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Atheism and Evolution¹

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Descartes, in the *Meditations* (1641), notes that "there are only two ways of proving the existence of God, one by means of his effects, and the other by means of his nature or essence." (AT VII, 120). The latter, *a priori* path, represented paradigmatically by the Ontological Argument of Saint Anselm (and its offspring, including Descartes's own version), has perennial appeal to a certain sort of philosopher, but leaves most people cold. The former, represented paradigmatically by the Argument from Design, is surely the most compelling of all arguments against atheism, and it apparently arises spontaneously whenever people anywhere are challenged to justify their belief in God. William Paley's example of finding a watch while strolling on the heath epitomizes the theme and leads, he says, to "the inference we think is inevitable, that the watch must have had a maker—that there must have existed, at some time and at some place or other, an artificer or artificers who formed it for the purpose which we find it actually to answer, who comprehended its construction and designed its use." (*Natural Theology*, 1800) Until Darwin came along, this was a respectable argument, worthy of Hume's corrosive but indecisive broadside in his *Dialogues Concerning Natural Religion* (1779). Descartes himself subscribed to a version of the Argument from Design, in his notorious Third Meditation argument that his idea of God was too wonderful to have been created by him. Though Descartes surely considered himself intelligent, and moreover an accomplished designer of ideas, he could not imagine that he could be the intelligent designer of his own idea of God.

The familiar idea that the marvels of the universe prove the existence of God as its creator is perhaps as old as our species, or even older. Did *Homo habilis*, the "handy" man who made the first crude tools, have some dim and inarticulate sense that it always takes a big fancy smart thing to make a less fancy thing? We never seen a pot making a potter, or a horseshoe making a blacksmith, after all. This trickle-down, mind-first vision of design seems self-evident at first. A creationist propaganda pamphlet I was once given by a student exploits this intuition with a mock questionnaire:

TEST TWO

Do you know of any building that didn't have a builder? [YES] [NO]

Do you know of any painting that didn't have a painter? [YES] [NO]

Do you know of any car that didn't have a maker? [YES] [NO]

If you answered YES for any of the above, give details: _____

¹Passages in this essay are drawn, with revisions, from Dennett 1995 and 2005.

The presumed embarrassment of the test-taker when faced with this tall order evokes the incredulity that many—probably most—people feel when they confront Darwin’s great idea. It does seem just obvious, doesn’t it, that there *couldn’t be* any such designs without designers, any such creations without a creator! The vertigo and revulsion this prospect provokes in many was perfectly expressed in an early attack on Darwin, published anonymously in 1868:

In the theory with which we have to deal, Absolute Ignorance is the artificer; so that we may enunciate as the fundamental principle of the whole system, that, IN ORDER TO MAKE A PERFECT AND BEAUTIFUL MACHINE, IT IS NOT REQUISITE TO KNOW HOW TO MAKE IT. This proposition will be found, on careful examination, to express, in condensed form, the essential purport of the Theory, and to express in a few words all Mr. Darwin's meaning; who, by a strange inversion of reasoning, seems to think Absolute Ignorance fully qualified to take the place of Absolute Wisdom in all the achievements of creative skill. (MacKenzie, 1868)

Exactly! Darwin's "strange inversion of reasoning" was in fact a new and wonderful way of thinking, completely overturning the mind-first way that even David Hume had been unable to cast aside, and replacing it with a bubble-up vision in which intelligence—the concentrated, forward-looking intelligence of an anthropomorphic agent—eventually emerges as just one of the products of mindless, mechanistic processes. These processes are fueled by untold billions of pointless, undesigned collisions, some vanishing small fraction of which fortuitously lead to tiny improvements in the lineages in which they occur. Thanks to Darwin’s principle of “descent with modification,” these ruthlessly tested design innovations accumulate over the eons, yielding breathtakingly brilliant designs that never had a designer—other than the purposeless, distributed process of natural selection itself.

