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INTELLIGENT THOUGHT

SCIENCE VERSUS THE
INTELLIGENT DESIGN MOVEMENT

EDITED BY

JOHN BROCKMAN



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this: "No, I personally don't. But I have numerous friends—eminent scientists—who do believe that an intelligence must have been involved in creation." Then I added, "However, all of us *do* science in the same way. We all take it for granted that science is the attempt to explain as much of the world as we can by natural mechanisms."

This time it would appear that no biological buttons were pushed. If not converts to atheism, these students left my office with no hostility toward science, at least for the moment.

My final advice is to forget arguing with those benighted zealots who would prefer that intellectual history had ended in the fifteenth century. There is no point in trying to convince the hard-core creationists—or, for that matter, the masters of manipulation. The real challenge is to reach out to the majority, to those sensible people who have been jerked around by conflicting ideologies and don't know what to think.

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DANIEL C. DENNETT

The Hoax of Intelligent Design and How It Was Perpetrated

IN THE SUMMER of 2005, the intelligent-design hoax, many years in the making, blossomed spectacularly. Over the course of a few weeks, its victims made headlines around the world:

(1) Cardinal Christoph Schönborn, Roman Catholic archbishop of Vienna, published an op-ed piece in *The New York Times* of July 7, proclaiming the Catholic Church's disavowal of the neo-Darwinian theory of evolution by natural selection.

(2) A month later, President George W. Bush announced at a press conference that he was in favor of teaching schoolchildren about intelligent design, saying that "part of education is to expose people to different schools of thought."

(3) Shortly afterward, Senator Bill Frist (R., Tenn.), the Senate majority leader, made the same point to reporters after a Rotary Club meeting in Nashville. Teaching both intelligent design and evolution "doesn't force any particular theory on anyone," Frist said. "I think in a pluralistic society that is the fairest way to go about education and training people for the future."

Where did nonscientists like Cardinal Schönborn, President Bush, and Senator Frist get the idea that a proposition favored by their religious perspectives is also a serious contender within science that ought to be taught?

These declarations were a public-relations coup for a well-organized group of conservative religious activists who are intent on persuading the American public that there is a significant controversy within biology about the status of the theory of evolution by natural selection. The challenger to the scientific establishment, they suggest, is the hypothesis of intelligent design. In response to their vigorous campaign, many Americans have come to think that ID is a legitimate school of thought in biology, worthy of study in classrooms. Editorials and opinion pieces have appeared by the dozens, many of them surmising that, in the interest of fairness and open-mindedness, perhaps a discussion of ID does belong in the schools. To some people, banning ID from the biology classroom smacks of censorship.

Biologists have been quick to respond, issuing incisive rebuttals to the various claims about the scientific integrity of ID, but these denunciations create the impression that an elitist scientific establishment is smothering an underdog, and a virtuous and plausible one at that—a theory quite literally “on the side of the angels.”

Could so many good people have been taken in by a hoax? Wouldn't that be impossible? No. Here's how one of the most ingenious hoaxes in the history of science has been perpetrated.

First, imagine how easy it would be for a determined band of naysayers to shake the world's confidence in quantum physics (“How weird it is!”) or Einsteinian relativity. In spite of nearly a century of instruction and popularization

by physicists, few people ever really get their heads around the concepts involved. Most people eventually cobble together a justification for accepting the assurances of the experts: “Well, they pretty much agree with one another, and they claim that it is their understanding of these strange topics that allows them to harness atomic energy and make transistors and lasers, which certainly do work . . .”

Fortunately for physicists, there is no powerful motivation for such a band of mischief-makers to form. Physicists don't have to spend much time persuading people that quantum physics and Einsteinian relativity have been established beyond all reasonable doubt.

With evolution, however, it's different. The fundamental scientific idea of evolution by natural selection is not just mind-boggling; natural selection, by executing God's traditional task of designing and creating all creatures great and small, also seems to deny one of the best reasons we have for believing in God's existence. So there's plenty of motivation for resisting the assurances of the biologists. Nobody is immune to wishful thinking. Over the years, we've developed and tested the scientific methods needed to protect ourselves from our own credulity, but we've also found ingenious ways to fool ourselves and others. Some of the methods used to exploit these urges are easy to analyze; others take a little more unpacking.

A creationist pamphlet sent to me some years ago had an amusing page in it, purporting to be part of a simple 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:

Take that, you Darwinians! The presumed embarrassment of the test-taker when faced with this task perfectly expresses the incredulity many people feel when they confront Darwin's great idea. It seems obvious, doesn't it, that there couldn't be any designs without designers, any such creations without a creator. Well, yes, until you look at what contemporary biology has demonstrated beyond all reasonable doubt: that natural selection—the process in which reproducing entities must compete for finite resources and thereby engage in a tournament of blind trial and error, from which improvements automatically emerge—has the power to generate breathtakingly ingenious designs.

