Expert Witness Report:
The Scientific Status of Intelligent Design

By William A. Dembski

March 29, 2005

1 Preliminary Considerations

Laypersons new to the debate over intelligent design encounter many conflicting claims about whether it is science. A *Washington Post* front page story (March 14, 2005) asserts that intelligent design is "not science [but] politics."[1] In that same story, Barry Lynn, the director of Americans United for Separation of Church and State, claims that intelligent design is merely "a veneer over a certain theological message," thus identifying intelligent design not with science but with religion. In a related vein, University of Copenhagen philosopher Jakob Wolf argues that intelligent design is not science but philosophy (albeit a philosophy useful for understanding science).[2] And finally, proponents of intelligent design argue that it is indeed science.[3] Who is right?

In determining how to answer this question, three points need to be kept in mind:

(1) Science is not decided by majority vote. Can the majority of scientists be wrong about scientific matters? Yes they can. Historian and philosopher of science Thomas Kuhn, in his *Structure of Scientific Revolutions*, documented numerous reversals in science

where views once confidently held by the scientific community ended up being discarded and replaced.[4] For instance, until the theory of plate tectonics was proposed, geologists used to believe that the continents were immovable.[5] Intelligent design is at present a minority position within science. But it is a position held by reputable scientists.[6]

(2) Just because an idea has religious, philosophical, or political implications does not make it unscientific. According to the late evolutionist Stephen Jay Gould, "Biology took away our status as paragons created in the image of God…. Before Darwin, we thought that a benevolent God had created us."[7] Oxford University biologist Richard Dawkins claims, "Darwin made it possible to be an intellectually fulfilled atheist."[8] In his book *A Darwinian Left: Politics, Evolution, and Cooperation*, Princeton bioethicist Peter Singer remarks that we must "face the fact that we are evolved animals and that we bear the evidence of our inheritance, not only in our anatomy and our DNA, but in our behavior too."[9] Gould, Dawkins, and Singer are respectively drawing religious, philosophical, and political implications from evolutionary theory. Does that make evolutionary theory unscientific? No. By the same token, intelligent design's implications do not render it unscientific. I myself have explored intelligent design's theological implications, but I have kept such theological reflections separate from my scientific research on intelligent design.[10]

(3) To call some area of inquiry "not science" or "unscientific" or to label it "religion" or "myth" is a common maneuver for discrediting an idea. Physicist David Lindley, for instance, to discredit cosmological theories that outstrip experimental data or verification, calls such theories "myths."[11] Writer and medical doctor Michael Crichton, in his Caltech Michelin Lecture, criticizes the Search for Extraterrestrial Intelligence (SETI) as follows: "SETI is not science. SETI is unquestionably a religion. Faith is defined as the firm belief in something for which there is no proof…. The belief that there are other life forms in the universe is a matter of faith. There is not a single shred of evidence for any other life forms, and in forty years of searching, none has been discovered. There is absolutely no evidentiary reason to maintain this belief. SETI is a religion."[12] Crichton's criticism, however, seems extreme. In the past, NASA has funded SETI research.[13] And even if the actual search for alien intelligences has thus far proved unsuccessful, SETI's methods of search and the possibility of these methods proving successful validate SETI as a legitimate scientific enterprise.[14]

2 What Is Intelligent Design?

Intelligent design studies patterns in nature that are best explained as the result of intelligence. It identifies those features of objects that reliably signal the action of an intelligent cause. To see what is at stake, consider Mount Rushmore. The evidence for Mount Rushmore's design is direct—eyewitnesses saw the sculptor Gutzon Borglum spend the better part of his life designing and building this structure. But what if there were no direct evidence for Mount Rushmore's design? Suppose humans went extinct and aliens, visiting the earth, discovered Mount Rushmore in substantially the same condition as now.

In that case, what about this rock formation would provide convincing circumstantial evidence that it was due to a designing intelligence and not merely to wind and erosion? Designed objects like Mount Rushmore exhibit characteristic features or patterns that point to an intelligence. Such features or patterns constitute signs of intelligence. Proponents of intelligent design, known as *design theorists*, purport to study such signs formally, rigorously, and scientifically. In particular, they claim that a type of information, known as *specified complexity*, is a key sign of intelligence. An exact formulation of specified complexity first appeared in *The Design Inference* and was then further developed in *No Free Lunch*.[15]

What is specified complexity? Recall the novel *Contact* by Carl Sagan.[16] In that novel, radio astronomers discover a long sequence of prime numbers from outer space. Because the sequence is long, it is *complex*. Moreover, because the sequence is mathematically significant, it can be characterized independently of the physical processes that bring it about. As a consequence, it is also *specified*. Thus, when the radio astronomers in *Contact* observe specified complexity in this sequence of numbers, they have convincing evidence of extraterrestrial intelligence. Granted, real-life SETI researchers have thus far failed to detect designed signals from outer space. The point to note, however, is that Sagan based the SETI researchers' methods of design detection on actual scientific practice.

Many special sciences already employ specified complexity as a sign of intelligence—notably forensic science, cryptography, random number generation, archeology, and the search for extraterrestrial intelligence (SETI).[17] Design theorists take these methods and apply them to naturally occurring systems.[18] When they do, these same methods for identifying intelligence indicate that the delicate balance of cosmological constants (known as cosmological fine-tuning) and the machine-like qualities of certain tightly integrated biochemical systems (known as irreducibly complex molecular machines) are the result of intelligence and highly unlikely to have come about by purely material forces (like the Darwinian mechanism of natural selection and random variation).[19] Accordingly, design in cosmology and biology is scientifically detectable, and intelligent design constitutes a legitimate scientific theory.

3 The Charge of Creationism

Despite intelligent design's clear linkage, both methodologically and in content, with existing sciences that sift the effects of intelligence from undirected natural forces, critics of intelligent design often label it a form of creationism. Not only is this label misleading, but in academic and scientific circles it has become a maneuver to censor ideas before they can be fairly discussed.

To see that the creationist label is misleading, consider that one can advocate intelligent design without advocating creationism. Creationism typically denotes a literal interpretation of the first chapters of Genesis as well as an attempt to harmonize science with this interpretation.[20] It can also denote the view common to theists that a personal transcendent God created the world (a view taught by Judaism, Christianity, and Islam).[21] In either case, however, creationism presupposes that the world came into being through a creative power separate from the world.