The signatures of these unplanned innovations are everywhere to be found in a close examination of the marvels of nature, in the inside-out retina of the vertebrate eye, the half-discarded leftovers in the genes and organs of every species, the prodigious wastefulness and apparent cruelty of so many of nature’s processes. These departures from wisdom, *frozen accidents*, in the apt phrase of Francis Crick, confront the theist with a dilemma: if God is responsible for these designs, then His intelligence looks disturbingly like human obtuseness and callousness. Moreover, as our understanding of the mechanisms of evolution grows, we can sketch out ever more detailed accounts of the historical sequence of events by which the design innovations appeared and were incorporated into the branching tree of genomes. A voluminous predictive account of the creative process is now emerging, replete with thousands of mutually supporting details, and no contradictions at all. As the pieces of this mega-jigsaw-puzzle fall into place with increasing rapidity, there can be no reasonable doubt that it is, in all its broad outlines if not yet in all its unsettled details, the true story of how all living things came to have the designs we observe.

Unreasonable doubt flourishes, however, thanks to the incessant propaganda efforts of

creationists and Intelligent Design (ID) spokespeople, such as William Dembski and Michael Behe, who have managed to persuade a distressingly large proportion of the lay population that there are genuine scientific controversies brewing in biology about its backbone theory, evolution by natural selection. There are not. Genuine scientific controversies abound in every corner of biology, but none of them challenges evolution. The legitimate way to stir up a storm in any scientific discipline is to come up with an alternative theory that

makes a prediction that is crisply denied by the reigning theory—but turns out to be true!

Or

explains something that has been baffling defenders of the status quo.

Or

unifies two distant theories, at the cost of some element of the currently accepted view.

To date, the proponents of ID have not produced a single instance of anything like that. No experiments with results that challenge any standard neo-Darwinian understanding. No observations from the fossil record or genomics or biogeography or comparative anatomy that undermine standard evolutionary thinking. No surprising predictions that have turned out to be true. No theoretical unifications or simplifications. Not a one. In short, no science—just advertising. No ID hypothesis has even been *ventured* as a rival explanation of any biological phenomenon. To formulate a competing hypothesis, you have to get down in the trenches and offer some details that have testable implications, but the ID proponents conveniently sidestep that requirement, claiming that they have no specifics in mind about who or what the intelligent designer might be.

To see this shortcoming in relief, consider an imaginary hypothesis of intelligent design that *could* explain the emergence of human beings on this planet:

About six million years ago, intelligent genetic engineers from another galaxy visited Earth and decided that it would be a more interesting planet if there was a language-using, religion-forming species on it, so they sequestered some primates (from among the ancestors of both humans and chimpanzees and bonobos), and genetically re-engineered them to give them the language instinct, and enlarged frontal lobes for planning and reflection. It worked.

If some version of this hypothesis were true, it could actually explain how and why human beings differ from their nearest relatives, and it would disconfirm all the competing neo-Darwinian hypotheses that are currently being pursued on this fascinating question. We'd still have the problem of how these intelligent genetic engineers came to exist on their home planet, but we could safely ignore that complication for the time being, since there is not the slightest shred of evidence in favor of this hypothesis. And—here is something the ID community is reluctant to discuss—no *other* intelligent-design hypothesis has anything more going for it. In fact, my farfetched—but possible!—hypothesis has the distinct advantage of being testable in principle: we could look in the human and chimpanzee genome for unmistakable signs of tampering by these genetic engineers (maybe they left a “Kilroy was here” message in human DNA for us to decode!). Finding some sort of user's manual neatly embedded in the apparently

functionless “junk DNA” that makes up most of the human genome would be a Nobel Prize-winning knockout coup for the ID gang, but if they are even looking, they are not telling anyone. They know better. Ironically, William Dembski’s “design inference” argument is supposed to set up a sure-fire test for finding just such tell-tale signs of intelligent tinkering in the causal ancestry of phenomena, but instead of trying to demonstrate the test in action, Dembski (2005) settles for the observation that the ID perspective “encourages biologists to investigate whether systems that first appear functionless might in fact have a function”—and no neo-Darwinian would disagree with that strategy.

Between the richly detailed and ever-ramifying evolutionary story, and the featureless mystery of God the creator of all creatures great and small, there is no contest. This is a momentous reversal for the ancient conviction that God’s existence can be read off the wonders of nature. Anyone who has ever been struck by the magnificent intricacy of design and prodigious variety of the living world and wondered what—if not God—could possibly account for its existence must now confront not just a plausible alternative, but an alternative of breathtaking explanatory power supported by literally thousands of confirmed predictions and solved puzzles. Richard Dawkins has put the point crisply: “Although atheism might have been *logically* tenable before Darwin, Darwin made it possible to be an intellectually fulfilled atheist.” (1986, p. 6).

