one more part of the mundane reality of contemporary life, but it is hardly something new. It has, in fact, been part of the heavy baggage of evolutionary thought from its very beginnings, articulated by one of the founders of the theory itself.

DOUBTS OF A FATHER

Nearly all creation stories agree on one thing, which is the uniqueness of the human species and the need for a special story to explain how we came to be. At a fundamental level, the idea of evolution undermines these stories, whether they are set in an Abrahamic Eden or upon

the sacred mesas of the Hopi. By telling us that we do not have such a story, by placing our origins squarely in the ordinary genetic, environmental, and selective processes that have produced every other living thing, evolution sweeps such narratives away and leaves us searching for our birthright as thoughtful, intelligent, and hopeful creatures. One of those troubled by that search was in fact a founding father of the theory of evolution itself, Alfred Russel Wallace.

As students of biology learn, Wallace shares full credit with Darwin for the theory of evolution by natural selection. It was in fact a letter from Wallace that moved Darwin to publish his long-held views on natural selection, resulting in papers by both naturalists in 1858, and then in the publication of Darwin's *On the Origin of Species* a year later. A tireless defender of the importance of natural selection, Wallace actually preceded Darwin in proposing that our own species had its origin in the evolutionary process. His 1864 paper, "The Origin of the Human Races and the Antiquity of Man Deduced from the Theory of Natural Selection," traced the physical evolution of the human body to the very same evolutionary forces that had shaped other species. However, Wallace also insisted that as human culture developed, it changed the rules of the evolutionary game. Michael Shermer describes Wallace's thoughts about this in his biography of the naturalist[13]: "Once the brain reached a certain level, however, natural selection would no longer operate on the body because man could now manipulate his environment."

By itself, this was hardly a controversial assertion. But a few years later, Wallace went further, insisting that certain uniquely human attributes could not have been produced by natural selection. Noting that even the "lowest races" possessed the mental attributes necessary to practice the high cultural arts and sciences characteristic of European civilization, Wallace wondered how natural selection could have produced these qualities when they did not seem to be useful to those "in the very lowest state of civilization." He wrote that unless Darwin could show him how talents such as sophisticated musical skill could have aided survival in the struggle for life, "I must believe that some other power [than natural selection] caused that development."[14]

Putting it bluntly, Wallace wrote, "How then was an organ developed far beyond the needs of its possessor? Natural selection could only

have endowed the savage with a brain a little superior to that of an ape, whereas he actually possesses one but little inferior to that of the average members of our learned societies."[15] Later in life, Wallace was involved in spiritualism and any number of scientifically questionable pursuits, but as Shermer points out, his argument here was based on none of these. Rather, it hinged "on the failure of natural selection to account for a *variety* of features" critical to human nature itself. [16]

That deep desire to look into the mirror of human nature and find something special still exists. But doesn't evolution devalue that claim? Doesn't it state that the qualities we so treasure, from language to artistic creativity to our high-minded moral codes, arise from nothing more than the grim calculus of competition and survival? When I confront skeptical audiences on the issue of evolution, I find very few individuals genuinely passionate about things such as the reptile-to-mammal transition or the evolution of the vertebrate body plan. What bugs a large number of folks to the core, however, is the idea of *human* evolution. The notion that we crawled out of the slime, that our ancestors were "monkeys," and that our senses of beauty, love, and morality were carved from nature red in tooth and claw seem to them profoundly degrading and demeaning.

Even some present-day scientists, such as Francis Collins, who has headed both the Human Genome Project and the National Institutes of Health, worry about the same issues that troubled Wallace. Collins describes a universal "moral law," a grasp of the concepts of right and wrong that is found in all people, regardless of their specific cultures. On the basis of evolution, he believes that one cannot account for either this moral law or the self-sacrificing altruism that so many people exhibit daily. Therefore, Collins, very much like Wallace, believes that only a higher power could have placed these noble standards of behavior within us.[17]

To many people, as to Wallace and Collins, the idea of accepting human evolution is more troubling than the mere abnegation of a biblical myth. It is a blow to their fundamental sense of what it means to be human. The problem for Wallace and Collins is not that evolution is wrong so much as that it fails to supply a complete and satisfying explanation of what it means to be human. To them and many others, the raw and simple forces that so clearly drive evolution by natural selection

do not seem to explain the depth and complexity of human life and thought. Something else is needed.

