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SPECIAL ISSUE: ORIGINS

DARWIN'S DANGEROUS IDEA

Like "Universal Acid," Evolutionary Theory Eats Through Every Other Explanation for Life, Mind and Culture

by DANIEL C. DENNETT

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WHEN I WAS A SCHOOLBOY, MY FRIENDS and I used to amuse ourselves with fantasies about an imaginary chemical we called universal acid. I have no idea whether we invented it or inherited it, along with Spanish fly and saltpeter, as part of underground youth culture. Universal acid is a liquid so corrosive that it will eat through *anything.* The problem with universal acid, of course, is what to keep it in. It dissolves glass bottles and stainless-steel canisters as readily as it does paper bags. What would happen if somehow you came upon a dollop of universal acid? Would the entire planet eventually be destroyed? If not, what would be left? After everything had been transformed by its encounter with universal acid, what would the world look like?

Our speculations were a diverting joke; none of us expected to come in contact with such corrosive material. Yet in only a few years I would encounter something bearing as close a likeness to universal acid as anyone could wish. It was not a chemical but an idea—one that eats through virtually every traditional concept, leaving in its wake a revolutionized world view, with most of the old landmarks still recognizable but transformed in fundamental ways. It was the idea that Charles Darwin, in 1859, unleashed on an unsuspecting world.

I was not the first to realize that I was dealing with dangerous stuff. From the moment of publication of *The Origin of Species,* Darwin's fundamental idea has inspired intense reactions, ranging from ferocious condemnation to ecstatic allegiance, sometimes tantamount to religious zeal. Darwin's theory has been abused and misrepresented by friend and foe alike. It has been misappropriated to lend scientific respectability to appalling political and social doctrines. It has been pilloried in caricature by opponents, some of whom would have it compete in the schools with "creation science," a pathetic hodgepodge of pious pseudoscience.

Almost no one is indifferent to Darwin, and no one should be. The Darwinian theory is a scientific theory, and a great one, but that is not all it is. The creationists who oppose it so bitterly are right about one thing: Darwin's dangerous idea cuts much deeper into the fabric of our most fundamental beliefs than many of its sophisticated apologists have yet admitted, even to themselves. Even today, more than a century after Darwin's death, many people still have not come to terms with its mind-boggling implications. Perhaps, they think, one can distinguish the parts of Darwin's idea that really are established beyond any reasonable doubt from the other, more speculative parts. Perhaps the rock-solid scientific facts would then turn out to have no stunning implications for religion, or human nature, or the meaning of life, whereas the parts of Darwin's ideas that get people so upset could be quarantined as controversial extensions, or mere interpretations, of the scientifically irresistible parts. That would be reassuring.

But alas, that is just about backward. There are vigorous controversies swirling around in contemporary evolutionary theory, but people who feel threatened by Darwinism should not take heart from that fact. Most—if not quite all—of the controversies concern issues that are "just science"; no matter which side wins, the outcome will not undo the basic Darwinian idea. That idea, which is as secure as any in science, really does have far-reaching implications for visions of what the meaning of life is or could be. Among other things, Darwin changed forever what it means to ask, and answer, the question, Why?

The Great Chain of Being

TO APPRECIATE HOW DEEPLY DARWIN'S UNIVERSAL ACID has etched its way into the intellectual landscape, it may help to see how the world looked before Darwin inverted it. A passage written by the English philosopher John Locke in his *Essay Concerning Human Understanding,* published in 1690, perfectly illustrates the conceptual blockade that was in place before the Darwinian revolution:

> Let us suppose any parcel of Matter eternal, great or small, we shall find it, in it self, able to produce nothing. . . . Matter then, by its own Strength, cannot produce in it self so much as Motion: the motion it has, must also be from Eternity, or else be produced, and added to Matter by some other Being more powerful than Matter. . . . But let us suppose Motion eternal too; yet Matter, *incogitative Matter* and Motion, whatever changes it might produce of Figure and Bulk, *could never produce Thought.* . . .
>
> So that if we will suppose nothing first, or eternal; *Matter* can never begin to be: If we suppose bare Matter, without Motion, eternal; *Motion* can never begin to be: If we suppose only Matter and Motion first, or eternal; *Thought* can never begin to be.