Take the development of the eye, which has been one of the favorite challenges of the advocates of intelligent design. How on Earth, they ask, could that engineering marvel be produced by a series of small, unplanned steps? Only an intelligent designer could have created such a brilliant arrangement of shape-shifting lens, aperture-adjusting iris, and light-sensitive image surface of exquisite sensitivity, all housed in a sphere that can shift its aim in a hundredth of a second and send megabytes of information to the visual cortex every second for years on end.

But as we learn more and more about the history of the genes involved and how they work—all the way back to their predecessor genes in the sightless bacteria from which multicelled animals evolved more than half a billion years

ago—we can begin to tell the story of how photosensitive spots gradually turned into light-sensitive craters that could detect the rough direction from which light came and then gradually acquired their lenses, improving their information-gathering capacities all the while.

We can't yet say what all the details of this process were, but real eyes representative of all the intermediate stages can be found, dotted around the animal kingdom, and we have detailed computer models to demonstrate that the creative process works just as the theory says. All it takes is a rare accident giving one lucky animal a mutation that improves its vision over that of its siblings; if this improvement helps it to have more offspring than its rivals, this gives evolution an opportunity to raise the bar and ratchet up the design of the eye by one mindless step. And since these lucky improvements accumulate—this was Darwin's insight—eyes can automatically get better and better and better, without any intelligent designer.

Brilliant as the design of the eye is, it betrays its origin with a telltale flaw: The retina is inside out. The nerve fibers that carry the signals from the eye's rods and cones (which sense light and color) lie on top of them and have to plunge through a large hole in the retina to get to the brain, creating a blind spot. No intelligent designer would put such a clumsy arrangement into a cancorder, and this is just one of hundreds of accidents frozen in evolutionary history that confirm the mindlessness of the process.

If you still find Test Two compelling, a sort of cognitive illusion that you can feel even as you discount it, you are like just about everybody else in the world; the idea that natural selection has the power to generate such sophisticated designs is deeply counterintuitive. Francis Crick, one of the discoverers of the structure of DNA, once jokingly credited his colleague Leslie Orgel with "Orgel's Second

Rule": Evolution is cleverer than you are. Even the most experienced evolutionary biologists are often startled by the power of natural selection to "discover" an "ingenious" solution to a design problem posed by nature.

When evolutionists like Crick marvel at the cleverness of the process of natural selection, they are not acknowledging intelligent design! The designs found in nature are nothing short of brilliant, but the process of design that generates them is utterly lacking in intelligence of its own. This ambiguity between process and product is built right into the word "design," and many evolutionists choose to say that what Darwin proved was that there is no design in nature—because he showed that there is no foresighted, intelligent designer. Perhaps this is the way we ought to use the word—to refer to the process, not the product—but perhaps not, and confusion over this has led to a lot of mischief. It permits the ID ideologues to exploit the ambiguity by inviting everybody to see the quite obvious evidence of design (in the product sense) and then encouraging them to conclude that this is evidence of a design *process* that is intelligent.

Who falls for this? Many people do. A particularly clear instance of the fallacy appears in Cardinal Schönborn's essay:

The Catholic Church, while leaving to science many details about the history of life on earth, proclaims that by the light of reason the human intellect can readily and clearly discern purpose and design in the natural world, including the world of living things.

This is true in the product sense ("Look at all the brilliant designs in nature!") and false in the process sense. The

Cardinal's conclusion is that the presence of a finished product—a fully evolved eye, for instance—is evidence of an intelligent-design process.¹ This is of course a tempting conclusion, but it is just what evolutionary biology has shown to be mistaken. Yes, eyes are for seeing, but these and all the other functional organs in the natural world can be generated by processes that are themselves without purpose and without intelligence. This is hard to understand, but so is the idea that colored objects in the world are composed of atoms that are not themselves colored, and that heat is not made of tiny hot things. Sometimes the truth is far from obvious and hard to keep in focus.