A CHILLING DOCTRINE?

The view that evolution threatens humanity's traditional view of itself is widely shared. Writing in the *Boston Review*, psychologist Tania Lombrozo put the problem this way:

> People find it dehumanizing to conceptualize themselves as animals, and human evolution underscores the continuity between humans and our (distant) cockroach cousins. . . . Associating animal characteristics with humans has been used to justify inhumane treatment; it strips people of human uniqueness and certain aspects of agency and moral consideration. An evolutionary history shared with other animals—and even plants and bacteria—might threaten the separation between human and non-human that maintaining our "specialness" seems to require.[18]

Dr. Lombrozo goes further, describing a study in which college undergraduates were asked how they thought accepting evolution as true might affect individuals and society.[19] Given the fact that the students in the study held a wide range of views, from fully accepting of evolution to fully rejecting, one might expect that pro-evolution individuals would see acceptance as a positive development, while creationist students might regard it as negative. Surprisingly, that was not true. Students across the board "viewed the consequences of accepting evolutionary principles in a way that might be considered undesirable: increased selfishness and racism, decreased spirituality, and a decreased sense of purpose and self-determination." For example, fully 83 percent of both creationist and evolutionist groups thought the theory would increase selfishness. Similarly, both groups agreed that evolution lessened one's sense of purpose, and that it would tend to increase racist feelings among those who accepted the theory as valid.

As this study shows, the notion that the idea of evolution is destructive to the social fabric is not limited to those who reject the theory for

religious reasons. One such person is the celebrated novelist and essayist Marilynne Robinson. Author of books such as *Lila*, *Housekeeping*, and *Gilead*, for which she received the Pulitzer Prize, Robinson has expressed deep unease with the implications of evolution for Western culture and society. This concern was addressed in "Darwinism," the key piece in her 1998 collection, *The Death of Adam: Essays on Modern Thought*. While clearly a critic of what she calls "Darwinism," Robinson is not interested in a scientific attack on evolution itself. She characterizes Darwin's work as "impressive," and notes that evolution, "the change that occurs in organisms over time,"[20] "was observed and even noted in antiquity."

But Robinson is deeply troubled by what she regards as the baggage that Darwinian theory has accumulated in the name of science. After exempting the "phenomenon" of evolution itself from her criticism, she defines "Darwinism" as "the interpretation of the phenomenon which claims to refute religion and to imply a personal and social ethic which is, not coincidentally, antithetical to the assumptions imposed and authorized by Judeo-Christianity."[21] Those "assumptions," as Robinson makes clear, include the bedrock foundations of Western culture regarding the worth of the individual and even the intellectual sources of science itself.

True or not, Robinson makes it clear that she regards evolution, with its emphasis on competition and survival, as a "chilling doctrine." She links it to the extermination of native peoples, to a harsh disregard for the value of the individual, and above all to a bitter reduction in the value of human life, thought, and creativity. Robinson's title, *The Death of Adam*, speaks, of course, to the way in which the idea of human evolution has displaced the Abrahamic creation story of Genesis and the Fall that once accounted for the origins of our species. But the loss, she feels, extends far beyond biblical myth to the very core of humane values and human culture. Quoting from Robinson's book, one reviewer captured her concerns this way:

> The question, as Robinson puts it, is whether "all that has happened on this planet is the fortuitous colonization of a damp stone by a chemical phenomenon we have called 'life.' " Or, in the words

> of an eminent sociobiologist, "an organism is only DNA's way of making more DNA." Think of Plato, Bach, Newton, Rembrandt, Shakespeare; then consider the implications of that "only."[22]

To Robinson, if we are *only* the vessels of our DNA, *only* the products of a mindless struggle for existence, and *only* the fortuitous colonizers of sea and soil, then every scrap of art and music and culture and even science is utterly without meaning or value. As Robinson writes, "It is a thing that bears reflecting upon, how much was destroyed, when modern thought declared the death of Adam."[23]