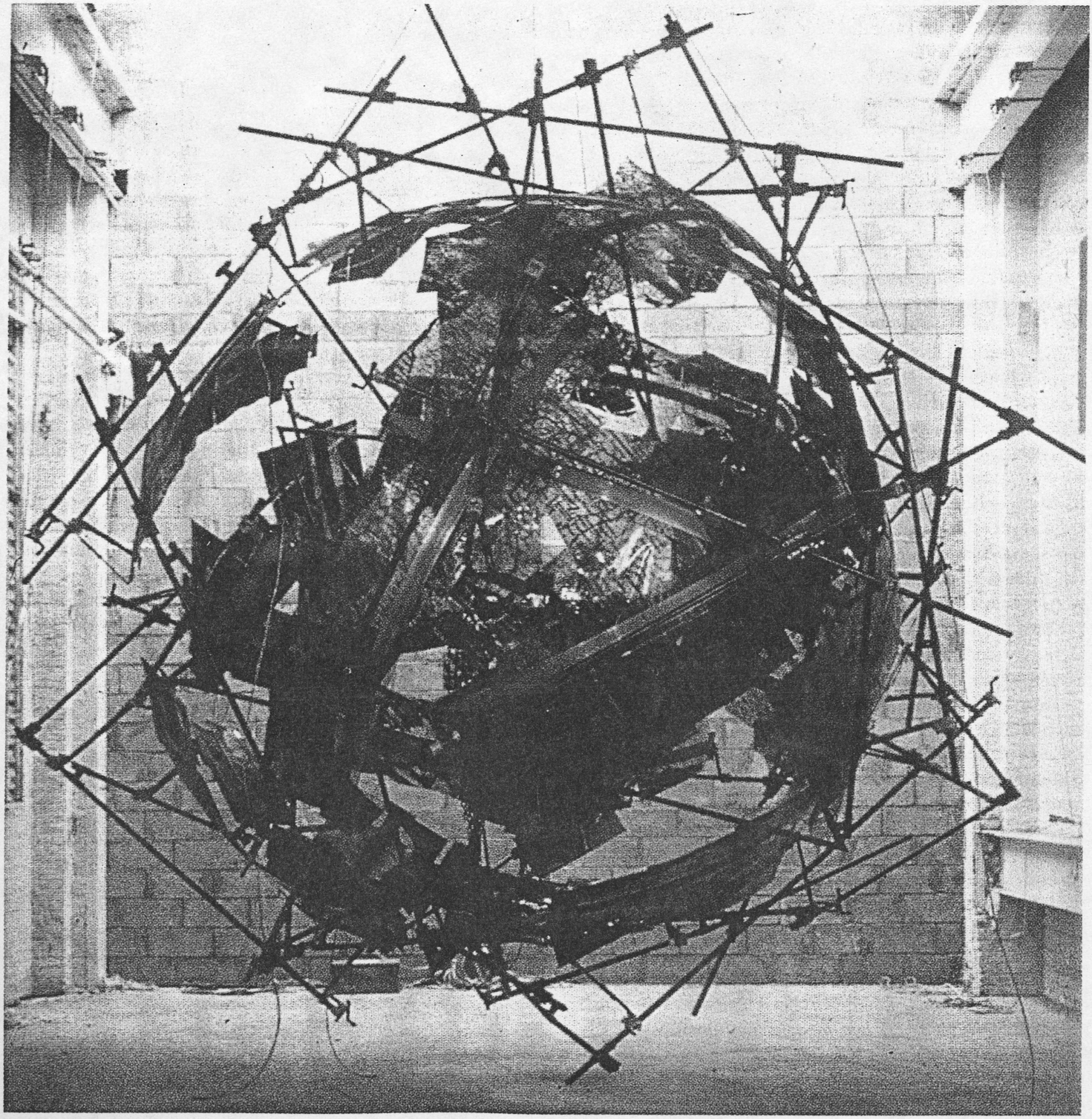
The argument may seem strange and stilted to modern readers, but Locke himself thought he was just reminding people of something obvious: mind must come first, or at least it must be tied for first. And so it seemed to many brilliant and skeptical thinkers before Darwin. Behind their thinking lay a top-to-bottom view of things often described

as a ladder, a tower or, in the memorable phrase of the American intellectual historian Arthur O. Lovejoy, a "great chain of being." Locke's argument invoked a particularly abstract version of the hierarchy, which I call the cosmic pyramid:

God
Mind
Design
Order
Chaos
Nothing

Everything finds its place somewhere in the pyramid—even blank nothingness, the ultimate foundation. Not all matter is ordered; some is in chaos; only some ordered matter is also designed; only some designed things have minds; and, of course, only one mind is God.