The campaigners for intelligent design have become adept at feeding off the difficulty of this idea, by starting with a straightforward counterclaim and then retreating into the fog of technical confusion when their counterclaims are refuted. For instance, the philosopher William Dembski, one of the two most prominent ideologues of the ID movement, has attempted to argue that a particular sort of design product does require an intelligent designer, and that the designs found in nature include such products, but his various expressions of the argument to date, which depend on some rather abstruse mathematical formula-

¹ Although Cardinal Schönborn stated that his view was the "official stance" of the Roman Catholic Church, a few days later the director of the Vatican Observatory, Father George Coyne, SJ, contradicted the Cardinal in "God's Chance Creation," an essay published in the British Catholic periodical *The Tablet* (August 6). Coyne, an astronomer from Arizona, argued that a good Catholic can hold the belief that life "evolved through a process of random genetic mutations and natural selection." Since then, some Catholics have branded Coyne a heretic, while others have defended him. The Vatican has not yet clarified the situation.

tions, have been shown to be technically flawed.² Few, if any, theoreticians give his project any hope of success, since the flaws they have uncovered are central to his thesis.

Of course the experts might be mistaken; once in a blue moon, a renegade comes along and overthrows a portion of what had been thought to be established science. How can nonscientists assess their own judgment in this case? Not by trusting wishful thinking. If you think you can *just see* that Dembski must be onto something even though you can't follow the mathematics, you are falling right into the trap. (Can't you *just see* that Einstein has to be wrong about time? Your hunches here aren't to be trusted; this is where the discipline of careful scientific argument and experiment must come into play.) Perhaps, then, you should wait with bated breath on the sidelines while the experts duke it out in the scientific arena. This would be fine, except that Dembski has left the playing field and is appealing directly to the spectators, instead of contending with the scientists on their own terms.

In his trade books, magazine articles, and popular lectures, Dembski makes it appear that there is scientific controversy—but there isn't, as we can see by comparing his path with others. Genuine scientific controversies about evolution abound. In just about every subfield, there are challenges to various relatively well-established hypothe-

² See, for instance, B. Fitelson, C. Stephens, and E. Sober, "How not to detect design," *Philosophy of Science* (1999) 66: 472-88; Daniel Wolpert, "William Dembski's treatment of the No Free Lunch theorems is written in jello," *Mathematical Reviews*, available at <http://www.talkreason.org/articles/jello.cfm>, and Thomas D. Schneider, "Rebuttal to William A. Dembski's posting and to his book *No Free Lunch*," at <http://www.lecb.ncifcrf.gov/~toms/paper/ev/dembski/rebuttal.html>.

ses. The legitimate way to stir up such a storm is to come up with an alternative hypothesis 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 independent theories at the cost of some element of the currently accepted view. To date, neither Dembski nor any other proponent of intelligent design has produced anything like that: no experiments with results that challenge any mainstream-biological understanding; no observations from the fossil record or genomics or biogeography or comparative anatomy that undermine standard evolutionary thinking. Instead, he and his cohorts use a ploy that works like this. First you misuse or misdescribe some scientist's work, provoking an angry rebuttal. Then, instead of dealing forthrightly with the charges leveled, you cite the rebuttal as evidence that there is a "controversy" to teach.

Note that the trick is content-free. You can use it on any topic. "Smith's work in geology supports my argument that the earth is flat," you say, misrepresenting Smith's work. When Smith responds with an angry denunciation of your misuse of her work, you pounce: "See what a controversy we have here? Professor Smith and I are locked in a titanic scientific debate. We should teach the controversy in the classrooms!" And here is the delicious part: You can often exploit the very technicality of the issues to your own advantage, counting on most of us to miss the point amid all the difficult details. In an essay on his Web site titled "Dealing with the Backlash to Intelligent Design," Dembski provides a candid description of his own methods, revealing in the fact that he provoked Thomas Schneider, a biologist at the National Cancer Institute, into a response that Dembski characterizes as "some hair-splitting that

could only look ridiculous to outsider observers." Clever! What looks to scientists—and is—a knockout objection by Dr. Schneider is portrayed to almost everyone else as ridiculous hairsplitting.

The other leading proponent of intelligent design is Michael Behe, a biochemist at Lehigh University. He claims in his book *Darwin's Black Box* (1996) that the intricate microscopic mechanisms that even simple bacteria need to stay alive and earn their living exhibit "irreducible complexity": "They depend for their functioning on having all their parts present at once, and hence could not have evolved gradually. Finding an example of such irreducible complexity has been the quest of skeptics about evolution ever since Darwin's day, and so far every case—the eye (what good is 5 percent of an eye?), the wing (could it have evolved in one fell swoop, and wouldn't it have been a hindrance until it got big enough to support lift-off?), and all the others that have been promoted—has been shown to be evolvable after all, by one roundabout route or another, not irreducibly complex. Remember Leslie Orgel's Second Rule and don't make the mistake of underestimating the cleverness of evolution.