Intelligent design, by contrast, places no such requirement on any designing intelligence responsible for cosmological fine-tuning or biological complexity. It simply argues that certain finite material objects exhibit patterns that convincingly point to an intelligent cause. But the nature of that cause—whether it is one or many, whether it is a part of or separate from the world, and even whether it is good or evil—simply do not fall within intelligent design's purview.

Thus Aristotle, who held to an eternal uncreated world and to a purposiveness built into the world, would today hold to intelligent design but not to creationism.[22] The same is true for Antony Flew, who until recently was the English speaking world's most prominent atheist. He now repudiates atheism because he sees intelligent design as necessary to explain the origin of life.[23] Yet, in embracing an intelligence behind biological complexity, he does not hold to creationism.[24]

Despite its constant repetition, the charge that intelligent design is a form of creationism is false. Robert Pennock and Barbara Forrest, for instance, repeat this charge in virtually all of their writings that criticize intelligent design.[25] Yet, as trained philosophers, they know very well that intelligent design is consistent with philosophical positions that hold to no doctrine of creation. Why, then, do they keep insisting that intelligent design is creationism? The reason is that creationism has been discredited in the courts and among the scientific and academic elite. Thus, if the label can be made to stick, intelligent design will be defeated without the need to investigate its actual claims.

To see that "creationism" is a question-begging label meant to stop the flow of inquiry before it can get started, consider that one of the most prominent critics of intelligent design has himself been called a creationist. That critic is Kenneth Miller. In his book *Finding Darwin's God*, Miller is critical of intelligent design in biology. Nonetheless, in that book he argues for an intelligence or purposiveness that underlies the laws of physics (laws that are necessary for the universe to be life-permitting).[26] Miller's reward for proposing intelligent design at the level of physics and cosmology is to be called a creationist by University of California professor Frederick Crews. In reviewing Miller's book, Crews writes:

> When Miller then tries to drag God and Darwin to the bargaining table [by finding design or purpose underlying the laws of physics], his sense of proportion and probability abandons him, and he himself proves to be just another "God of the gaps" creationist. That is, he joins Phillip Johnson, William Dembski, and company in seizing upon the not-yet-explained as if it must be a locus of intentional action by the Christian deity.[27]

Despite criticisms like this by Crews and others, mainstream physics is now quite comfortable with design in cosmology. Take the following remark by Arno Penzias, Nobel laureate and codiscoverer of the cosmic background radiation: "Astronomy leads us to a unique event, a universe which was created out of nothing, one with the very delicate balance needed to provide exactly the conditions required to permit life, and one which has an underlying (one might say 'supernatural') plan."[28] Or consider the following insight by well-known astrophysicist and science writer Paul Davies: "There is for me powerful evidence that there is something going on behind it all.... It seems as though somebody has fine-tuned nature's numbers to make the

Universe.... The impression of design is overwhelming."[29] Elsewhere Davies adds: "The laws [of physics] ... seem to be the product of exceedingly ingenious design…. The universe must have a purpose."[30] Remarks like this by prominent physicists and cosmologists are now widespread.[31]

Why should inferring design from the evidence of cosmology be scientifically respectable, but inferring design from the evidence of biology be scientifically disreputable, issuing in the charge of creationism? Clearly, a double standard is at work here. Design theorists argue that the evidence of biology confirms a design inference. But even if that confirmation were eventually overturned by new evidence, such a failure would constitute a failure of intelligent design as a scientific theory and not a failure of intelligent design to qualify as a scientific theory, much less to deserve the label creationism.

4 Problems with Evolutionary Theory

Most scientific theories are imperfect in the sense that what they claim about the natural world and what the natural world in fact displays do not match up perfectly. Newton's theory, for instance, predicts certain types of planetary orbits. Nevertheless, the perihelion of Mercury violated this prediction—not by much, but enough to call Newton's theory into question. Ultimately, Einstein resolved this anomaly by replacing Newton's theory with his own theory of General Relativity.

The problem of theories not matching up with facts has been known since the time of the ancient Greeks, who described this problem in terms of "saving the phenomena." In other words, the task of science (known back then as "natural philosophy") was to match up scientific theories with the phenomena (or appearances) of nature. The physicist Pierre Duhem even wrote a book on this topic.[32] He also wrote another book to describe what scientists do when their theories do not match up with the facts.[33] In that case, according to Duhem, they have two options. One is simply to abandon the theory. The other, and by far the more common option, is to add auxiliary hypotheses to try to shore up the theory. Simply put, the second option is to put patches over those aspects of the theory that don't match up with the facts.

Which option is preferable? This is a judgment call. Is the mismatch so egregious and the patch so artificial that the theory cannot be reasonably salvaged? In that case, scientists prefer option one. Has the theory proven itself useful in the past and is the mismatch so minor and the patch so unobtrusive that the theory remains largely intact. In that case, scientists prefer option two. The problem is, as Thomas Kuhn showed in his vastly influential *The Structure of Scientific Revolutions*, that there is no easy way to draw the line between these two options.[34]

Scientists remain divided over what to do about the mismatches between contemporary evolutionary theory and the facts of biology. Nevertheless, the mismatches are there in plain view, as are the patches put on evolutionary theory to mitigate the mismatches. The best known mismatch is the overwhelming failure of the fossil record to match up with Darwin's expectation that living forms fall within one gigantic, gradually branching tree of life.[35] In fact, the fossil record is full of gaps that show no sign of being bridged.

To see this, one does not need to look to the work of design theorists. Evolutionists have recognized the problem right along. For instance, Stephen Jay Gould, who until his death was the most prominent evolutionary theorist this side of the Atlantic, noted: "The extreme rarity of transitional forms in the fossil record persists as the trade secret of paleontology. The evolutionary trees that adorn our textbooks have data only at the tips and nodes of their branches; the rest is inference, however reasonable, not the evidence of fossils."[36]

Gould's solution to this problem was to propose his idea of punctuated equilibrium, in which evolution takes place in isolated populations that are unlikely to be fossilized, with the result that the fossil record exhibits a pattern of sudden change followed by stasis.[37] But this patch has its own problems. For one, it does not address the mechanism of evolutionary change. Also, it is largely untestable because all the interesting evolution happens where it is inaccessible to scientific observation.