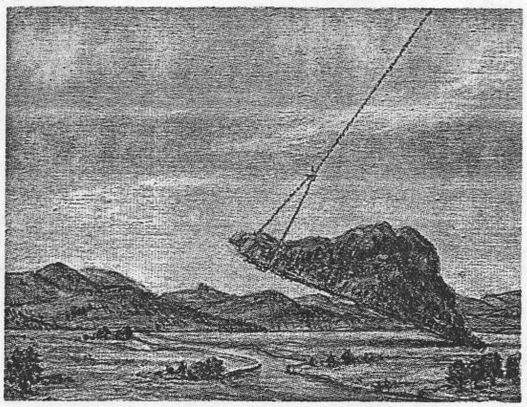
What is the difference between order and design? As a first stab, I would say that order is mere regularity, mere pattern; design reflects Aristotle's *telos,* an exploitation of order for a purpose, as in a cleverly designed artifact. The solar system exhibits stupendous order, but (apparently) it has no purpose—it is not *for* anything. An eye, in contrast, is for seeing. Before Darwin, the distinction was not always clearly marked, but Darwin suggested a division. Give me order and time, he said, and I will give you design—without the aid of mind.



Mike & Doug Starn, Sphere of Influence, *1990–92*

Kinds, Essences and Change

DARWIN DID NOT SET OUT TO FIND AN ANTIDOTE TO Locke's conceptual paralysis or to pin down a grand cosmological alternative. His aim was slightly more modest: he wanted to explain the origin of species. The naturalists of his day had amassed mountains of facts about living things and had succeeded in systematizing those facts along several dimensions. Two great sources of wonder emerged from that work. First were all the discoveries about the impressive adaptations of organisms. Second was the recognition of the prolific diversity of living things: it had begun to dawn on people that literally millions of kinds of plants and animals inhabit the earth. Why were there so many?



Fanny Brennan, Mountain Lift, *1990*

Even more striking were the patterns discernible within that diversity, particularly the huge gaps between many organisms. There were birds and mammals that swam like fish, but none with gills; there were dogs of many sizes and shapes, but no dogcats or dogcows or feathered dogs. The patterns cried out for classification. Aristotle taught that all things—not just living things—have two kinds of properties: essential properties, without which they fail to be the particular kind of thing they are, and accidental properties, which are free to vary within the kind. And along with each kind of thing came an essence. Essences for Aristotle were definitive: timeless, unchanging, all or nothing. A thing could not be *rather* silver or *quasi*-gold or a *semi*-mammal. Species of organisms were deemed to be as timeless and unchangeable as the perfect triangles and circles of Euclidean geometry.

On the outskirts of that deliciously crisp and systematic hierarchy lurked a plethora of awkward and puzzling facts. There were all manner of hard-to-classify intermediate creatures, which seemed to have parts of more than one essence. There were curious higher-order patterns of shared and unshared features: Why should it be backbones and not feathers that birds and fish share, and why should *creature with eyes* or *carnivore* not be as important a classifier as is *warm-blooded*? Which principle of classification should count? In Plato's famous image, which system "carved nature at the joints"?

What Darwin provided was the first background theory for showing why one classification scheme would get the joints right. The solution, he argued, was to take a historical approach. Species are not eternal and immutable; they have evolved over time and can give birth to new species in turn. The idea was not new; many versions of it had been seriously discussed since the time of the ancient Greeks. But there was a powerful Aristotelian bias against it: essences, after all, were unchanging; a thing could not change its essence, and new essences could not be born (except, of course, by God's command in episodes of Special Creation). Reptiles could no more turn into birds than copper could turn into gold.

To imagine how the idea of evolution must have struck Darwin's contemporaries, consider how you would react if someone announced that, long, long ago, the number 7 had been an even number and that it had gradually acquired its oddness by exchanging some properties with the ancestors of the number 10 (which was once a prime number). Utter nonsense, of course. Inconceivable. Yet that was just the kind of conceptual leap Darwin demanded of his peers. In *The Origin of Species* he set out both to prove *that* modern species were revised descendants of earlier species—species had evolved—and to show *how* that "descent with modification" had taken place. The book presented an overwhelmingly persuasive case for the first thesis and a tantalizing case in favor of the second. Suddenly the burden of proof shifted to the skeptics: Could they show that Darwin's arguments were mistaken? Could they show how natural selection would be incapable of giving rise to the effects he described? Given all the signs of historical process that Darwin had uncovered—all the brush marks of the artist, you might say—could anyone imagine how any process other than natural selection could have led to all those effects?

Algorithmic Processes

DARWIN SUCCEEDED NOT ONLY BECAUSE HE DOCUMENTED his ideas exhaustively but also because he grounded them in a powerful theoretical framework. In modern terms, he had discovered the power of an algorithm.