Behe's candidates are different only in being so small, and although he thinks they are irreducibly complex, not only has he not shown any of them to be irreducibly complex (and when pressed, he admits as much) but biologists have already demonstrated the evolutionary paths that almost certainly account for his cases. While evolutionists still don't know all the steps (and hence in principle could someday be proved wrong), the task of arguing credibly that these phenomena are irreducibly complex has become much more demanding in the face of this recent work, and Behe, tellingly, has not attempted to recast his cases in its light.

In fact, no intelligent-design hypothesis has even been ventured as a rival explanation of any biological phenomenon. This might seem surprising to people who think that intelligent design competes directly with the hypothesis of non-intelligent design by natural selection. But saying, as intelligent-design proponents do, "You haven't explained everything yet" is not a competing hypothesis. Evolutionary biology certainly hasn't explained everything that perplexes biologists, but intelligent design hasn't yet tried to explain anything at all.

To formulate a competing hypothesis, you have to get down in the trenches and offer details that have testable implications. So far, intelligent-design proponents have conveniently sidestepped 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 6 million years ago, intelligent genetic engineers from another galaxy visited Earth and decided it would be a more interesting planet if there was a language-using, religion-forming species on it, so they sequestered some primates 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 explain how and why human beings differ from their nearest relatives, and it would disconfirm the competing evolutionary hypotheses. We'd still have the problem of how these intelligent genetic engineers came to exist on their home planet, but we can safely ignore that complication

for the time being, since there is not the slightest shred of evidence in favor of their existence.

But here is something the ID community is reluctant to discuss: No other intelligent-design hypothesis has anything more going for it than the one above. In fact, that far-fetched hypothesis has the advantage of being testable in principle: We could compare the human and chimpanzee genomes and look for unmistakable signs of tampering by those genetic engineers from another galaxy. 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 coup for the intelligent-design gang, but if they are looking at all, they haven't come up with anything to report. Ironically, Dembski's "design inference" argument is supposed to set up a surefire test for finding just such telltale signs of intelligent tinkering in the causal ancestry of phenomena, but instead of trying to demonstrate his test in action, Dembski settles for the observation, in his Web essay "In Defense of Intelligent Design," that the ID perspective "encourages biologists to investigate whether systems that first appear functionless might in fact have a function"—as if any evolutionist would disagree with that.

Am I saying, then, that Dembski and Behe and the other ID ideologues are deliberate hoaxers who know full well that their "theories" are bunkum? No. I have no doubt that Dembski and Behe fervently believe that they have seen the truth. The history of science includes many cases of deeply committed researchers who have been taken in by their own wishful thinking and are as much victims as perpetrators of the illusions they seek to spread. In some of these famous cases, the researchers in question made up data or faked experiments when their careful experiments stubbornly persisted in yielding the "wrong" results. Or

they suppressed data that contradicted their pet hypotheses. Dembski and Behe haven't done this; they don't have any experiments or observations in the first place. Others have abandoned the attempt to achieve their goals within the scientific enterprise and tried instead to win the argument in the court of public opinion by misrepresenting their opponents' claims or trying to discredit them, and this is the course that both Dembski and Behe have followed.

Science is an enormously prestigious and influential institution, for good reason. The discipline of submitting your claims to the judgment of peer review, where you have to respond to your critics or withdraw or revise your assertions, is the chief antidote to wishful thinking, and when Dembski and Behe forsake science in favor of public-relations campaigns, you can conclude that they have conceded that they just don't have the goods. They would love to have scientific validation of their hypotheses, but they have given up trying to get it and are now trying to undermine the prestige of science instead. And while they are no doubt sincere in their belief that intelligent design is a legitimate alternative to evolution by natural selection, they are simply being dishonest when they deliberately misrepresent the issues, again and again and again. One example from each will make their methods clear.

Dembski quoted the paleontologist Peter Ward as saying, "If ever there was evidence suggesting Divine Creation, surely the Precambrian and Cambrian transition, known from numerous localities across the face of the earth, is it."³ The fact that Ward used this passage as a dra-

³ This example is drawn from Jason Rosenhouse, "Why Scientists Get So Angry When Dealing with ID Proponents," *Skeptical Inquirer*, November/December, 2005, pp. 42-5. In a similar incident, Dembski misrepresented my own work, was caught, semi-apologized in

matic introduction to an account of the evolutionary biology that explains these transitions just fine was conveniently left out of Dembski's discussion, and when this was pointed out to him, he defended his use of Ward, saying that he was not quoting Ward out of context since he had mentioned in an aside that Ward was not a supporter of intelligent design. In other words, *Gotcha!* Scientists debate their views with tremendous vigor and rhetorical panache, but cute tricks like this have no place in the arena of genuine science, and they abound in Dembski's work.