There are many other mismatches between contemporary evolutionary theory and the facts of biology, which I'll leave to my fellow expert witnesses who are biologists to address. Nonetheless, even without specialized biological knowledge, it is possible for laypersons to see that evolutionary theory, as taught in high school and college biology textbooks, is desperately in need of fuller treatment and a more adequate discussion of alternatives.

Right now, the basal biology textbooks from which students receive their first exposure to evolutionary theory explain the origination of biological forms in terms of the neo-Darwinian mechanism of natural selection and random genetic errors. This mechanism, however, is now increasingly seen as inadequate to explain the diversity of biological forms, and not just by design theorists.

For instance, Lynn Margulis, a biologist who is a member of the National Academy of Sciences, criticizes the neo-Darwinian theory as follows: "Like a sugary snack that temporarily satisfies our appetite but deprives us of more nutritious foods, neo-Darwinism sates intellectual curiosity with abstractions bereft of actual details—whether metabolic, biochemical, ecological, or of natural history."[38] Robert Laughlin, a Nobel laureate physicist concerned with the properties of matter that make life possible, offers even stronger criticism:

> Much of present-day biological knowledge is ideological. A key symptom of ideological thinking is the explanation that has no implications and cannot be tested. I call such logical dead ends antitheories because they have exactly the opposite effect of real theories: they stop thinking rather than stimulate it. Evolution by natural selection, for instance, which Charles Darwin originally conceived as a great theory, has lately come to function more as an antitheory, called upon to cover up embarrassing experimental shortcomings and legitimize findings that are at best questionable and at worst not even wrong. Your protein defies the laws of mass action? Evolution did it! Your complicated mess of chemical reactions turns into a chicken? Evolution! The human brain works on logical principles no computer can emulate? Evolution is the cause![39]

Note that neither Margulis nor Laughlin are advocates of intelligent design.

These criticisms cut to the very heart of contemporary evolutionary theory and are directly pertinent to how evolution should be taught. Right now, basal biology textbooks reflect a "consensus trance," giving the illusion that there is unanimity among biologists over how evolution occurred when in fact there is no such unanimity.[40] This consensus trance needs to be broken, with alternatives to neo-Darwinism welcomed into high school and college biology curriculums. One such alternative, though by no means the only one, is intelligent design.

5 The Controversy Surrounding Intelligent Design

The controversy surrounding intelligent design occurs at many levels, but it is ultimately a scientific controversy within the scientific community. To be sure, there are educational, political, religious, and philosophical aspects to this controversy, but if there were no scientific controversy here, these other aspects would never have gotten off the ground.

There are a number of ways to see that this truly is a scientific controversy. One indicator is that design theorists are increasingly publishing research supporting intelligent design in the peer-reviewed mainstream scientific literature, especially in the biological literature (see Appendix 3). A related indicator is that their work is increasingly being subjected to criticism within the mainstream scientific literature.[41] And, most importantly, design theorists have a genuine program of scientific research that they are now pursuing with increasing vigor (see Appendix 4).

Despite this, critics of intelligent design argue that intelligent design is not a scientific theory. They do so, however, not by confronting the evidence and logic by which design theorists argue for their conclusions. Rather, they do so by definitional fiat. Essentially, they engage in conceptual gerrymandering, carefully defining science so that conventional evolutionary theory falls within science and intelligent design falls without. This device typically goes by the name of *methodological naturalism* or *methodological materialism*. Eugenie Scott, director of the evolution watchdog group the National Center for Science Education (NCSE), describes methodological materialism as follows:

> Most scientists today require that science be carried out according to the rule of *methodological materialism*: to explain the natural world scientifically, scientists must restrict themselves only to material causes (to matter, energy, and their interaction). There is a practical reason for this restriction: it works. By continuing to seek natural explanations for how the world works, we have been able to find them. If supernatural explanations are allowed, they will discourage—or at least delay—the discovery of natural explanations, and we will understand less about the universe.[42]

There are two problems with this statement. First, if methodological materialism is merely a working hypothesis that scientists employ because "it works," then scientists are free to discard it when it no longer works. Design theorists contend that for adequately explaining biological complexity, methodological materialism fails and rightly needs to be discarded. Second, and more significantly, in defining science as the search for natural explanations, Scott presupposes precisely what must be demonstrated. If, by natural explanations, Scott simply means

explanations that explain what is happening in nature, there would be no problem, and intelligent design would constitute a perfectly good natural explanation of biological complexity. But that is not what she means.

By natural explanations, Scott means explanations that resort only to material causes—as she puts it, to "matter, energy, and their interaction." But that is precisely the point at issue, namely, whether nature operates exclusively by such causes. If nature contains a richer set of causes than purely material causes, then intelligent design is a live possibility and methodological materialism will misread physical reality. Note, also, that to contrast natural explanations with supernatural explanations further obscures this crucial point. Supernatural explanations typically denote explanations that invoke miracles and cannot be understood scientifically. But explanations that call upon intelligent causes require no miracles and give no evidence of being reducible to Scott's trio of "matter, energy, and their interaction." Indeed, design theorists argue that intelligent causation is perfectly natural provided that nature is understood aright.

To say that the intelligent design research program is at odds with the traditional neo-Darwinian theory of evolution is to offer a truism. Less obvious, perhaps, is that this controversy between competing theories is healthy for science, for it renders both intelligent design and neo-Darwinian theory scientifically testable. Unfortunately, the way things stand now, given the artificial exclusion of intelligent design from scientific discussion (as by Eugenie Scott's device of methodological materialism), neo-Darwinian theory has been rendered immune to scientific disconfirmation. In other words, it has become scientifically untestable.

Eshel Ben Jacob, the Maguy-Glass Chair in Physics of Complex Systems at Tel Aviv University in Israel, is troubled by this state of affairs. He writes, "Darwin, a free thinker who dared make far-reaching conclusions based on observations, would have been dismayed to see the petrified doctrine his brainchild has become. Must we admit that all organisms are nothing but watery Turing machines evolved merely by a sequence of accidents favored by nature? Or do we have the intellectual freedom to rethink this fundamental issue?"[43]

The study of biological origins is fundamentally incomplete so long as intelligent design is ruled out as a live option for scientific discussion. Larry Arnhart, who takes a Darwinian approach to ethics and is a critic of intelligent design,[44] nonetheless agrees. According to him, Darwinian evolutionary theory cannot be adequately taught without teaching intelligent design as its proper foil and counterpart.[45]

The integrity of current evolutionary theorizing depends on making room for intelligent design. Darwin himself would have agreed. In his *Origin of Species*, he wrote: "A fair result can be obtained only by fully stating and balancing the facts and arguments on both sides of each question."[46] When it comes to biological origins, intelligent design presents the facts and arguments for one side of this question. To pretend that there is no scientific controversy surrounding intelligent design is therefore itself unscientific.