Undermining the best argument anybody ever thought of for the existence of God is not, of course, proving the non-existence of God, and many careful thinkers who have accepted evolution by natural selection as the explanation of the wonders of the living world have cast about for other supports for their continuing belief in God. The idea of treating Mind as an effect rather than as a First Cause is too revolutionary for some. Alfred Russel Wallace, the co-discoverer with Darwin of natural selection, could never accept the full inversion, proclaiming that “the marvelous complexity of forces which appear to control matter, if not actually to constitute it, are and must be mind-products.” (quoted by Gould, 1985, p.397.) More recently, the physicist Paul Davies, in his book, *The Mind of God* (1992, p.232), opines that the reflective power of human minds can be “no trivial detail, no minor by-product of mindless purposeless forces.” This is a most revealing way of expressing a familiar denial, for it betrays an ill-examined prejudice. Why, we might ask Davies, would its being a by-product of mindless, purposeless forces make it trivial? Why couldn’t the most important thing of all be something that arose from unimportant things? Why should the importance or excellence of *anything* have to rain down on it from on high, from something more important, a gift from God? Darwin’s inversion suggests that we abandon that presumption and look for sorts of excellence, of worth and purpose, that can emerge, bubbling up out of “mindless, purposeless forces.”

But before we settle into the bubble-up perspective on ultimate importance, with whatever comfort we can muster, we need to deal with the residual skepticism of the traditional trickle-down perspective: once mindless, purposeless evolution gets under way, it generates magnificent design over time, but how did it get started? Don’t we need God to kindle the process by miraculously and improbably assembling the first self-replicating thing? This hope—and the contrary conviction that the origin of life can be accounted for somehow by a natural series of events of low but not negligible probability—grounds the intense interest, not to say

passion, surrounding contemporary research on the origin of life. The details of the process are not yet settled, but the presence of fairly complex building blocks—not just amino acids and basic “organic” molecules—in the pre-biotic world is now established, and the problem confronting scientists today is less a matter of imponderable mystery than an embarrassment of riches: so many possibilities are not yet excluded. The conviction that it must have taken a miracle—a temporary violation of the standing laws of physics and chemistry—for life to get initiated has lost whatever plausibility it ever had.

But, then, those standing laws themselves require an explanation, do they not? If God the Artificer and God the Kindler have lost their jobs, what of God the Lawgiver? This suggestion has been popular since the earliest days of Darwinian thinking and Darwin himself toyed with this attractive retreat. In a letter in 1860 to the American naturalist, Asa Gray, an early supporter, Darwin wrote, "I am inclined to look at everything as resulting from *designed* [emphasis added] laws, with the details whether good or bad, left to the working out of what we may call chance." (Darwin, 1911, p.105)

Automatic processes are themselves often creations of great brilliance. From today's vantage point, we can see that the inventors of the automatic transmission and the automatic door-opener were no idiots, and their genius lay in seeing how to create something that could do something "clever" without having to think about it. Indulging in some anachronism, we could say that to some observers in Darwin's day, it seemed that he had left open the possibility that God did his Handiwork by designing an automatic design-maker. And to some of these, the idea was not just a desperate stopgap but a positive improvement on tradition. The first chapter of *Genesis* describes the successive waves of Creation and ends each with the refrain "and God saw that it was good." Darwin had discovered a way to eliminate this retail application of Intelligent Quality Control; natural selection would take care of that without further intervention from God. (The 17th-century philosopher Gottfried Wilhelm Leibniz had defended a similar hands-off vision of God the Creator.) As Henry Ward Beecher put it, "Design by wholesale is grander than design by retail." (Rachels, 1991, p.99) Asa Gray, captivated by Darwin's new idea but trying to reconcile it with as much of his traditional religious creed as possible, came up with this marriage of convenience: God *intended* the "stream of variations" and *foresaw* just how the laws of nature He had laid down would prune this stream over the eons. As John Dewey later aptly remarked (1910, p.12), invoking yet another mercantile metaphor, "Gray held to what may be called design on the installment plan.