For a biologist, it might be easy to set aside all such concerns by saying something like "You evolved, so deal with it." And if the question of human ancestry and the natural history of our species were all that was at stake, I might go with that curt dismissal. But some of the most visible public champions of evolution have traveled much further and increasingly propose a view that they say is supported by science in its purest form: that human nature is nothing more than the accidental combination of atoms and their aggregation into molecular assemblies that produce within us illusions of value, purpose, and meaning. As Richard Dawkins has famously written, "The universe we observe has precisely the properties we should expect if there is, at bottom, no design, no purpose, no evil and no good, nothing but blind, pitiless indifference."[24]

Dawkins's view of the universe is markedly at odds with a conviction that has united human cultures from their very beginnings. That is that our very existence is a matter of significance. From such thoughts emerge the creation stories that bind societies together, as well as their collective art, music, literature, and even their science. The drive to understand, after all, comes only partly from a hope that scientific knowledge will be of practical importance. Just as critical is the simple desire *to know*, followed by the satisfaction and joy produced by understanding and born of the conviction that human understanding is our goal and even our destiny.

Does human evolution support this ennobling view? In the minds of many, it doesn't. We may regard our place in the animal kingdom as exalted, but to a biologist we primates can be seen as just one tiny

branch in an overgrown forest. In historical terms, we appeared only recently—almost an afterthought on planet Earth—and it would be foolhardy to view the whole of natural history as a process with the purpose of bringing our species into existence.

As astronomer Neil deGrasse Tyson explains, "if the purpose of the universe was to create humans, the Cosmos was embarrassingly inefficient about it. And if a further purpose of the universe was to create a fertile cradle for life, then our cosmic environment has got an odd way of showing it. Life on earth, during more than 3½ billion years of existence, has been persistently assaulted by natural sources of mayhem, death, and destruction. Ecological devastation exacted by volcanoes, earthquakes, and climate change, tsunamis, storms, and especially killer asteroids have left extinct 99.99 percent of all species that have ever lived here."[25]

Looked at this way, the conditions of human evolution reduce us to the status of mere organism, just one among many on this improbable planet. The field of evolutionary psychology may explain why we *think* we're important—such illusions have survival value—but evolution itself says we're not. As Stephen Jay Gould wrote, neither we nor one of our most cherished properties was a sure thing in this cold, harsh world:

> Humans are not the end result of predictable evolutionary progress, but rather a fortuitous cosmic afterthought, a tiny little twig on the enormously arborescent bush of life, which if replanted from seed, would almost surely not grow this twig again or perhaps any twig with any property that we would care to call consciousness.[26]

One is left to suspect that for Gould, even our best attempts to find grandeur in life are merely the illusions of that cosmic afterthought.

MORE BAD NEWS

As Gould suggests, the bush of life does not seem in any way to have been programmed to produce us. The evolutionary process is not predictable, and therefore we are, in every sense, an accidental species. This

is exactly the title of a book by Henry Gee, a British paleontologist and evolutionary biologist. In *The Accidental Species*, Gee writes, "There is nothing special about being human, any more than there is anything special about being a guinea pig or a geranium."[27] In fact, if the story of science were written by other organisms, rather than humans, Gee knows that they would see things differently:

> Giraffe scientists would no doubt write of evolutionary progress in terms of lengthening necks, rather than larger brains or toolmaking skill. So much for human superiority. If that's not ignominy enough, bacterial scientists would no doubt ignore humans completely except as convenient habitats, the passive scenery against which the bacterial drama is cast. Now, ask yourself—which of these stories is any more valid than any other, at least as a narrative?[28]

Describing where the book will take his readers, Gee points out one of its key themes:

> I take a brief tour of several attributes that at some time or another have been regarded as unique to humans. These include bipedality, technology, intelligence, language, and finally sentience or self-awareness. It turns out that most if not all have been seen in one or more nonhuman species—or once one has accounted for a human bias in investigating such attributes, they turn out to be no more special than any other feature of any other organism.[29]

Apparently, we have to come to grips with the fact that to some extent at least, all of the human properties we hold so dear are found in other animals. Neither language nor technology nor self-awareness is uniquely human. Therefore, we are indeed no more special than any other organism.