6 The Scientific Usefulness of Intelligent Design

According to Nobel laureate William Lawrence Bragg, "The important thing in science is not so much to obtain new facts as to discover new ways of thinking about them."[47] Intelligent design is doing just that—discovering useful ways of thinking about and interpreting well-established facts of science that pertain to biological complexity and diversity.

Take the problem of junk DNA. According to the conventional neo-Darwinian theory of evolution, the genome of organisms is cobbled together over a long evolutionary history through a trial and error process of natural selection sifting the effects of random genetic errors. As a consequence, neo-Darwinism expects to find a lot of "junk" DNA, that is, DNA that serves no useful purpose but that is simply carried along for the ride because it is easier for cells to keep copying DNA that genetic errors render useless than to identify and eliminate such DNA from the genome.

The theory of intelligent design, on the other hand, in approaching organisms as designed systems, is less apt to dismiss seemingly useless DNA as junk. Instead, it encourages biologists to investigate whether systems that at first appear functionless might in fact have a function. And, as it is now turning out, seemingly useless "junk" DNA is increasingly being found to serve useful biological functions. For instance, James Shapiro and Richard Sternberg have recently provided a comprehensive overview of the functions of repetitive DNA—a classic type of "junk" DNA.[48] Similarly, Roy Britten has recently outlined the functions of mobile genetic elements—another class of sequences long thought to be simply parasitic junk.[49]

Looking for function in biological systems despite its apparent absence follows from what in Appendix 4 is called the Principle of Methodological Engineering. As is clear from the intelligent design research themes outlined in that appendix, the theory of intelligent design is capable of generating useful insights into biological systems—insights not forthcoming from a purely materialistic conception of evolution such as neo-Darwinism. At the same time, intelligent design is also asking tough questions of conventional evolutionary theory, forcing it to own up to its unsolved problems. David Raup, one of the world's leading paleontologists and a member of the National Academy of Sciences, though a skeptic of intelligent design, regards this as a healthy development. As he puts it:

> [If] some natural biological process, as yet undiscovered, yields the organisms we have without relying solely on conventional natural selection operating on random variation,… then Darwin et al. have found a mechanism that works in simple cases (which it certainly does!) but misses more important mechanisms of evolutionary change and adaptation. The search for the missing mechanisms can only be helped by people like you [i.e., design theorists] asking tough questions. Keep at it![50]

7 *Of Pandas and People*

I have a special interest in the supplemental biology textbook *Of Pandas and People*.[51] Since 1997, I have worked as the academic editor for the Foundation for Thought and Ethics, which publishes this book.[52] Moreover, since the summer of 2001, I have worked on producing the third edition of this book. Not only have I acted as the development editor of the third edition, but I have also become its principal author, rewriting substantial portions of the second edition as well as adding a great deal of new material, much of which I have written myself but some of which I have solicited from Michael Behe and Jonathan Wells (who, along with me, are now coauthors of the third edition, the original authors being Dean Kenyon and Percival Davis). The book has so drastically expanded in size and scope that the third edition is being renamed *The Design of Life: Discovering Signs of Intelligence in Biological Systems*. It is due to be published this year (2005).

Having worked so closely in revising, expanding, and updating the second edition of this book, I feel I know it better than anyone. It is clear that the book is now dated. Indeed, the first edition was published in 1989 and the second edition (published in 1993) involves only minor changes in relation to the first edition.[53] *Of Pandas and People* was and remains the only intelligent design textbook. In fact, it was the first place where the phrase "intelligent design" appeared in its present use. Since the second edition of this book, intelligent design has gone from a small and marginalized challenge confronting neo-Darwinian evolution to a comprehensive scientific research program for reconceptualizing biology (cf. Appendix 4).

Despite the book's age, it provides a valuable contribution to the high school biology curriculum. This is because both the criticisms it offers against neo-Darwinian theory and the evidences it provides in favor of intelligent design continue to stand—the book is accurate. To be sure, the discussion over intelligent design has progressed substantially since the book's publication back in the early 1990s. But precisely because the mainstream basal biology textbooks have for the past decades entirely ignored this discussion, the book's criticisms of neo-Darwinism and its evidences for intelligent design continue to advance the teaching of high school biology.

It also helps, as a pedagogical aid, that *Of Pandas and People* is age-appropriate. Although a few isolated places in the later excursion chapters may be challenging for some ninth and tenth graders, most of the book is readily accessible. Moreover, the long overview chapter at the beginning is user-friendly and ideally suited for all high school students. Bottom line: This book has something of scientific value for all high school biology students.

8 The Dover Area School District Statement

The Dover Area School District Statement makes five points that are directly relevant to what high school students in the Dover area will learn from taking high school biology:

(1) It indicates that with regard to biological origins, students will only be required to learn about Darwin's theory of evolution.

(2) It states that scientific theories are not facts and that there are problems ("gaps") with Darwinian theory.

(3) It states that intelligent design is an explanation of the origin of life.

(4) It informs students that *Of Pandas and People* is an intelligent design textbook and is available in the school library for their perusal.

(5) It leaves the discussion of the origin of life to individual students and their families.

Point (1) is legally unproblematic, though given what was said in sections 4, 5, and 6 of this report, a sound high school biology education should open up the class discussion beyond merely Darwin's theory of evolution. As for point (2), it is common knowledge that theories are not identical with facts. Moreover, Darwin's theory (even in its contemporary neo-Darwinian form) has serious problems (or "gaps") that are not being adequately addressed in high school biology curricula. This last concern was raised in section 4 of this report and has been thoroughly documented by Jonathan Wells.[54]

Point (3) is correct but inaptly stated. The theory of intelligent design certainly addresses the origin of life, but it is not limited to the origin of life—it also explains the subsequent diversification of life. Moreover, it provides a *scientific* explanation for the origin and diversification of life (as opposed to a religious or philosophical explanation). This is the main issue that critics of intelligent design dispute, namely, intelligent design's scientific status. Nonetheless, the case for the legitimacy of intelligent design as a scientific explanation and as an alternative to neo-Darwinian theory is overwhelming (see sections 2, 5, and 6 as well as Appendices 3 and 4 of this report). Point (3) is fine as far as it goes, but it does not go far enough.

