This essay originally appeared in *The New Yorker*, Dec. 13, 1999. It is adapted from chapters 19 and 20 of *Nonzero: The Logic of Human Destiny*, by Robert Wright, published by Pantheon Books in 2000 and by Vintage Books in 2001. (Please note that a central argument of the *New Yorker* essay--that biological evolution is directional, and Stephen Jay Gould's argument to the contrary is deeply flawed--is made in much greater detail in chapter 19 of the book.)

THE ACCIDENTAL CREATIONIST

Why Stephen Jay Gould is bad for evolution.

BY ROBERT WRIGHT

FOUR months ago, when the Kansas Board of Education voted to cut evolution from the mandatory science curriculum, few people were more outraged than Stephen Jay Gould. Teaching biology without evolution is "like teaching English but making grammar optional," Gould said. The Kansas decision reeked of "absurdity" and "ignorance" and was a national embarrassment. The question of whether to teach evolution "only comes up in this crazy country," he told an audience at the University of Kansas after the decision.

All of this is more or less true. But it's also true that, over the years, Gould himself has lent real strength to the creationist movement. Not intentionally, of course. Gould's politics are secular left, the opposite of creationist politics, and his outrage toward creationists is genuine. Yet, in spite of this stance—and, oddly, in some ways because of it—he has wound up aiding and abetting their cause.

This indictment of Gould will no doubt surprise his large reading public. After all, in addition to being America's unofficial evolutionist laureate, Gould is a scientist of sterling credentials—a Harvard paleontologist and, currently, the president of the American Association for the Advancement of Science. In what more capable hands could the defense of science rest?

This indictment will also surprise many evolutionary biologists, but for different reasons. It isn't that they necessarily consider Gould a great scientist; a number of insiders take a quite different view. But they do generally think of him as a valiant warrior against the creationist hordes. The eminent British biologist John Maynard Smith has observed, "Gould occupies a rather curious position, particularly on his side of the Atlantic. Because of the excellence of his essays, he has come to be seen by nonbiologists as the preeminent evolutionary theorist. In contrast, the evolutionary biologists with whom I have discussed his work tend to see him as a man whose ideas are so confused as to be hardly worth bothering with, but as one who should not be publicly criticized because he is at least on our side against the creationists."

In truth, though, Gould is not helping the evolutionists against the creationists, and the sooner the evolutionists realize that the better. For, as Maynard Smith has noted, Gould "is giving nonbiologists a largely false picture of the state of evolutionary theory."

Over the past three decades, in essays, books, and technical papers, Gould has advanced a distinctive view of evolution. He stresses its flukier aspects—freak environmental catastrophes and the like— and downplays natural selection's power to design complex life forms. In fact, if you really pay attention to what he is saying, and accept it, you might start to wonder how evolution could have created anything as intricate as a human being.

As it happens, creationists have been wondering the very same thing, and they're delighted to have a Harvard paleontologist who will nourish their doubts. Gould is a particular godsend to the more intellectual anti-evolutionists, who mount the sustained (and ostensibly secular) critiques that give creationism a veneer of legitimacy. In attacking Darwinian theory, they don't have to build a straw man; Gould has built one for them. When Phillip E. Johnson, the most noted of these writers, begins a sentence, "As Stephen Jay Gould describes it, in his fine book," this is not good cause for Gould to swell with pride.

Gould also performs a more subtle service for creationists. Having bolstered their caricature of Darwinism as implausible, he bolsters their caricature of it as an atheist plot. He depicts evolution as something that can't possibly reflect a higher purpose, and thus can't provide the sort of spiritual consolation most people are after. Even Gould's recent book "Rocks of Ages," which claims to reconcile science and religion, draws this moral from the story of evolution: we live in a universe that is "indifferent to our suffering."

Obviously, if the grounds for this conclusion are as firm as he says, then we have to live with it. But they're not. Though modern Darwinism is incompatible with various religious beliefs (such as a literal interpretation of Genesis), it needn't alienate religious seekers of a liberal-minded variety: those with no attachment to any scriptural creation scenario but with a suspicion—or, at least, a hope—that life has more meaning than meets the eye. Indeed, the Darwinian account of our creation, once stripped of the misconceptions that Gould has covered it with, is not only compatible with a higher purpose but vaguely suggestive of one.