An algorithm is a formal process that can be counted on—logically—to yield a certain kind of result whenever it is "run" or instantiated. The idea that an algorithm is a foolproof and somehow "mechanical" procedure has been around for centuries, but it was the pioneering work of Alan M. Turing, Kurt Gödel and Alonzo Church in the 1930s that more or less fixed the current understanding of the term. Three key features of algorithms are important here:

1. Substrate neutrality: The power of the procedure is a result of its logical structure, not the materials that happen to be used in carrying it out. Long division works equally well with pencil or pen, paper or parchment, neon lights or skywriting, using any symbol system you like.

2. Underlying mindlessness: Although the overall design of the procedure may be brilliant, or may yield brilliant results, each constituent step is utterly simple. The recipe requires no wise decisions or delicate judgments on the part of the recipe reader.

3. Guaranteed results: Whatever it is an algorithm does, it always does it, provided the algorithm is executed without misstep. An algorithm is a foolproof recipe.

Algorithms need not have anything to do with numbers. Consider the process of annealing a piece of steel. What could be more physical, less "computational," than that? The blacksmith repeatedly heats the steel and then lets it

cool, and somehow in the process it becomes much stronger. How? Does the heat create special toughness atoms that coat the surface? Or does it suck out of the atmosphere subatomic glue that binds all the iron atoms together? No, nothing like that takes place.

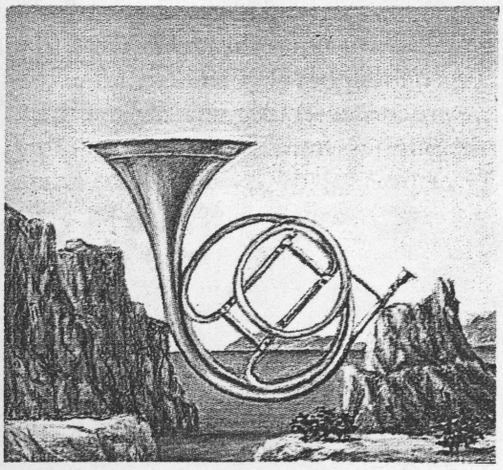
The right level of explanation is the algorithmic level: As the metal cools from its molten state, it begins to form a solid in many spots at the same time, creating crystals that grow together until the entire mass is solid. The first time that takes place, the arrangement of the individual crystal structures is less than optimal; they are weakly held together, with lots of internal stresses and strains. Heating the steel again—but not all the way to melting—partly breaks down those structures, so that, when next they cool, the broken-up bits adhere to the still-solid bits in a different arrangement. It can be mathematically proved that the rearrangements tend to form a progressively stronger total structure, provided the heating and cooling are done just right.

To understand annealing in depth you have to learn the physics of all the forces operating at the atomic level. But the basic idea of how and why the process works can be lifted clear of those details and put in substrate-neutral terminology. For example, metallurgical annealing has inspired a general problem-solving technique in computer science known as simulated annealing, a way of getting a computer program to build, disassemble and rebuild a data structure (such as another program) over and over, blindly groping toward a better—sometimes even an optimal—version.

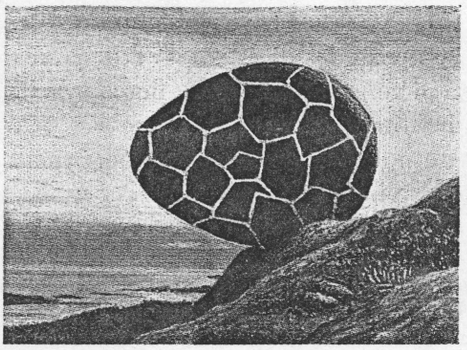
Similarly, Darwin's ideas about the powers of natural selection can be lifted out of their home base in biology. Darwin himself had few inklings about the microscopic processes of genetic inheritance (and those turned out to be wrong). Because of substrate neutrality, however, his basic insights have floated like a cork on the waves of subsequent research and controversy, from Mendel to molecular biology.

Universal Acid, Redux

HERE, THEN, IS DARWIN'S DANGEROUS IDEA: THE ALGORithmic level *is* the level that best accounts for the speed of the antelope, the wing of the eagle, the shape of the orchid, the diversity of species and all the other occasions for wonder in the world of nature. Incredible as it may seem, the entire biosphere is the outcome of nothing but a cascade of algorithmic processes feeding on chance. Who designed the cascade? Nobody. It is itself the outcome of a blind algorithmic process. As Darwin himself put it, in a letter to the British geologist Charles Lyell shortly after the publication of *Origin*:



Fanny Brennan, Big Horn, *1992*



Fanny Brennan, Lily's Egg, *1990*

> I would give absolutely nothing for the theory of Natural Selection, if it requires miraculous additions at any one stage of descent. . . . If I were convinced that I required such additions to the theory of natural selection, I would reject it as rubbish.