Point (4) is straightforward. The key issue it raises is one of appropriateness: is it appropriate within a biology class to list, as a recommended text, one that argues for the design of biological systems? Clearly, the appropriateness will depend on intelligent design's legitimacy as a scientific theory, which passes off the appropriateness of (4) to the correctness of (3). And (3), as I have argued, is correct (though a more complete statement of (3) is to be preferred).

Finally we come to point (5). This point, ironically enough, is at once misconceived and unproblematic. It is misconceived because most basal biology textbooks do touch on the origin of life, recounting primitive earth simulation experiments that purport to show how the building blocks of life might plausibly have originated.[55] Because biological evolution presupposes the origin of life, a sound biology education cannot cordon off one from the other. At the same time, there is no well-developed theory of life's origin; rather, there are numerous proposals, none of which holds sway and all of which constitute at best wildly speculative scenarios.[56] This state of affairs is reflected in how little space basal biology textbooks typically devote to the origin of life (the focus tends to be much more on the subsequent diversification of life). Thus, leaving the discussion of life's origin to individual students and their families makes little if any difference to the high school biology curriculum.

9 Expert Witness Information

QUALIFICATIONS:
See my curriculum vitae in Appendix 1 as well as the announcement of my winning the Trotter Prize in Appendix 2. Past recipients of that prize have included Charles Townes and Francis Crick, both Nobel laureates. Townes received the Nobel Prize in physics and Crick in biology.

EXPERIENCE:
In the last four years, I have not been an expert witness in any legal proceeding. In that time, I have not testified at any trial, I have not been deposed, and I have not written any expert witness reports. I have, however, testified before the Texas State Board of Education (September 10, 2003, Austin, Texas) regarding basal biology textbook adoptions. In my testimony, I stressed the need to remove inaccuracies from these texts and for these texts to admit weaknesses in neo-Darwinian theory. My testimony before the Texas State Board of Education can be found in Appendix 5.

COMPENSATION:
$200.00 per hour.

Appendix 1: Curriculum Vitae of W. A. Dembski

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Education

Ph.D.	philosophy	University of Illinois at Chicago	1996
M.Div.	theology	Princeton Theological Seminary	1996
M.A.	philosophy	University of Illinois at Chicago	1993
Ph.D.	mathematics	University of Chicago	1988
S.M.	mathematics	University of Chicago	1985
M.S.	statistics	University of Illinois at Chicago	1983
B.A.	psychology	University of Illinois at Chicago	1981

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Dept. of Philosophy, University of Texas, Austin, Texas
Henry Schaefer III—Professor of Chemistry (hfs@arches.uga.edu)
Dept. of Chemistry, University of Georgia, Athens, Georgia

Fellowships/Awards

Texas A&M's Trotter Prize, shared with Stuart Kauffman, April 2005
Past recipients: Charles Townes and Francis Crick (2002)
Alan Guth and John Polkinghorne (2003)
Paul Davies and Robert Shapiro (2004)
Intelligent Design Network's Wedge of Truth Award, 2004
for promoting intelligent design (past recipients include Michael Behe)
Templeton Foundation Book Prize ($100,000)
for writing book on information theory, 2000–2001
Discovery Institute Fellowship
for research in intelligent design, 1996–1999
Notre Dame Postdoctoral Fellowship (Department of Philosophy)
for philosophy of religion, 1996–1997
University of Illinois at Chicago, Outstanding Dissertation Award in
Fine Arts and Humanities for *The Design Inference*; published
subsequently September 1998 with Cambridge University Press
Pascal Centre Research Fellowship
for studies in science and religion, 1992–1995
Northwestern University Postdoctoral Fellowship (Department of Philosophy)
for history and philosophy of science, 1992–1993
National Science Foundation Postdoctoral Fellowship
for mathematics, 1988–1991
McCormick Fellowship (University of Chicago)
for mathematics, 1984–1988
National Science Foundation Graduate Fellowship
for psychology and mathematics, 1982–1985
Nancy Hirshberg Memorial Prize for best undergraduate research paper
in psychology at the University of Illinois at Chicago, 1981.

Academic Experience

Associate Research Professor, Conceptual Foundations of Science, Baylor University research in intelligent design, 1999–present
Fellow, Discovery Institute, Center for the Renewal of Science and Culture research in complexity, information, and design, 1996–present
Adjunct Assistant Professor, University of Dallas, Department of Philosophy teaching introduction to philosophy, 1997–1999
Postdoctoral Fellow, University of Notre Dame, Department of Philosophy teaching philosophy of religion + research, 1996–1997
Independent Scholar, Pascal Centre, Hamilton, Ontario, Canada research in complexity, information, and design, 1993–1996
Postdoctoral Fellow, Northwestern University, Department of Philosophy teaching philosophy of science + research, 1992–1993
Research Associate, Princeton University, Department of Computer Science research in cryptography & complexity theory, 1990
Postdoctoral Visiting Fellow, University of Chicago, James Franck Institute research in chaos & probability, 1989
Postdoctoral Visiting Fellow, MIT, Department of Mathematics research in probability theory, 1988
Lecturer, University of Chicago, Department of Mathematics teaching undergraduate mathematics, 1987–1988

Professional Associations

Discovery Institute—senior fellow

Wilberforce Forum—senior fellow

International Society for Complexity, Information, and Design —executive director

Progress in Complexity, Information, and Design—general editor

Foundation for Thought and Ethics—academic editor

American Mathematical Society

Evangelical Philosophical Society

American Scientific Affiliation

Books

The Design of Life: Discovering Signs of Intelligence in Biological Systems (biology textbook coauthored with Michael Behe, Jonathan Wells, Percival Davis, and Dean Kenyon). Dallas.: Foundation for Thought and Ethics, forthcoming 2005.