Why do we think and act the way we do? Surely it is because our big brains give us access to a range of data and sensory experiences that no other animal can approach. We can then weigh such inputs and determine our own actions, relying on reason, common sense, and

personal preference, right? Well, maybe not. If behavioral traits and tendencies are genetic in nature, meaning they can be inherited, then such traits are subject to natural selection just as surely as any other. At a basic level, this means evolution has shaped our brains, the tools with which we think and experience the outside world.

There may be nothing remarkable about that, until the tools of evolutionary psychology are actually employed to explain specific human behaviors. Only a few years ago, one of those studies hit very close to home for me. Like many men I know, I regard my children as among the greatest treasures in my life. While there are many counterexamples, of course, I am privileged to know many men who are and have been exemplary fathers. These men care for and nurture their children, as well as doing the unglamorous work of changing diapers, preparing meals, and cleaning house. Most important, they are steady and supportive influences on the lives of their children, preparing them for happy and productive lives as they grow. If you asked any of them about their lives as parents, they would tell you, almost certainly, that they made a deliberate and thoughtful choice to be involved in the lives of their kids. Some of them would say they did this for themselves, others for the best interests of the children, and still others would say that it was best for their spouses and their relationship. But all would agree, they made the choice.

Not very long ago, such men were greeted by a headline telling them that all of this was just an illusion. The choice wasn't theirs to make, because evolution had made it for them. The real reason they'd immersed themselves in the care of their children was the size of their testicles. They were just a little too small. Guys with the big ones don't hang out with their kids. They're too busy chasing other women and trying to spread their seed around. And it's because their genes made them do it.

This was the popular interpretation of a 2013 study of testicle size and parenting, published in one of the world's most prestigious scientific journals,[30] and widely discussed in the press. As I read the paper and looked over the data, it was clear to me that one could make a case that the "small testicles = good dads" argument was a little shaky on purely statistical grounds. But that's not the point. The researchers were

doing their best to correlate a physiological property with a behavioral one, and there was at least some evidence to suggest they had found something interesting. What stood out was the way in which they had *explained* the source of that correlation, in other words, why it existed in the first place. Specifically, they claimed to have an evolutionary reason to expect exactly such a relationship between gonad mass and child care.

Noting that "evolution optimizes the allocation of resources toward either mating or parenting so as to maximize fitness," they had set out to find whether "human anatomy and brain function reflect a trade-off between mating and parenting investment." And so they did. In this particular case, you might say that evolutionary psychology had found the "real" reasons some men are good fathers—as well as why others repeatedly neglect their families to chase other women. I can almost imagine an unfaithful husband saying, "Honey, I couldn't help it. It's those damn testicles." And, wincing in painful anticipation, I can certainly imagine my wife's response if she ever heard those words from me. Curiously, the researchers seem not to have felt the need to conduct an actual survey of the marital fidelity of the men in their study to see if it matched their expectations. Perhaps they felt that their story of evolutionary imperatives was just so compelling that further testing was not required.

In one sense, evolutionary psychology is a straightforward science that seeks to uncover some of the powerful forces that shape human behavior. It often uses empirical measures (testicle mass is an obvious one, effective parenting somewhat less so) to construct explanations based on evolutionary logic (maximization of long-term reproductive fitness). In so doing, it promises to provide valuable insights into basic questions in behavioral science ranging from the personal to the social. One practitioner of the discipline has even suggested using the findings of evolutionary psychology to redesign the social structure of an American city along sound evolutionary principles.[31] But in another sense, evolutionary psychology suggests that our most intimate thoughts, our goals, our values, even our morals are not our own, but are the artifacts of thousands of generations of natural selection, exerting a power that is beyond our ability to control.

Explanations abound in the literature purporting to explain intelligence, racism, sexual orientation, morality, and religious faith all in

terms of evolutionary advantage. At a conference in 2009,[32] E. O. Wilson, the author of *Sociobiology*, a founding text of the field, showed slides of the beautiful landscaping surrounding the corporate headquarters of the John Deere corporation in Moline, Illinois. Wilson wondered, why do we find great lawns clustered with shrubbery and lakes so appealing? His answer was that they resemble the environments of the Pleistocene in which evolution formed our species, shaping its behavior, its likes and dislikes, and even its aesthetic tastes. Apparently, our prehistoric ancestors were really into rolling lawns, manicured gardens, and dancing fountains.