The idea of evolution by algorithm is still controversial. Today evolutionary biologists are engaged in a tug-of-war between those who are relentlessly pushing toward an algorithmic treatment and those who, for various submerged reasons, are resisting the trend. It is rather as if there were metallurgists around who were disappointed by the algorithmic explanation of annealing. "You mean that's all there is to it? No microscopic superglue especially created by the heating and cooling process?" Nobody denies that evolution, like annealing, works; what is at issue is Darwin's radical vision of how and why it works. The forces of resistance can dimly see that their skirmish is part of a wider campaign. If the game is lost in evolutionary biology, where will it end?

Like universal acid, Darwin's idea quickly began to eat its way out of its original container. If the redesign of organisms could be a mindless, algorithmic process of evolution, why could that process itself not be the product of evolution, and so forth, all the way down the cosmic pyramid? And if mindless evolution could account for the breathtakingly clever artifacts of the biosphere, how could the products of our own minds be exempt from an evolutionary explanation? Darwin's idea thus also threatened to spread all the way up, dissolving the illusion of human authorship, our own divine spark of creativity and understanding.

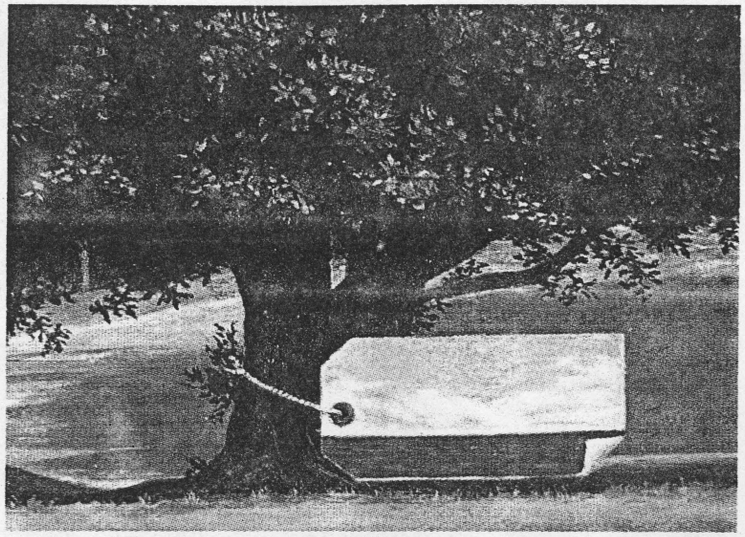
In response, anxious thinkers have waged a number of failed campaigns to contain Darwin's idea within some acceptably safe, partial revolution. Cede some or all of modern biology to Darwin, perhaps, but hold the line there. Keep Darwinian thinking out of cosmology, out of psychology, out of human culture, out of ethics, politics and religion! (Among those who favor holding the line within biology itself, Stephen Jay Gould has offered several post-Darwinian counterrevolutions.) The forces of containment have won many battles and, to their credit, have exposed and discredited many flawed applications of Darwin's idea. But new, improved waves of Darwinian thinking keep coming.

Order and Design

LIKE ANY GOOD REVOLUTIONARY, DARWIN DID NOT SIMPLY topple the old system; he adapted as much of it as possible to his own purposes. Under his influence the cosmic pyramid took on a new meaning, hinging on a radically altered

concept of design. Many philosophers had regarded the existence of design as proof of the existence of God. The late-eighteenth-century theologian William Paley compared the intricacy of the universe to that of a watch found on a heath in the wilderness. Where there is a watch, can there fail to be a watchmaker?

As Paley pointed out, a watch exhibits a tremendous amount of work done. Watches and other designed objects do not just happen; they are the product of what modern industry calls R&D—research and development—and R&D is costly, in both time and energy. Before Darwin the only model of a process whereby R&D could get done was one that invoked an intelligent artificer. What Darwin saw was that in principle the same work could be done by a different kind of process that distributed the work over huge amounts of time, thriftily conserving the design work that had been accomplished at each stage so that it did not have to be done over again.