The Design Revolution: Answering the Toughest Questions about Intelligent Design. Downer's Grove, Ill.: InterVarsity Press, 2004.

No Free Lunch: Why Specified Complexity Cannot Be Purchased without Intelligence. Lanham, Md.: Rowman & Littlefield, 2002.

Science and Evidence for Design in the Universe, Proceedings of the Wethersfield Institute, vol. 9 (coauthored with Michael J. Behe and Stephen C. Meyer). San Francisco: Ignatius Press, 2000.

Intelligent Design: The Bridge between Science and Theology. Downer's Grove, Ill.: InterVarsity Press, 1999. [Award: *Christianity Today*'s Book of the Year in the category "Christianity and Culture." Translated into Finnish and Korean. Translation into Spanish in preparation.]

The Design Inference: Eliminating Chance through Small Probabilities. Cambridge: Cambridge University Press, 1998. [CUP's best-selling philosophical monograph.]

Edited Collections

A Man for This Season: The Phillip Johnson Celebration Volume (co-edited with Jed Macosko, Festschrift collection in honor of Phillip Johnson). Downer's Grove, Ill.: InterVarsity Press, forthcoming 2005.

Debating Design: From Darwin to DNA (co-edited with Michael Ruse). Cambridge: Cambridge University Press, 2004.

Uncommon Dissent: Intellectuals Who Find Darwinism Unconvincing. Wilmington, Del.: Intercollegiate Studies Institute, 2004.

Signs of Intelligence: Understanding Intelligent Design (co-edited with James Kushiner). Grand Rapids, Mich.: Brazos Press, 2001. [Translation into Indonesian in preparation.]

Unapologetic Apologetics: Meeting the Challenges of Theological Studies (co-edited with Jay Wesley Richards; selected papers from the Apologetics Seminar at Princeton Theological Seminary, 1995–1997). Downer's Grove, Ill.: InterVarsity Press, 2001.

Mere Creation: Science, Faith, and Intelligent Design (proceedings of a conference on design and origins at Biola University, 14–17 November 1996). Downer's Grove, Ill.: InterVarsity Press, 1998.

Books in Preparation

Freeing Inquiry from Ideology: A Michael Polanyi Reader, co-edited with Bruce Gordon; an anthology of Michael Polanyi's writings, book under contract with InterVarsity Press.

Being as Communion: The Metaphysics of Information, Templeton Book Prize project, book under contract with Ashgate publishers for series in science and religion.

The End of Christianity, book under contract with Broadman & Holman.

The Mathematical Foundations of Intelligent Design. Technical research monograph.

The Nature of Nature, co-edited with Bruce Gordon, conference retrospective on the *Nature of Nature* conference at Baylor, 12–15 April 2000, book award through Grace Valley Christian Center, Davis, California.

The End of Materialism, co-edited collection with Jeffrey Schwartz and Mario Beauregard.

The Patristic Understanding of Creation, co-edited with Brian Frederick, anthology of writings from the Church Fathers on creation and design.

Publications

in progress

Series of technical mathematical articles collected together under the rubric *The Mathematical Foundations of Intelligent Design*. Topics to include variational information (relevant article presently under submission), uniform probability, displacement/no free lunch theorems, Bayesian methods, Fisherian methods, specification, universal probability bounds, specified complexity, configurational entropy, and conservation of information/fourth law of thermodynamics.

"In Defense of Intelligent Design," *The Oxford Handbook of Religion and Science*, edited by Philip Clayton.

to be submitted

"Searching Large Spaces: Displacement and the No Free Lunch Regress." Available online at www.designinference.com.

forthcoming

"Information as a Measure of Variation." *Complexity*. Available online at www.designinference.com

"Intelligent Design." In *The Encyclopedia of Religion*, 2nd edition, edited by Lindsay Jones. New York: Macmillan.

"Transcendence," *New Dictionary of Christian Apologetics* (British InterVarsity), available online at www.designinference.com.

"Does the Design Argument Show There Is a God?" In *The Apologetics Study Bible*, general editor Ted Cabal. Nashville, Tenn.: Broadman & Holman, forthcoming.

"Reflections on Human Origins," *Progress in Complexity, Information, and Design*.

"Dealing with the Backlash against Intelligent Design." In William A. Dembski and Jed Macosko, eds., *A Man for This Season: The Phillip Johnson Celebration Volume*. Downers Grove, Ill.: InterVarsity.

2004

"Irreducible Complexity Revisited," *Progress in Complexity, Information, and Design* 3(1) (2004): available online at

http://www.iscid.org/papers/Dembski_IrreducibleComplexityRevisited_011404.pdf.

"Everything that Rises Must Converge," review of Simon Conway Morris's book *Life's Solution: Inevitable Humans in a Lonely Universe*, *Books & Culture* (Nov/Dec 2004): 42.

"An Information-Theoretic Design Argument," in Francis Beckwith, William Lane Craig, and J. P. Moreland, eds., *To Everyone and Answer: A Case for the Christian Worldview* (volume in honor of Norman Geisler), 77–94. Downers Grove, Ill.: InterVarsity, 2004.

"The Myths of Darwinism." In *Uncommon Dissent: Intellectuals Who Find Darwinism Unconvincing*.

"The Logical Underpinnings of Intelligent Design." In *Debating Design: From Darwin to DNA*.

"The New Age of Information," *World Magazine*, 3 April 2004: 45–47. Available online at www.designinference.com/documents/2004.04.Darwins_Meltdown.htm.

Foreword to Geoffrey Simmons's *What Darwin Didn't Know*. Eugene, Oregon: Harvest House, 2004.

"Five Questions Evolutionists Would Rather Dodge," *Citizen Magazine*, web version, April 2004: http://www.family.org/cforum/citizenmag/webonly/a0031659.cfm. Unedited version available at www.designinference.com.

2003

"Response to Paul Gross," *Science Insights*, November 2003: 10–14. Available online at http://www.nas.org/publications/sci_newslist/7_5/7-5_letters.pdf.

"Skepticism's Prospects for Unseating Intelligent Design." In Paul Kurtz, ed., *Science and Religion: Are They Compatible?* Amherst, N.Y.: Prometheus Books, 2003.

Five entries in the Macmillan *Encyclopedia of Science and Religion*, 2003, edited by Wentzel van Huyssteen: "Algorithm," "Algorithmic Complexity," "Boundary Conditions," "Dissipative Structures," and "Teleological Argument."