All the favors that Gould unwittingly performs for creationists can be traced to his thinking on the fundamental issue of "directionality," or "progressivism"—that is, how inclined evolution is (if at all) to build more complex and intelligent animals over time.

Consider the bombardier beetle. In one compartment, the beetle carries a harmless chemical mix. In another compartment resides a catalyst. The beetle adds the catalyst to the mix to create a scalding substance that he can then spray, through a pliable rear-end nozzle, on tormentors. (This basic idea—making chemicals safe to transport but deadly when deployed—would, long after natural selection invented it, be reinvented by human beings, in the form of binary chemical weapons.)

Clearly, a beetle equipped with two munitions tanks and a spray nozzle is more complex than a beetle lacking such accoutrements. And this isn't just any old kind of biological complexity. The beetle's arsenal involves behavioral complexity: aiming and squirting a toxic nozzle. Aiming and squirting—like any impressive behavior—involves information processing, a command-and-control system. In some small measure, then, evolution's promotion of the beetle to bombardier rank involved a growth in intelligence. In other lineages, the evolution of intelligence—of behavioral complexity—has proceeded further. And we have binary chemical weapons, among other things, to show for it.

WAS this general trend in the cards? Or is the growth in complexity and intelligence we've seen on this planet more or less an accident, something that doesn't flow from basic properties of natural selection?

Ten years ago, Gould's position on the directionality issue was extreme: he didn't even concede that biological complexity has tended to grow over time. This reluctance, evident in his book "Wonderful Life" (1989), was harshly criticized (by me, for one), and he has since abandoned it. (Full disclosure: I made the criticism in an unfavorable review of Gould's book, and he has since written unfavorable things about my work.) In his more recent assault on directionality, the 1996 book "Full House," Gould allows that the outer envelope of complexity—the complexity of the most complex species around—may tend to grow.

For that matter, he acknowledges, the average complexity of all species may have grown. But he insists that this growth does not constitute "progress" because it is fundamentally "random."

[Author's note: Since this essay was first published in *The New Yorker*, I've noticed that some readers misinterpret my critique of Gould's emphasis on "randomness." The issue is *not* whether new genes are *generated* randomly--a question on which Gould and I agree. The issue is whether the process by which genes are selectively preserved is just as likely to move organic complexity downward as upward (Gould's position) or whether that process will more often move complexity upward (my position). In other words: if you think I am departing from standard Darwinian theory, and positing the existence of "orthogenesis" or any other quasi-mystical force, you have misunderstood my argument. For a less condensed version of my argument against Gould's position, click here.]

To explain what he means by "random," Gould uses the metaphor of "the drunkard's walk." A drunk is heading down a sidewalk that runs east-west. Skirting the sidewalk's south side is a brick wall, and on the north side is a curb and a street. Will the drunk eventually veer off the curb, into the street? Probably. Does this mean he has a "northerly directional tendency"? No. He's just as likely to veer south as north. But when he veers south the wall bounces him back to the north. He is taking "a random walk" that just seems to have a directional tendency.

If you get enough drunks and give them enough time, one of them may eventually get all the way to the other side of the street. That's us: the lucky species that, through millions of years of random motion, happened to get to the far north, the land of great complexity. But we didn't get there because north is an inherently valuable place to be. If it weren't for the brick wall—that is, the fact that no species can have less than zero complexity—there would be just as many drunks south of the sidewalk as north of it, and the randomness of all their paths would be obvious. Gould writes, "The vaunted progress of life is really *random motion away from simple beginnings,* not *directed impetus toward inherently advantageous complexity."*

What Gould neglects is a number of nonrandom factors that fall under the rubric of "positive feedback." The bombardier beetle is a good example. Since there was a time when beetles didn't exist, there must have been a time when no animals were specially adapted to kill and eat them. Then beetles came along, and then various animals did acquire, by natural selection, the means to kill and eat them. This growth in behavioral complexity spurred a response: the beetle's binary weapon. Thus does complexity breed complexity—positive feedback.