Fanny Brennan, Tagged Tree, *1982*

Another way of looking at the difference—and the tight relation—between design and order was popularized by the Austrian physicist Erwin Schrödinger. In physics, order or organization can be measured as differences in heat between regions of space-time; entropy is simply disorder, the opposite of order. According to the second law of thermodynamics, the entropy of any isolated system increases with time. In other words, things run down; the universe is unwinding out of a more ordered state into the ultimately disordered state called its heat death.

What, then, are living things? They are things that resist crumbling into dust, at least for a while, by not being isolated—by taking in from their environment the wherewithal to keep life and limb together. The psychologist Richard L. Gregory of the University of Bristol in England sums up the idea crisply:

> Time's arrow given by Entropy—the loss of organization, or loss of temperature differences—is statistical and 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.

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 the service of the battle against disorder.

It is not impossible to oppose the trend of the second law, but it is costly, as Gregory dramatized with an unforgettable example. Suppose you decided to reverse entropy by unscrambling an egg. How much would it cost to make a device that takes scrambled eggs as input and delivers unscrambled eggs as output? Even with an unlimited budget the most brilliant engineers could not do it. But there is a ready solution: a live hen. Feed it scrambled eggs, and it will be able to make eggs for you—for a while—thanks to the design built into it.

The more design a thing exhibits, the more R&D work must have been done to make it. In Darwin's conception, the vertical dimension of the cosmic pyramid becomes the measure of how much design has gone into items at a given level. Minds still end up near the top, but only because they are among the most advanced effects (to date) of the creative process—not, as in the old version, its cause or source. And the products of human minds, namely, human artifacts, must count as more designed still. That might seem counterintuitive at first; surely a paper clip is a trivial product of design compared with any living thing, however rudimentary. But imagine yourself walking along an apparently deserted beach on an alien planet. Which discovery would excite you more: a clam, or a clam rake?

Cranes and Skyhooks

NOW IMAGINE ALL THE "LIFTING" THAT MUST HAVE BEEN needed to create the magnificent organisms and (other) artifacts in the upper reaches of the cosmic pyramid. Vast distances must have been traversed since the dawn of life and the earliest, simplest self-replicating entities. Darwin has offered an account of the crudest, most rudimentary, stupidest imaginable lifting process: natural selection. By taking the smallest possible steps, the process can gradually, over eons, traverse those huge distances.

Could it really have happened that way? Can Darwin's mindlessly mechanical algorithms really get all the way to here (the world of wonders we all inhabit) from there (the world of chaos or utter undesignedness) in only a few billion years? Or did the process need a leg up now and then, if only at the very beginning, from some sort of "mind first" force or power or process? In short, does evolution need a skyhook?

> **skyhook.** orig. *Aeronaut.* An imaginary contrivance for attachment to the sky; an imaginary means of suspension in the sky.
>
> —*Oxford English Dictionary*

The first use of the term noted by the *OED* dates from 1915, when an airplane pilot, commanded to remain aloft for an hour beyond the planned landing, replied, "Submitted: that this machine is not fitted with skyhooks."

Skyhooks would be wonderful things to have: miraculous lifters, unsupported and insupportable, great for hauling unwieldy objects out of difficult circumstances and speeding up all sorts of construction projects. Sad to say, though, there are no skyhooks.

But there are cranes. Anyone who is, like me, a lifelong spectator at construction sites surely has noticed with some satisfaction that it sometimes takes a small crane to set up a big crane. And it must have occurred to many other onlookers that, in principle, the big crane could be used to build a still more spectacular crane. In principle (if not in real-world construction projects), there is no limit to the cascade of cranes that could be organized to accomplish some mighty end. In the Darwinian context cranes are natural evolutionary subprocesses or features that speed up the basic, slow pace of natural selection. Cranes are expensive; they have to be designed and built from everyday parts already on hand; and they need to be erected on a firm base of existing ground. Once built, however, they are excellent lifters; they do their job in an honest, non-question-begging fashion; and they have the decided advantage of being real.

For more than a century skeptics have been trying to find a proof that Darwin's idea just cannot work, at least not all the way. Time and again they have come up with truly fascinating challenges: leaps and gaps and other marvels that do seem, at first, to need skyhooks. But then along have come the cranes—discovered, in many cases, by the very skeptics who were hoping to find a skyhook.

Sex

ONE EXTREMELY POWERFUL CRANE, MOST EVOLUTIONARY theorists agree, is sex. Species that reproduce sexually can move through the universe of possible, nonlethal designs—which might be called design space—much more rapidly than organisms that reproduce asexually. That cannot be the raison d'être of sex, however. Evolution cannot see far down the road; anything it builds must have an immediate payoff to counterbalance the cost. Some other, short-term benefit must have maintained the positive selection pressure required to make sexual reproduction an offer few species could refuse.