"Intelligent Design Theory." In *Religion in Geschichte und Gegenwart*, 4th edition, edited by Hans Dieter Betz, Don S. Browning, Bernd Janowski, Eberhard Jüngel. Tübingen: Mohr Siebeck, 2003.

"The Act of Creation: Bridging Transcendence and Immanence." In Mehrdad M. Zarandi, ed., *Science and the Myth of Progress*. Bloomington, Ind.: World Wisdom, 2003.

"Challenging Materialism's Chokehold on Science" (book review of Jeffrey Schwartz and Sharon Begley's *The Mind and the Brain*). First Things no. 103, 2003: http://www.firstthings.com/ftissues/ft0305/reviews/dembski.html. Unedited review at www.designinference.com.

"The Chance of the Gaps." In Neil Manson, ed., *God and Design: The Teleological Argument and Modern Science* (London: Routledge, 2002), 251–274.

"Can Evolutionary Algorithms Generate Specified Complexity?" In *From Complexity to Life: On the Emergence of Life and Meaning*, edited by Niels H. Gregersen, foreword by Paul Davies (Oxford: Oxford University Press, 2002), 93–113.

2002

"The Design Argument," in *Science and Religion: A Historical Introduction*, edited by Gary B. Ferngren (Baltimore: Johns Hopkins Press, 2002), 335–344 .

"Detecting Design in the Natural Sciences," *Natural History* 111(3), April 2002: 76.

"How the Monkey Got His Tail," *Books & Culture*, November/December 2002: 42 (book review of S. Orzack and E. Sober, *Adaptationism and Optimality*).

MESA (Monotonic Evolutionary Simulation Algorithm). A Java program by William Dembski, John Bracht, and Micah Sparacio that models evolutionary searches and employs monotonic smooth fitness gradients. Its aim is to determine the degree to which fitness perturbation and variable coupling impede evolutionary searches. Available at www.iscid.org/mesa.

"Can Functional Logic Take the Place of Intelligent Design? Response to Walter Thorson." Perspectives on Science and Christian Faith 54(1) (2002): 22–23.

"Not Taking Information Seriously Enough." Review of James E. Huchingson, *Pandemonium Tremendum: Chaos and Mystery in the Life of God* (Cleveland: Pilgrim Press, 2001). Appeared in *Princeton Theological Seminary Bulletin* 23(1) (2002): 114–116. Available online at www.designinference.com.

"Darwin's Predictable Defenders: A Response to Massimo Pigliucci." Christian Research Journal 25(1) 2002: available online at http://www.equip.org/free/DS701.pdf. One of four essays as part of "Science and Religion 2002: A Response to *Skeptical Inquirer*."

"Why Natural Selection Can't Design Anything," *Progress in Complexity, Information, and Design* 1(1), 2002: http://iscid.org/papers/Dembski_WhyNatural_112901.pdf.

"Random Predicate Logic I: A Probabilistic Approach to Vagueness," *Progress in Complexity, Information, and Design* 1(2-3), 2002: http://www.iscid.org/papers/Dembski_RandomPredicate_072402.pdf.

"Another Way to Detect Design?" *Progress in Complexity, Information, and Design* 1(4), 2002: http://iscid.org/papers/Dembski_DisciplinedScience_102802.pdf.

"Evolution's Logic of Credulity: An Unfettered Response to Allen Orr," *Progress in Complexity, Information, and Design* 1(4), 2002: http://www.iscid.org/papers/Dembski_ResponseToOrr_010703.pdf

"What Have Butterflies Got to Do with Darwin?" Review of Bernard d'Abrera's *Concise Atlas of Butterflies*. *Progress in Complexity, Information, and Design* 1(1), 2002: http://www.iscid.org/papers/Dembski_BR_Butterflies_122101.pdf.

"Refuted Yet Again!" A reply to Matt Young published with metanexus.net. (Young has since co-edited a collection titled *Why Intelligent Design Fails* with Rutgers University Press, 2004). Article available online at www.designinference.com.

Foreword to Benjamin Wiker's *Moral Darwinism: How We Became Hedonists*. Downers Grove, Ill.: InterVarsity Press, 2002.

Foreword to Peter S. Williams's *The Case for Angels*. Carlisle, UK: Paternoster Press, 2002.

2001

"Where Do We Go From Here," *Perspectives on Science and Christian Faith* 53(4), December 2001: 283-291 (with Paul Anderson, Loren Haarsma, and Susan Drake Emmerich; transcript of panel discussion at Mundelein conference, 2000, titled *Asking the Right Questions*).

"The Possibility of Detecting Intelligent Design." *Mathematics in a Postmodern Age: A Christian Perspective*, edited by James Bradley and Russell Howell (Grand Rapids, Mich.: Eerdmans, 2001), 278–308.

"The Pragmatic Nature of Mathematical Inquiry." *Mathematics in a Postmodern Age: A Christian Perspective*, edited by James Bradley and Russell Howell (Grand Rapids, Mich.: Eerdmans, 2001), 98–130.

"Detecting Design by Eliminating Chance: A Response to Robin Collins." In *Christian Scholar's Review* 30(3), Spring 2001: 343–357.

"Intelligent Design Coming Clean." Montville, N.J.: Digital Publishing Solutions, 2001. [Originally published through Metanexus.net.]

"Is Intelligent Design a Form of Natural Theology?" Published with metanexus.net. Available at www.designinference.com.

"What Have Butterflies Got to Do with Darwin?" Review of Bernard d'Abrera's *The Concise Atlas of Butterflies of the World* (London: Hill House, 2001). Published with metanexus.net.

Foreword to Neil Broom's *How Blind Is the Watchmaker?*. Downers Grove, Ill.: InterVarsity Press, 2001.

2000

"Naturalism and Design." In *Naturalism: A Critical Analysis*, edited by William Lane Craig and J. P. Moreland (London: Routledge, 2000).

"Conservatives, Darwin & Design: An Exchange" (co-authored with Larry Arnhart and Michael J. Behe). *First Things* no. 107 (November 2000): 23–31.

"The Third Mode of Explanation." In *Science and Evidence for Design in the Universe*.