What is the difference between Order and Design? As a first stab, we might say that Order is mere regularity, mere pattern; Design is Aristotle's "telos", an exploitation of Order for a purpose, such as we see in a cleverly designed artifact. The solar system exhibits stupendous Order, but does not (apparently) have a purpose—it isn't *for* anything. An eye, in contrast is *for* seeing. Before Darwin, this distinction was not always clearly marked. Indeed, it was positively blurred:

In the thirteenth century, Aquinas offered the view that natural bodies [such as planets, raindrops, volcanos, . . .] act as if guided toward a definite goal or end 'so as to obtain the best result.' This fitting of means to ends implies, argued Aquinas, an intention. But,

seeing as natural bodies lack consciousness, they cannot supply that intention themselves. "Therefore some intelligent being exists by whom all natural things are directed to their end, and this being we call God." (Davies, 1992, p.200)

Hume's Cleanthes, following in this tradition, lumps the adapted marvels of the living world with the regularities of the heavens--it's *all* like a wonderful clockwork to him. But Darwin suggests a division: Give me Order, he says, and time, and I will give you Design. Let me start with regularity--the mere purposeless, mindless, pointless regularity of physics--and I will show you a process that eventually will yield products that exhibit not just regularity but purposive design. (This was just what Karl Marx thought he saw when he declared that Darwin had dealt a death blow to Teleology: Darwin had *reduced* teleology to non-teleology, Design to Order.)

A more recent idea about the difference--and tight relation--between Design and Order will help clarify the picture. This is the proposal, first popularized by the physicist Erwin Schrödinger (1967), that Life can be defined in terms of the Second Law of Thermodynamics. In physics, order or organization can be measured in terms of *heat differences* between regions of space time; *entropy* is simply disorder, the opposite of order, and according to the Second Law, the entropy of any isolated system increases with time. In other words, things run down, inevitably. According to the Second Law, the universe is unwinding out of a more ordered state into the ultimately disordered state known as the heat death of the universe. What then are living things? They are things that defy this crumbling into dust, at least for awhile, by not being isolated--by taking in from their environment the wherewithal to keep life and limb together. The psychologist Richard Gregory summarizes the idea:

Time's arrow given by Entropy--the loss of organization, or loss of temperature differences--is statistical and it is subject to local small-scale reversals. Most striking: life is a systematic reversal of Entropy, and intelligence creates structures and energy differences against the supposed gradual 'death' through Entropy of the physical Universe. (1981, p.136)

Gregory goes on to credit Darwin with the fundamental enabling idea: "It is the measure of the concept of Natural Selection that increases in the complexity and order of organisms in biological time can now be understood." Not just individual organisms, but the whole process of evolution that creates them, thus can be seen as fundamental physical phenomena running contrary to the larger trend of cosmic time.

A *designed* thing, then, is either a living thing or a part of a living thing, or the artifact of a living thing, organized in any case in aid of this battle against disorder. It is not impossible to oppose the trend of the Second Law, but it is costly. Gregory dramatizes this with an unforgettable example. A standard textbook expression of the directionality imposed by the Second Law of Thermodynamics is the claim that you can't *unscramble* an egg. Well, not that you absolutely can't, but that it would be an extremely costly, sophisticated task, uphill all the way against the Second Law. Now consider: how expensive would it be to make a device that would take scrambled eggs as input and deliver unscrambled eggs as output? There is one ready solution: put a live hen in the box! Feed it scrambled eggs, and it will be able to make eggs for

you--for a while. Hens don't normally strike us as near-miraculously sophisticated entities, but here is one thing a hen can do, thanks to the Design that has organized it, that is still way beyond the reach of the devices created by human engineers.