Another crane, one that was created to be a crane, is genetic engineering. Genetic engineers—people who engage in recombinant-DNA tinkering—can now take huge leaps through design space, creating organisms that would never have evolved by "ordinary" means. That is no miracle—provided the genetic engineers themselves (and the artifacts they use in their trade) are wholly the products of earlier, slower evolutionary processes.

In *The Descent of Man* Darwin made it clear that the cranes of evolution reach all the way up to the throne of mind. That idea was too revolutionary for many people—and it remains so, even among some of evolution's best friends. Alfred Russel Wallace, whom Darwin acknowledged as codiscoverer of the principle of evolution, never quite got the point. When, later in life, Wallace converted to spiritualism and exempted human consciousness altogether from the iron rule of evolution, Darwin wrote to him: "I hope you have not murdered too completely your own and my child."

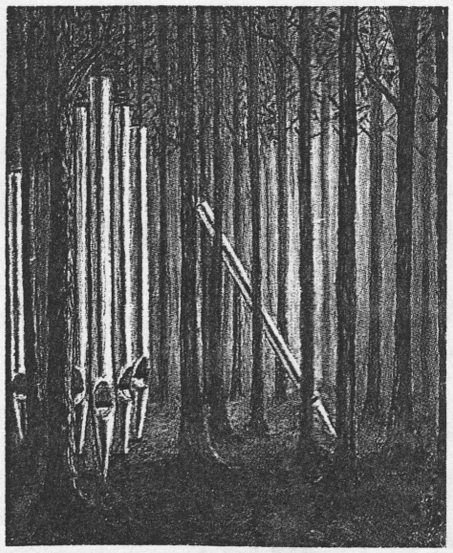
More recently the physicist Paul Davies of the University of Adelaide in Australia proclaimed in his book *The Mind of God* that the reflective power of human minds can be "no trivial detail, no minor by-product of mindless purposeless forces." That familiar denial betrays an ill-examined prejudice. Why, one 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? Darwin's inversion suggests that varieties of excellence, worth and purpose can emerge, bubbling up out of "mindless, purposeless forces."

People ache to believe that human beings are vastly different from all other species—and they are right. We are different. We are the only species that has access to an extra mode for preserving and communicating design: culture. (Other species have some capacity to transmit information "behaviorally" as well as genetically, but they have not developed culture to the takeoff point that our species has.) People have language, the primary medium of culture, and language has opened up new regions of design space that only we are privy to. In a few short millennia—a mere instant in biological time—we have already launched our new exploration vehicles to transform not only the planet but the very process of design development that created us.

Crane-Making Cranes

HUMAN CULTURE IS NOT JUST A CRANE MADE UP OF CRANES; it is a crane-making crane, so powerful that its effects can swamp many (but not all) of the earlier genetic pressures and processes that created it and still coexist with it.

What kind of evolutionary revolution took place to set us apart so decisively from all other products of the genetic revolution? The explanation, I think, parallels the wonderful story told by the biologist Lynn Margulis of the University of Massachusetts at Amherst, about the revolution that paved the way for all complex life. Once upon a time, Margulis says, the only organisms on earth were cells without nuclei, the prokaryotes. They were simple, solitary forms of life, destined for nothing fancier than drifting around in an energy-rich soup and reproducing themselves. Then, one day, some prokaryotes were invaded by parasites. But the invaders turned out to be beneficial; they joined forces with their hosts, creating a revolutionary new kind of entity, a eukaryotic cell. That partnership opened up the vast space of possibilities known as multicellular life.

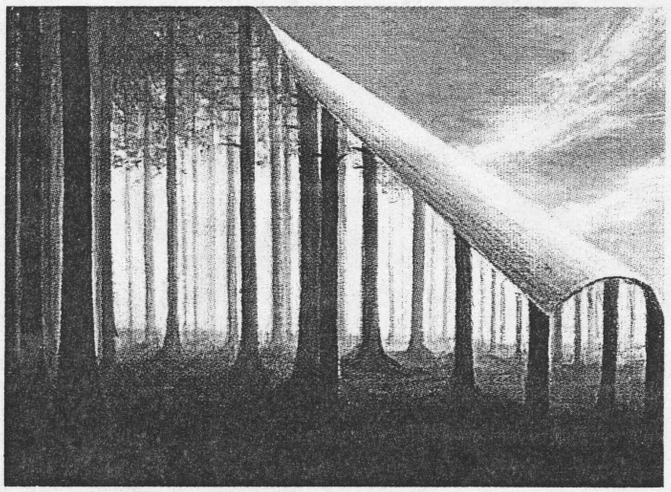


Fanny Brennan, Fugue, *1991*

A few billion years passed. Then one fine day another invasion began. A single species of multicellular organism, a kind of primate, had developed a variety of structures and capacities that happened to make the organism particularly well suited for the invaders. In fact, the primate hosts