One might expect that, given enough time, beetle predators would up the ante, developing some clever way to neutralize the beetle's noxious spray. In fact, they have. Skunks and one species of mouse, the biologists James Gould (no relation) and William Keeton have written, "evolved specialized innate behavior patterns that cause the spray to be discharged harmlessly, and they can then eat the beetles." Evolutionary biologists call this form of positive feedback an "arms race." Richard Dawkins and John Tyler Bonner, among others, have noted that arms races favor the evolution of complexity. Yet Gould's two books on the evolution of complexity don't even mention the phenomenon.

Finding evidence of arms races in the fossil record is tricky. But Harry Jerison, a paleoneurologist at U.C.L.A., measured the remnants of various mammalian lineages spanning tens of millions of years and discerned a suggestive pattern. In North America, the "relative brain size" of carnivorous mammals—brain size in proportion to body size—showed a strong tendency to grow over time. So did the relative brain size of the herbivorous mammals that were their prey. Meanwhile, comparable South American herbivores, which faced no predators, showed almost no growth in relative brain size. Apparently, ongoing species-against-species duels are conducive to progress.

Arms races can happen within species, not just between them. For example, male chimps spend lots of time scheming to top each other. They form coalitions that, on attaining political dominance, get prime sexual access to females. So savvy males should, on average, get the most genes into the next generation, raising the average level of savviness. And, the savvier the average chimp, the savvier chimps have to be to excel in the next round. There's little doubt that this arms race has helped make chimps as smart as they are, and there's no clear reason that the process should stop now.

Yet natural selection, as described by Gould, has no room for such a dynamic. "Natural selection talks only about ‘adaptation to changing local environments,’" he writes. And "the sequence of local environments in any one place should be effectively random through geological time—the seas come in and the seas go out, the weather gets colder, then hotter, etc. If organisms are tracking local environments by natural selection, then their evolutionary history should be effectively random as well."

This would be good logic if environments consisted entirely of sea and air. But a living thing's environment consists largely of other living things: things it eats and things that eat it, not to mention members of its own species which compete and consort with it. And no one—not even Gould—denies that the average complexity of all species constituting this organic environment tends to grow. Nor would it matter if we assumed, along with Gould, that back at the dawn of life the growth in average complexity was wholly random. The fact would remain that, for whatever reason, environmental complexity started to grow. Species, in "tracking" this growth of complexity, can't be described as stumbling around randomly. Their evolution is directional. And since they are part of the environment of other species the process is self-reinforcing. More positive feedback.

The evolution of human intelligence has the earmarks of positive feedback. To the extent that we can judge from an imperfect fossil record, the growth in brain size—from *Australopithecus africanus* through *Homo habilis, Homo erectus,* and early *Homo sapiens* to modern *Homo sapiens*—is fairly brisk, with no signs of backtracking and little in the way of pauses. This suggests three million years of pretty persistent brain expansion.

In Gould's world view, the only way to explain this trend is as a long series of lucky coin flips—the most serendipitous drunken walk in the history of drinking. And it isn't just our ancestors, in Gould's scheme, who were so lucky. Mammalian lineages broadly exhibit movement toward braininess.

The odds of all this happening by luck alone, as Gould would have it, seem to me not that different from the odds that God created all species in a few days. By the basic criterion of scientific judgment—that the most plausible story wins—it's roughly a tie. So, as long as Gould's version of evolution dominates popular understanding, why should the average school-board member find one theory beyond serious doubt and the other unworthy of mention? Neither fits the facts.

Gould recognizes that his story is an unlikely one. If you replayed evolution on this planet, he says, the chances of getting any species as smart as humans— smart enough to reflect on itself—are "extremely small." In fact, he fairly delights in the prospect that "we are, whatever our glories and accomplishments, a momentary cosmic accident that would never arise again if the tree of life could be replanted from seed and regrown under similar conditions." To insist otherwise, to see evolution as a natural progression toward intelligent forms of life, is to indulge a "delusion" grounded in "human arrogance" and desperate "hope."