The more Design a thing exhibits, the more R and D work had to have occurred to produce it. Minds are among the most designed of entities (in part because they are the self-redesigning things). But this means that they are among the most advanced *effects* (to date) of the creative process, not--as in the old version--its cause or source. Their products in turn--the human artifacts that were our initial model--must count as more designed still. This may seem counterintuitive at first. A Keats ode may seem to have some claim to having a grander R and D pedigree than a nightingale--at least it might seem so to a poet ignorant of biology--but what about a paper clip? Surely a paper clip is a trivial product of design compared to any living thing, however rudimentary. In one obvious sense, yes, but reflect for a moment. Put yourself in Paley's shoes, but walking along the apparently deserted beach on an alien planet. Which discovery would excite you the most: a clam or a clam-rake? Before the planet could make a clam-rake, it would have to make a clam-rake-maker, and that is a more designed thing by far than a clam.

Only a theory with the logical shape of Darwin's could *explain* how designed things came to exist, because any other sort of explanation would be either viciously circular or an infinite regress (Dennett, 1975). The old way, the mind-first way, endorsed the principle that it takes an Intelligence to make an Intelligence. Children chant "it takes one to know one" but an even more persuasive slogan would seem to be "it takes a greater one to make a lesser one." Any view inspired by this slogan immediately faces an embarrassing question, however, as Hume had noted: If God created and designed all these wonderful things, who created God? Supergod? And who created Supergod? Superdupergod? Or did God create himself? Was it hard work? Did it take time? Don't ask! Well then, we may ask instead whether this bland embrace is any improvement over just denying the principle that Intelligence (or Design) must spring from Intelligence. Darwin offered an explanatory path that actually honored Paley's insight: real work went into designing this watch, and work isn't free. Richard Dawkins summarizes the point:

Organized complexity is the thing we are having difficulty explaining. Once we are allowed simply to *postulate* organized complexity, if only the organized complexity of the DNA/protein replicating engine, it is relatively easy to invoke it as a generator of yet more organized complexity. . . . But of course any God capable of intelligently designing something as complex as the DNA/protein replicating machine must have been at least as complex and organized as the machine itself. . . . To explain the origin of the DNA/protein machine by invoking a supernatural Designer is to explain precisely nothing, for it leaves unexplained the origin of the Designer. (1986, p.141)

As Dawkins goes on to say, "The one thing that makes evolution such a neat theory is that it explains how organized complexity can arise out of primeval simplicity." (p.316) But still, that primeval simplicity exhibits Order, and what of the laws of nature themselves? Don't they manifest the existence of a Lawgiver? The physicist and cosmologist Freeman Dyson puts the point cautiously: "I do not claim that the architecture of the universe proves the existence of God. I claim only that the architecture of the universe is consistent with the hypothesis that mind

plays an essential role in its functioning." (Dyson, 1979, p.251) Since, as Dawkins notes, the hypothesis that (organized, complex) mind plays such a role could not possibly be explanatory, we should ask: With what *other* hypotheses is the architecture of the universe consistent? There are several.

As more and more has been learned about the development of the universe since the Big Bang, about the conditions that permitted the formation of galaxies and stars and the heavy elements from which planets can be formed, physicists and cosmologists have been more and more struck by the exquisite sensitivity of the laws of nature. The speed of light is approximately 186,000 miles per second. What if it were only 185,000 miles per second, or 187,000 miles per second? Would that change much of anything? What if the force of gravity were 1% more or less than it is? The fundamental constants of physics--the speed of light, the constant of gravitational attraction, the weak and strong forces of sub-atomic interaction, Planck's constant--have values that of course permit the actual development of the Universe as we know it to have happened. But it turns out that if in imagination we change any of these values by just the tiniest amount, we thereby posit a universe in which none of this could have happened, and indeed in which apparently nothing life-like could ever have emerged: no planets, no atmospheres, no solids at all, no elements except hydrogen and helium, or maybe not even that--just some boring plasma of hot, undifferentiated stuff, or an equally boring nothingness. So isn't it a wonderful fact that the laws are *just right* for us to exist? Indeed, one might want to add, we almost didn't make it!