If that smacks just a bit of overreach, imagine a future in which evolutionary science will produce definitive answers as to why we prefer Mozart to Salieri, why we regard pedophilia with disdain, and why human societies tend to place mostly males in positions of leadership. That is exactly the program advanced by Wilson in *Consilience*, a landmark 1998 book that made such promises for the future of the evolutionary project. That book, in effect, told my colleagues in the humanities and social sciences to step out of the way, because evolutionary psychologists were taking over their disciplines. And perhaps they will.

But if evolutionary psychology can provide the *real* reasons for each of our values, tastes, and judgments, where does that leave our sense of self, our conception of what it means to be human? Not in a very good place.

Biology would then become an all-powerful tool, sweeping up the great diversity of human cultures, artistry, beliefs, philosophies, hopes, and fears into a simple biological basket of evolutionary imperatives. Art and music explained not in aesthetic terms, but by their utility in attracting mates. Religion merely an artifact of social bonding in the struggle between competing tribes. Great literature is no longer to be analyzed for plot or style, but explained as pointless narrative that merely stirs the collective unconscious of a bestial past.

What is the good life? What is truth? What is proper, moral, and ethical? In the most extreme of "Darwinian" worlds these are not even questions that matter. Morality itself would be nothing more than a social construction, and our sense of ethical behavior just an evolutionary lubricant greasing the gears of social interactions. What is true and

what is right is only that which is of value in the struggle for existence. Developing a philosophy of ethical values would be pointless, because evolution has already placed a powerful set of pseudo-ethics in our heads, a system serving only the ruthless demands of survival and reproductive success.

A DARWINIAN MIND

If the claims of some working in evolutionary psychology were not enough to deflate the human ego, consider the possibility that we are not even in control of our own thoughts and actions. Here the challenge comes from the application of evolutionary materialism to the organ we call the brain. If the brain and the "mind" are one, and modern neuroscience leaves us little choice but to conclude that they are, then our mental selves are creations of the biology of our nervous systems. Those nervous systems, of course, are themselves the products of evolution, shaped by the forces of natural selection.

To author and neuroscientist Sam Harris, this means that free will is an illusion. Our decisions emerge not from conscious choice, but from a series of background forces and mental events over which we have no control. Indeed, even our belief in freedom of action is simply a ruse that evolution has programmed into our brains. As Harris describes it, all we can do is to accept this as fact, "while knowing, of course, that we are ultimately being steered."[33] We are driverless cars running a program we did not write, which we cannot control, and whose existence we are not even wired to sense.

Charles Darwin himself worried about the role of natural selection in shaping the brain. "With me the horrid doubt always arises," he wrote, "whether the convictions of man's mind, which has been developed from the mind of the lower animals, are of any value or at all trustworthy. Would anyone trust in the convictions of a monkey's mind, if there are any convictions in such a mind?"[34] It's a good question. Would we trust a monkey's convictions? Should we trust our own?

If our bodies are merely survival machines, programmed to preserve and propagate the genes within us, then part of that programming, to be sure, is the brain itself. And if the brain is simply a component of that

machine, then it serves not truth and beauty, but only a raw calculus of survival and reproductive success.

Let me be clear that I do not believe that the scientific core of evolution negates human belief and conviction as mere byproducts of our struggle to survive. I don't believe that it tells us that our behavior is predetermined or that we lack free will. I don't believe that it reduces us to mere animals, mindless matter, or accidents of nature. Nor does it tell us that our lives are purposeless or pointless.

Our deep, ancestral association with the natural world does not undermine our unique humanness, it's not a knife in the heart of humane intellectual life, and it's certainly not what Robinson once lamented as the "death of Adam." It is, in fact, the best news we have ever received about the world and our place in it. To explain why I believe this, I will first look at the process of evolution itself and grapple with some of the most intimate details of how we came to be. There are many surprises waiting for us there, not the least of which is how evolution allows us to appreciate the actual place we occupy in the scheme of things. We are surely part of Darwin's tangled bank. But we are also the only creatures to be able to transcend it.