This is where Gould's aims, perversely, converge with those of the creationists: both, for their own philosophical reasons, want to depict the evolution of a human level of intelligence as spectacularly

unlikely. But what, exactly, is Gould's philosophical reason? Why is he so chipper about our creation's being an aimless and pointless process? The answer lies in Darwinism's checkered political past.

Early in this century, biological progressivism was dear to the hearts of social Darwinists, who used evolution to justify racism, imperialism, and a laissez-faire indifference to poverty. Part of the logic behind social Darwinism—to the extent that it had a coherent logic—was something like the following: The suffering, even death, of the weak at the hands of the strong is an example of "survival of the fittest." And surely the "survival of the fittest" has God's blessing. After all, He built the dynamic into His great creative process, natural selection. And how do we know that natural selection is God's handiwork? Because of its inexorable tendency to create organisms as majestic as ourselves, organisms worthy of admission to Heaven. In short, biological progressivism was used to deify nature in all its aspects, and nature, thus deified, was invoked in support of oppression.

This variant of social Darwinism— which infers political and moral values from the direction of evolution—has been essentially dead for a long time, but for Gould it is still an ever-present enemy. His denunciations of progressivism often include dark allusions to the political values that accompanied it in the early twentieth century. His war against progressivism, it seems, is waged partly to vanquish a religious right that died out long ago. Yet the effect of the war is to give aid and comfort to a new religious right.

Anti-progressivism is the grand unifying theme in Gould's oeuvre. To the lay reader, he may seem a man of many theories, but, time and again they amount to the argument that natural selection, far from being a tireless engineer of organic improvement, is actually an erratic agent that is often swamped by outside factors, and so can’t be counted on to push evolution upward. Hence his championing of "punctuated equilibrium"—the idea that evolution proceeds in fits and starts, and spends much of its time moving nowhere in particular. Hence, too, his insistence that many parts of plants and animals are not "adaptations" (things designed by natural selection for a particular purpose) but "spandrels" (incidental by-products of past evolution which may happen to serve a function but weren't originally "selected" for that function).

Neither of these claims is wholly wrong. Both—in moderate form, at least--were embraced by some Darwinians before Gould came along and applied new labels to them. But Gould bills these retreads as fresh and radical, and his rhetorical extravaganzas then become priceless assets for creationists. In depicting himself as the torch carrier for "a new and general theory of evolution," he once declared standard Darwinian theory--the so-called modern synthesis that had crystallized by mid-century—"effectively dead, despite its persistence as textbook orthodoxy." Not surprisingly, this sound bite is endlessly repeated by such writers as Michael Denton, whose book "Evolution: A Theory in Crisis" is a favorite of creationists.

Gould was widely criticized for pronouncing Darwinism dead, and he has long since qualified the claim. But the fact remains that he made the statement, it was silly, and it had consequences. When an interviewer asked Phillip Johnson how he came to suspect that Darwinism lacked scientific merit, he said that reading Gould's claim had been a formative experience. Gould's writings on punctuated equilibrium have been a particular gift to creationists. He dwells on gaps in the fossil record to argue that evolution works fitfully; creationists then quote him to argue that it doesn't work at all. (They love the conspiratorial aura of Gould's description of these gaps as the "trade secret of paleontology.")

Obviously, we can't hold scholars strictly responsible for how their words are used. There *are* lots of gaps in the fossil record, and though many biologists believe that Gould cites the record too selectively, it isn't his fault when creationists quote him dishonestly, as they sometimes do. The problem is that often they

don't have to. The biochemist Michael Behe writes, in the anti-evolutionist text "Darwin's Black Box," "Gould has argued that the rapid rate of appearance of new life forms demands a mechanism other than natural selection for its explanation." Gould does say that, when he depicts punctuated equilibrium as a major new concept, requiring "additional laws," beyond natural selection.