Is this wonderful fact something that needs an explanation, and if so, what kind of explanation might it receive? According to the *Anthropic Principle*, we are entitled to infer facts about the universe and its laws from the undisputed fact that we (we *anthropoi*, we human beings) are here to do the inferring and observing. The Anthropic Principle comes in several flavors. In the "weak form" it is a sound, harmless and on occasion useful application of elementary logic: if *x* is a necessary condition for the existence of *y*, and *y* exists, then *x* exists. Believers in any of the proposed strong versions of the Anthropic Principle think they can deduce something wonderful and surprising from the fact that we conscious observers are here--for instance, that in some sense the universe exists *for* us, or perhaps that we exist *so that* the universe as a whole can exist, or even that God created the universe the way He did so that we would be possible. Construed in this way, these proposals are attempts to restore Paley's Argument from Design, re-addressing it to the Design of the Universe's most general laws of physics, not the particular constructions those laws make possible. Here, once again, Darwinian countermoves are available.

The boldest is that somehow there might have been some sort of *differential reproduction* of whole universes, with some varieties having more "offspring" than others, due to their more fecund laws of nature. Hume's mouthpiece Philo toyed with this idea, in the *Dialogues Concerning Natural Religion*, when he imagined a designer-god who was far from intelligent:

And what surprise must we entertain, when we find him a stupid mechanic, who imitated others, and copied an art, which, through a long succession of ages, after multiplied trials, mistakes, corrections, deliberations, and controversies, had been gradually improving? Many worlds might have been botched and bungled, throughout an eternity, ere this

system was struck out: Much labour lost: Many fruitless trials made: And a slow, but continued improvement carried on during infinite ages of world-making. [part V]

Hume imputes the "continued improvement" to the minimal selective bias of a "stupid mechanic", but we can replace the stupid mechanic with something even stupider without dissipating the lifting power: a purely algorithmic Darwinian process of world-trying. Hume obviously didn't think this was anything but an amusing philosophical fantasy, but the idea has recently been developed in some detail by the physicist, Lee Smolin (1992).

The basic idea is that the singularities known as black holes are in effect the birthplaces of offspring universes, in which the fundamental physical constants would differ slightly, in random ways, from the physical constants in the parent universe. So according to Smolin's hypothesis, we have both differential reproduction and mutation, the two essential features of any Darwinian selection algorithm. Those universes that just happened to have physical constants that encouraged the development of black holes would *ipso facto* have more offspring, which would have more offspring, and so forth--that's the selection step. Note that there is no grim reaper of universes in this scenario; they all live and "die" in due course, but some merely have more offspring. According to this idea, then, it is no mere interesting coincidence that we live in a universe in which there are black holes. But nor is it an absolute logical necessity; it is rather the sort of conditional near-necessity you find in any evolutionary account. The link, Smolin claims, is carbon, which plays a role both in the collapse of gaseous clouds (or in other words, the birth of stars, a precursor to the birth of black holes) and, of course, in our molecular engineering.

Is the theory testable? Smolin offers some predictions that would, if disconfirmed, pretty well eliminate his idea: it should be the case that all the "near" variations in physical constants from the values we enjoy should yield universes in which black holes are less probable or less frequent than in our own. In short, he thinks our universe should manifest at least a local, if not global, optimum in the black-hole-making competition. The trouble is that there are too few constraints, so far as I can see, on what should count as a "near" variation and why, but perhaps further elaboration on the theory will clarify this. Needless to say, it is hard to know what to make of this idea yet, but whatever the eventual verdict of scientists, the idea already serves to secure a philosophical point. Freeman Dyson, and others who think they see a wonderful pattern in the laws of physics, might be tempted to make the tactical mistake of asking the rhetorical question "What else but God could *possibly* explain it?" Smolin offers a nicely deflating reply. If we follow the Darwinian down this path, God the Artificer turns first into God the Lawgiver, who then can be seen to merge with God the Lawfinder who does not *invent* the laws of nature, but just eventually stumbles across them in the course of blind trial and error of universes. God's hypothesized contribution is becoming less personal--and hence more readily performable by something dogged and mindless!