Behe wrote in his book: "Lynn Margulis is highly respected for her widely accepted theory that mitochondria, the energy source of plant and animal cells, were once independent bacterial cells." That is indeed true, and he mentioned Margulis favorably so he could quote one of her famous over-the-top anti-establishment outbursts (some-what out of context): "Neo-Darwinism," she said in a 1990 piece in *American Zoologist*, should be seen as "a minor twentieth-century religious sect within the sprawling religious persuasion of Anglo-Saxon biology." But Behe never even discussed the implications of the work that made her famous, which was precisely to show how the astonishing complexity of the eukaryotic cells that make up the bodies of all multicellular organisms could have evolved gradually. In other words, she is famous for actually *reducing* what otherwise would look for all the world to evolution skeptics like "irreducible complexity." When Behe turned to her more recent work, which directly challenges two of his pet

a piece on his Web site, and then went right back to making the same misrepresentation. See "Disbelieving Darwin Discussed" at Metaviews 030. 2000.03.23 (<http://www.antievolution.org/people/mgrey/IDC/21990.html>).

examples of irreducibly complex subsystems, bacterial flagella and eukaryotic cilia, he dismissed it, and that of Thomas Cavalier-Smith and Eors Szathmary, as mere "word-pictures." "What is fatal, however," he wrote, "is that neither side has filled in any mechanistic details for its model." This was not strictly true back in 1996, when Behe wrote this, and in the interim many of the mechanistic details have been filled in, but you'll still find Behe (and Dembski) quoting Margulis as an eminent biologist on the side of ID, and you won't find Behe backing off his claim that the bacterial flagellum is irreducibly complex. (A good recent account is Kenneth R. Miller, "The Flagellum Unspun: The Collapse of 'Irreducible Complexity,'" in *Debating Design: from Darwin to DNA*, ed. Michael Ruse and William Dembski, Cambridge University Press, 2004. Dembski's and Behe's replies in the same volume offer further examples of the sly twisting of words, but it isn't clear whom they are trying to impress: Certainly scientists reading their essays will see through them, and nonscientists probably won't read the book.)

When ID proponents urge that we "teach the controversy," it's worth pointing out that there are plenty of substantive scientific controversies in biology that are not yet in the textbooks or the classrooms. The scientific participants in these arguments vie for acceptance among the relevant expert communities in peer-reviewed journals, and the writers and editors of textbooks grapple with judgments about which findings have risen to the level of acceptance—not yet truth—to make them worth serious consideration by undergraduates and high school students.

So get in line, IDers. Get in line behind the hypothesis that life started on Mars and was blown here by a cosmic impact. Get in line behind the aquatic-ape hypothesis, the

gestural-origin-of-language hypothesis and the theory that singing came before language, to mention just a few of the enticing hypotheses that are actively defended but still insufficiently supported by hard facts.

The Discovery Institute, the conservative organization that has worked so ingeniously to put intelligent design on the map, complains that its members face hostility from the established scientific journals. But establishment hostility is not the real hurdle to the intelligent-design movement. Consider why: Literally thousands of peer-reviewed scientific articles are published every year elaborating and extending the basic theory of evolution, and most of the authors of these articles never become famous, in spite of their proven expertise. Surely a few of them would happily jump ship and risk ridicule from the establishment for the chance to become world famous as the Scientist Who Refuted Darwin. If intelligent design were a scientific idea whose time had come, young scientists would be dashing around their labs, vying to win the Nobel Prizes that are certainly in store for anybody who can overturn any significant proposition of contemporary evolutionary biology. Remember cold fusion? The establishment was virulently hostile to that hypothesis, but scientists around the world rushed to their labs in the effort to explore the idea, in hopes of sharing in the glory if it turned out to be true.

Instead of spending more than \$1 million a year on publishing books and articles for nonscientists and on other public-relations efforts, the Discovery Institute should finance its own peer-reviewed electronic journal. This way, the organization could live up to its self-professed image as the doughty defenders of brave iconoclasts bucking the establishment. For now, though, the theory they are promoting is exactly what the libertarian author George

Gilder, a cofounder and longtime affiliate of the Discovery Institute, has said it is: "Intelligent design itself does not have any content."

Since there is no content, there is no "controversy" to teach in biology class. But here is a good topic for a high school course on current events and politics: Is intelligent design a hoax? And if so, how was it perpetrated? There are plenty of fascinating further details behind the sketch given here.

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