This particular excess has drawn criticism from Gould's mentor, the renowned biologist Ernst Mayr. In his book "Toward a New Philosophy of Biology" Mayr insists that any plausible version of punctuated equilibrium is "completely consistent" with the modern Darwinian synthesis, and that the engine of change in punctuated equilibrium is natural selection. Mayr should know. He, more than anyone else, created the theory of punctuated equilibrium, decades before Gould gave it that catchy title.

Of all the Gouldian themes cherished by Darwinism's detractors, perhaps the most interesting is one publicized by Johnson in the early nineteen-nineties, in an *Atlantic Monthly* essay and in his book "Darwin on Trial." Johnson's argument began with the accurate observation that species often go extinct because of what you might call bad luck, not bad genes. For example, a meteor may strike and trigger an environmental cataclysm, wiping out thousands of species that, only the day before, seemed ideally suited to life on earth.

Johnson then asked: If which genes perish is so often determined randomly, how could natural selection work well? Isn't the idea supposed to be that, while genetic traits are *generated* randomly, they are weeded out selectively, depending on whether they are "fit"?

That is indeed how natural selection designs fit organisms. But, according to mainstream Darwinian theory, most of the consequential weeding out doesn't happen conspicuously and suddenly, when whole species go extinct; it happens on a day-to-day basis within a species, as some individuals fail to spread their genes as ably as other individuals. So even if every few hundred million years a meteor strikes, wiping out lots of well-designed species, other well designed species remain, and the design work continues.

Maybe Johnson's mistake was to use Gould as a source. Gould has repeatedly stressed the randomness of great species extinctions, and emphasized selection *among* species, while underplaying day-to-day selection within species. Indeed, Johnson's book cited Gould on all three of those themes. ("As usual," he wrote, "Gould is the most interesting commentator.")

Random extinctions are a central theme of Gould's book "Wonderful Life." In using them to assault the notion of evolutionary progress, he took a different tack from Johnson's, but in the end he was no more successful.

The book is about the fossils of the Burgess Shale, products of an apparently sudden (as these things go) expansion of biological diversity around five hundred and seventy million years ago, at the beginning of the Cambrian Period. The subsequent history of the Shale animals, Gould argued, illustrates how radically bad luck can alter evolution's course. In particular, some very weird-looking Shale creatures had fallen prey to an essentially random mass extinction, and left no descendants. If not for this bad break, today's tree of life would presumably look very different.

Since Gould's book was published, his interpretation of these fossils has been challenged by a number of paleontologists. It now seems that the Burgess Shale animals weren't nearly so weird as Gould and some other researchers first thought; many fit readily into a standard taxonomic tree, and their descendants are with us still. In the case of a fossil so bizarre-looking that it was named *Hallucigenia,* Gould--following

the then-prevailing interpretation—seems to have been looking at it upside down. Those baffling squiggly things on its "back" were legs. And those strangely spiky "legs" *were* spikes--armor, presumably the product of an arms race.

Still, Gould's premise is valid. Whether or not the Burgess Shale animals are a case in point, species do go extinct because of cosmic rolls of the dice. A meteor shows up and—poof!--no dinosaurs. But Gould's argument from this premise blurs the line between two separate issues: the question of whether a given species was likely to evolve and the question of whether the properties it embodies were likely to evolve.

For example, if our ancestors had been wiped out through bad luck, then, as Gould has repeatedly proclaimed, human beings would never have evolved. This point—in some ways the central point of "Wonderful Life"—is so unarguable that, as far as I know, it has never been argued against. No sober biologist would claim that there was some kind of inexorability to the evolution of *Homo sapiens* per se: a species five or six feet tall with ear lobes, bad jokes, and all the rest. The question is whether the evolution of *some* form of highly intelligent life was likely all along. In his first book on directionality, Gould simply skirted the question; in the second, he declared the answer to be no. The problem with this answer goes beyond Gould's overlooking arms races. The broader issue is what you might call natural selection's genius.

Though natural selection is a blind process that works by trial and error— and random trial, at that—it has a remarkable knack for invention, for finding and filling empty niches. It doesn't just invent great technologies; it keeps reinventing them. Flight and eyesight are two properties so amazing that creationists cite them for their implausibility. Yet flight has arisen through evolution on at least three separate occasions, and eyes have developed independently dozens of times.