But suppose, for the sake of argument, that Smolin's speculations are all flawed; suppose *selection* of universes doesn't work after all. There is a weaker, semi-Darwinian speculation that also answers the rhetorical question handily. Hume also toyed with this weaker idea, in part VIII of his *Dialogues*:

Instead of supposing matter infinite, as Epicurus did, let us suppose it finite. A finite number of particles is only susceptible of finite transpositions: And it must happen, in an eternal duration, that every possible order or position must be tried an infinite number of times

Suppose . . . that matter were thrown into any position, by a blind, unguided force; it is evident that this first position must in all probability be the most confused and most disorderly imaginable, without any resemblance to those works of human contrivance, which, along with a symmetry of parts, discover an adjustment of means to ends and a tendency to self-preservation. . . . suppose, that the actuating force, whatever it be, still continues in matter . . . Thus the universe goes on for many ages in a continued succession of chaos and disorder. But is it not possible that it may settle at last . . . ? May we not hope for such a position, or rather be assured of it, from the eternal revolutions of unguided matter, and may not this account for all the appearing wisdom and contrivance which is in the universe?

This idea exploits no version of selection at all, but simply draws attention to the fact that we have eternity to play with. There is no five-billion year deadline in this instance, the way there is for the evolution of life on Earth. Several versions of this speculation have been seriously considered by physicists and cosmologists in recent years. John Archibald Wheeler (1974), for instance, has proposed that the Universe oscillates back and forth for eternity: a Big Bang is followed by expansion which is followed by contraction into a Big Crunch, which is followed by another Big Bang, and so forth forever, with random variations in the constants and other crucial parameters occurring in each oscillation. Each possible setting is tried an infinity of times, and so every variation on every theme, both those that "make sense" and those that are absurd, spins itself out, not once but an infinity of times.

It is hard to believe that this idea is empirically testable in any meaningful way, but we should reserve judgment. Variations or elaborations on the theme just might have implications that could be confirmed or disconfirmed. In the meantime it is worth noting that this family of hypotheses does have the virtue of extending the principles of explanation that work so well in testable domains all the way out. Consistency and simplicity are in its favor. And that, once again, is certainly enough to blunt the appeal of the traditional alternative. Here's why: *if* the universe were structured in such a way that an infinity of different "laws of physics" get tried out in the fullness of time, we would be mistaken to think that there is anything special about our finding ourselves with such exquisitely well-tuned laws. It had to happen eventually, with or without help from a benign God. This is not an argument for the conclusion that the universe is, or must be, so structured, but just an argument for the more modest conclusion that no feature of the observable "laws of nature" could be invulnerable to this alternative, deflationary interpretation.

Once these ever more speculative, ever more attenuated Darwinian hypotheses are formulated, they serve--in classic Darwinian fashion--to diminish by small steps the explanatory task facing us. All that is left over in need of explanation at this point is a certain perceived elegance or wonderfulness in the observed laws of physics. If you doubt that the hypothesis of an infinity of variant universes could actually explain this elegance, you should reflect that this has

at least as much claim to being a non-question-begging explanation as any traditional alternative; by the time God has been depersonalized to the point of being some abstract and timeless principle of beauty or goodness, not an Artificer or a Lawgiver or even a Lawfinder but at best a sort of Master of Ceremonies, it is hard to see how the existence of God could explain anything. What would be asserted by the "explanation" that was not already given in the description of the wonderful phenomenon to be explained? The Darwinian perspective doesn't prove that God—in any of these guises—couldn't exist, but only that we have no good reason to think God does exist. Not a classical *reductio ad absurdum* argument, then, but nevertheless a rational challenge that reduces the believer's options to an absurdly minimalist base. As the Reverend Mackerel says, in Peter de Vries comic novel, *The Mackerel Plaza* (1958), "It is the final proof of God's omnipotence that he need not exist in order to save us."

Evolutionary biology also supports atheism indirectly by providing an explanatory framework for what we might call the genealogy of theology. Since belief in God cannot be justified by any scientific or logical argument, but is nevertheless a nearly ubiquitous ingredient in human civilization, what explains the maintenance of this belief? This is an oft-neglected part of the atheist's burden of proof: not merely showing the fallacies and dubieties in the various arguments that have been offered for the existence of God, but explaining why such a dubious proposition would be favored by anybody in the first place. There has been no shortage of dismissive hypotheses offered over the centuries: neuroses that are the inevitable byproducts of civilization, a conspiracy of ultimately selfish priests, and sheer stupidity, for instance, are perennially popular hunches. Recent works in evolutionary social science (Boyer, 2001, Atran, 2002, Dennett, 2006) demonstrate that there are both more interesting and more plausible—and scientifically confirmable—hypotheses to pursue.

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