had created the invaders as well, in much the way spiders create webs and birds create nests. In a twinkling—in less than 100,000 years—the invaders transformed the apes who were their unwitting hosts into something altogether new: *witting* hosts, who, thanks to their huge stock of newfangled invaders, could imagine the heretofore unimaginable, leaping through design space as nothing had ever done before. Following the evolutionary biologist Richard Dawkins of the University of Oxford, I call the invaders memes. The radically new kind of entity created when a particular kind of animal is properly furnished (or infested) with memes is what is commonly called a person.

Roughly speaking, memes are ideas—specifically, the kind of complex ideas that form themselves into distinct memorable units, such as: *arch; wheel; wearing clothes; vendetta; right triangle; alphabet; calendar; the* Odyssey; *calculus; chess; perspective drawing; evolution by natural selection; impressionism; "Greensleeves"; deconstructionism.* In Dawkins's conception, memes represent units of cultural transmission analogous to the genes of biological evolution. Like genes, memes are replicators, subject to much the same principles of evolution as genes are. Their fate is determined by whether copies and copies of copies of them persist and multiply, and that depends on the selective forces that act directly on the various physical vehicles that embody them. Some thinkers have proposed that there could be a science of meme evolution—memetics—strongly parallel to genetics. Others consider the proposal absurd.



Fanny Brennan, Forest, *1987*

Emotional Aversions

SOME PEOPLE HATE THE VERY idea of explaining human culture in evolutionary terms. I think they are making a big mistake. They want to believe that the human way of life is radically different from that of all other living things—and so it is. But they also want to understand that difference as the result of a miracle, a gift from God, a skyhook, not a crane. Why? Why should people flinch from carrying Darwin's idea through to its logical conclusion?

The answer, I think, is fear. They are afraid that the idea will not just explain but will explain *away* the minds and purposes and meanings that everyone holds dear; that the universal acid will pass through their most cherished monuments, dissolving them into an unrecognizable and unlovable puddle of scientistic destruction.

I can sympathize with such concerns. But the damage, if damage it is, is already done. Even if Darwin's idea came to be rejected by science—utterly discredited and replaced by some vastly more powerful (and currently unimaginable) vision—it would still have irremediably demolished everything that came before it. Simply by making design without mind conceivable, Darwin rendered Locke's argument, and the thinking behind it, as obsolete as the quill pen with which it was written. There can be no returning to pre-Darwinian innocence.

We used to sing a lot when I was a child, at school and Sunday school, around the campfire at summer camp, or gathered around the piano at home. One of my favorite songs, simple but surprisingly beautiful, was "Tell Me Why":

Tell me why the stars do shine,
Tell me why the ivy twines,
Tell me why the sky's so blue.
Then I will tell you just why I love you.

Because God made the stars to shine,
Because God made the ivy twine,
Because God made the sky so blue.
Because God made you, that's why I love you.

That straightforward, sentimental declaration still brings a lump to my throat—so sweet, so innocent, so reassuring is its vision of life. But it is a vision most of us have outgrown, however fondly we may recall it. The kindly God who lovingly fashioned every one of us (all creatures great and small) and sprinkled the sky with shining stars for our delight—that God is, like Santa Claus, a myth of childhood, not anything a sane, undeluded adult could literally believe in.

I, too, cherish many of the ideas and ideals that Darwin seems to challenge, and I want to protect them. I want to protect the campfire song, and what is beautiful and true in it, for my little grandson and his friends, and for their children. Many other, more magnificent ideas may also need protection. But the only good way to do that—the only way that has a chance in the long run—is to cut through the smoke screens and look at the idea as unflinchingly, as dispassionately, as possible.

There is no future in a sacred myth. Why not? Because of our curiosity. Because, as the song reminds us, we want to know why. We may have outgrown the song's answer, but we will never outgrow the question. Whatever we hold precious, we cannot protect it from our curiosity, because being who we are, one of the things we deem precious is the truth. Our love of truth is surely a central element in the meaning we find in our lives. In any case, the idea that we might preserve meaning by kidding ourselves is a more pessimistic, more nihilistic idea than I for one can stomach. If that were the best that could be done, I would conclude that nothing mattered after all. •

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