Eyes are so favored by natural selection because light is a terrific medium of perception. It moves in straight lines, bounces off solid things, and travels faster than anything in the known universe. But smell, sound, touch, and taste are also amply represented in the animal kingdom, and are just the beginning of a long list of organic data-gathering technologies.

Indeed, humankind's vaunted twentieth-century advances in sensory technology seem almost like a long exercise in reinventing the wheel. We now have infrared sensors for night vision; rattlesnakes beat us to that one. We use sonar—old hat to bats and dolphins. Some burglar alarms work by creating electric fields and sensing disturbances in them; so do some fish, such as the elephant-snout fish of Africa.

Why is natural selection so attentive to sensory technologies? Because they facilitate adaptively flexible behavior. And what else does that? The ability to process all this sensory data and adjust behavior accordingly. In other words: brains—that is, intelligence as an abstract property. It is natural selection's demonstrable affinity for certain properties—its tendency to invent them and nurture them independently in myriad species—which renders trivial Gould's truism about how bad luck can wipe out any one species or group of species. The fates of particular species may depend on the luck of the draw. But the properties they embody were in the cards—at least, in the sense that the deck was stacked heavily in their favor.

Consider some properties of human intelligence which are often taken as defining assets of our species, such as language and the inventive use of tools. Though no species is nearly as accomplished as ours in either realm, primitive versions of these features are widespread.

The most obvious examples of tool use come from our close relatives, chimpanzees. Chimps pound nuts open with sticks and stones. They take twigs, strip them of leaves, poke them into termite nests, then pull

them out and eat the termites. Some chimps even use sticks to brush each other's teeth. This sort of thing doesn't seem to be narrowly programmed by the genes. There is innovation and then emulation. In other words, there is cultural evolution—the selective transmission of nongenetic information from animal to animal.

Animals also can be surprisingly articulate. East African vervet monkeys have several warning calls, depending on the predator: one means "snake," one means "eagle," and one means "leopard," and each elicits an apt response (looking down, looking up, or running into the bush). Mastery of this language takes cultural fine-tuning. Young vervets may look up, see a pigeon, and give the "eagle" call. Adults then look up and, by failing to join in the call, induce an enlightening chagrin.

Of course, no nonhuman species is about to embark on the sort of cultural evolution that got us from the Stone Age to the sophisticated technology of the information age. None of these animals could possibly formulate a message as complex as "Have you tried just turning it off and then turning it on again and seeing if that solves the problem?"

Still, they may not be as far from that utterance as they seem. For at some point, with the accumulation of tools and other forms of culture, culture itself can become an accelerator of genetic evolution. As those individuals best at manipulating culture reproduce more successfully than their neighbors, genes for deft intellect spread faster. This, in turn, speeds up cultural evolution, which further speeds up genetic evolution, and so on: yet another form of progressive evolution via positive feedback. In our lineage, this "co-evolution" of genes and culture may have acquired momentum with the first handcrafted stone tools, more than two million years ago, when the brains of our ancestors were only half the size of modern brains.

Many biologists believe that human social organization has also favored genes for intelligence. Our species, for example, has "reciprocal altruism." We are designed to feel warmly toward people who do favors for us, to return the favors, and thus to forge mutually beneficial relationships—friendships. What's more, one kind of favor we swap is social support. That is, we are a "coalitional" species; groups compete with each other for status and influence. Reciprocal altruism takes brainpower—to remember who has helped you and who has hurt you. And the coalitional variety takes more brainpower, since strategic plotting and communication among allies are vital.

Here again, the basic ingredients are not peculiar to us. Vampire bats have reciprocal altruism; they'll donate painstakingly gathered blood to a needy friend, who will return the favor when fortunes are reversed. And vampire bats have bigger forebrains—the locus of much "social" intelligence—than other bats.

As for the richer form of reciprocal altruism, coalitional contention, it turns out not to be confined to such famously political animals as chimpanzees. Bottle-nosed dolphins even form coalitions of coalitions. Team X of male dolphins will help team Y vanquish team Z, and, later, team Y will return the favor. Since victory brings sex, skill in coalition building is an obvious candidate for an arms race among dolphins.

All told, if you look at the foundations of human intelligence—tool use, language, reciprocal altruism, coalitional contention, and others—you can find them, if in primitive form, scattered far and wide across the animal kingdom. Given evolution's tendency to generate more and more species, to elevate complexity, and to keep inventing and reinventing technologies, the eventual combination of these foundational properties in a single species was likely all along.

Gould writes, "Humans are here by the luck of the draw." Undeniably true. But there's a difference between saying it took great luck for you to be the winner and saying it took great luck for there to be a winner. This is the distinction off which lotteries, casinos, and bingo parlors make their money. In the game of evolution, I submit, it was just a matter of time before one species or another raised its hand (or, at least, its grasping appendage) and said, "Bingo!"

This thesis, though little publicized, is not radical. Some noted biologists, such as William D. Hamilton and Edward O. Wilson, believe that the evolution of great intelligence was likely from the start.

Hamilton's work also suggests another interesting likelihood. He was the first to rigorously explain the evolution of family bonds—that is, "kin-selected altruism." In the human species, with its complex emotions, such altruism entails love and empathy. What's more, these warm feelings were expanded by the advent of reciprocal altruism so that we are now capable of empathizing with people we're not related to. Since natural selection has invented both kinds of altruism numerous times, it is not too wild to suggest that this expansive sentiment was probable all along.

This prospect—that evolution's directionality may have a "moral" dimension—helps explain why some religiously inclined people find progressivism intriguing. Obviously, this theme wouldn't sell the creationists themselves on Darwinism; if you think that Genesis is literally true, evolution will always be your enemy. But, in the battle between Darwinians and creationists for the hearts and minds of the uncommitted, it matters whether evolution by natural selection is spiritually suggestive.

Even if you accept the arguments for directionality, and agree that intelligence and even love were likely from the start, that is hardly overwhelming evidence of a higher purpose. But it's closer to it than Gould's version of evolution—a stumbling, bumbling process that just happened to lead, Mr. Magoo-like, to Einstein, Mother Teresa, and the Internet.

Some Darwinians flirt with deism, the no-frills faith that was favored during the Enlightenment precisely for its compatibility with science. In this view, God set cosmic history in motion and then adopted a hands-off policy, confident that it would lead to something interesting. Certainly, history *has* led to something interesting. Who knows? Maybe the present moment—when an intelligent form of life starts to collectively, deliberately shape the whole biosphere's destiny, was itself, in some statistical sense, destiny.

But, really, how consoling could any Darwinian god be? Those who would like to believe in a higher power that is both omnipotent and benign will be frustrated by the most casual inspection of the medium of our design. Among the key ingredients in natural selection's creative energy are death and suffering, the casting aside of the "unfit." And, for every bit of love and harmony, there seems to be a flip side of antagonism and cruelty; among the things we do for loved ones is hate their enemies. What kind of god would use natural selection as a creative tool?

It is tempting to answer as the biologist George Williams has: a very bad god. On the other hand, a smart, reflective species with a capacity for empathy could be capable of greater things than we've seen. Maybe human behavior will someday justify a theology rather like that of the ancient Manichaeans: maybe nature, though dominated by darkness, has always contained seeds of light, seeds of intellect and love, which over the ages grow until they transcend their base embodiment.

In any event, to note the ample dark side of evolution is simply to re-state the problem that any honest religion must confront: the problem of evil. And solving timeless theological quandaries is beyond Darwinism's job description. My point is just that Darwinism needn't put theologians out of a job.

Granted, it may force them to abandon beliefs. Scientific progress, as the philosopher Alfred North Whitehead wrote, has long spurred the amendment of religious doctrine—"to the great advantage of religion"—while religion's essence remained intact. For many religious people, part of that essence is the belief that, above and beyond the vestigial cruelties and absurdities of the human experience, there is a point to it all, a point that, even if obscure, may yet become manifest. So far, biological science has provided no reason to conclude otherwise.