"Mechanism, Magic, and Design," *Christian Research Journal* 23(2) 2000: available online at http://www.equip.org/free/DM808.htm.

"What Can We Reasonably Hope For? — A Millennium Symposium." *First Things* no. 99, January 2000: 19–20.

"Who's Got the Magic." Response to Robert Pennock, published initially at metanexus.net. Reprinted without permission in Robert Pennock, ed., *Intelligent Design Creationism and Its Critics: Philosophical, Theological, and Scientific Perspectives* (Cambridge, Mass.: MIT Press, 2001), 639–644.

"Disbelieving Darwin—And Feeling No Shame!" Published initially at metanexus.net, available at www.designinference.com. Revised version published as "Shamelessly Doubting Darwin," *American Outlook* (November/December 2000): 22–24.

"Because It Works, That's Why!" (review of Y. M. Guttmann's *The Concept of Probability in Statistical Physics*). *Books & Culture*, March/April 2000: 42–43.

"The Design Argument." In *The History of Science and Religion in the Western Tradition: An Encyclopedia*, edited by Gary B. Ferngren (New York: Garland, 2000), 65–67.

"The Limits of Natural Teleology" (review of Robert Wright's *Nonzero: The Logic of Human Destiny*). *First Things* no. 105 (August/September 2000): 46–51.

"Intelligent Design Is Not Optimal Design." Response to Francisco Ayala, posted initially at metanexus.net. Available online at www.designinference.com.

1999

"Signs of Intelligence: A Primer on the Discernment of Intelligent Design." *Touchstone* 12(4), 1999: 76–84.

"Are We Spiritual Machines?" *First Things* no. 96, October 1999: 25–31.

"Not Even False? Reassessing the Demise of British Natural Theology." *Philosophia Christi* 2nd series, 1(1), 1999: 17–43.
"The Last Magic" (review of Mark Steiner's *The Applicability of Mathematics as a Philosophical Problem*). *Books & Culture*, July/August 1999. [Award: Evangelical Press Association, First Place for 1999 in the category "Critical Reviews."]
"Thinkable and Unthinkable" (review of Paul Davies's *The Fifth Miracle*). *Books & Culture*, September/October 1999: 33–35.
"The Arrow and the Archer: Reintroducing Design into Science." *Science & Spirit* 10(4), 1999(Nov/Dec): 32–34, 42.

1998

"Randomness." In *Routledge Encyclopedia of Philosophy*, edited by Edward Craig. London: Routledge, 1998.
"Reinstating Design within Science." *Rhetoric and Public Affairs* 1(4), 1998: 503–518. Reprinted in John Angus Campbell and Stephen C. Meyer, eds., *Darwinism, Design, and Public Education*. East Lansing, Mich.: Michigan State University Press, 2003: 403–417.
"Fruitful Interchange or Polite Chitchat? The Dialogue between Theology and Science" (co-authored with Stephen C. Meyer). *Zygon* 33(3), 1998: 415–430.
"Mere Creation." In *Mere Creation: Science, Faith, and Intelligent Design*.
"Redesigning Science." In *Mere Creation: Science, Faith, and Intelligent Design*.
"Science and Design." *First Things* no. 86, October 1998: 21–27.
"Intelligent Design: The New Kid on the Block." *The Banner* 133(6), 16 March 1998: 14–16.
"The Intelligent Design Movement." *Cosmic Pursuit* 1(2), 1998: 22–26.
"The Bible by Numbers" (review of Jeffrey Satinover's *Cracking the Bible Code*). *First Things*, August/September 1998 (no. 85): 61–64.

1997

"Intelligent Design as a Theory of Information" (revision of 1997 NTSE conference paper). *Perspectives on Science and Christian Faith* 49(3), 1997: 180–190. Reprinted without permission in Robert Pennock, ed., *Intelligent Design Creationism and Its Critics: Philosophical, Theological, and Scientific Perspectives* (Cambridge, Mass.: MIT Press, 2001), 553–573.
"Christology and Human Development." *Foundations* 5(1), 1997: 11–18.

1996

"Schleiermacher's Metaphysical Critique of Miracles." *Scottish Journal of Theology* 49(4), 1996: 443–465.
"Transcendent Causes and Computational Miracles." In *Interpreting God's Action in the World* (*Facets of Faith and Science*, volume 4), edited by J. M. van der Meer. Lanham: The Pascal Centre for Advanced Studies in Faith and Science/ University Press of America, 1996.
"The Problem of Error in Scripture." *Princeton Theological Review* 3(1)(double issue), 1996: 22–28.
"Teaching Intelligent Design as Religion or Science?" *Princeton Theological Review* 3(2), 1996: 14–18.
"The Paradox of Politicizing the Kingdom." *Princeton Theological Review* 3(1)(double issue), 1996: 35–37.
"Alchemy, NK Boolean Style" (review of Stuart Kauffman's *At Home in the Universe*). *Origins & Design* 17(2), 1996: 30–32.

1995

"What Every Theologian Should Know about Creation, Evolution, and Design." *Princeton Theological Review* 2(3), 1995: 15–21.
"The Fallacy of Contextualism." *Themelios* 20(3), 1995: 8–11.
"The God of the Gaps." *Princeton Theological Review* 2(2), 1995: 13–16.

1994

"The Incompleteness of Scientific Naturalism." In *Darwinism: Science or Philosophy?* edited by Jon Buell and Virginia Hearn (Proceedings of the Darwinism Symposium held at Southern Methodist University, 26–28 March 1992), pp. 79–94. Dallas: Foundation for Thought and Ethics, 1994.

"On the Very Possibility of Intelligent Design." In *The Creation Hypothesis*, edited by J. P. Moreland, pp. 113–138. Downers Grove: InterVarsity Press, 1994.

1991

"Randomness by Design." *Nous* 25(1), 1991: 75–106.

"Reviving the Argument from Design: Detecting Design through Small Probabilities." *Proceedings of the 8th Biannual Conference of the Association of Christians in the Mathematical Sciences* (at Wheaton College), 29 May – 1 June 1991: 101–145.

1990

"Uniform Probability." *Journal of Theoretical Probability* 3(4), 1990: 611–626.

"Reverse Diffusion-Limited Aggregation." *Journal of Statistical Computation and Simulation* 37(3&4), 1990: 231–234.

"Scientopoly: The Game of Scientism." *Epiphany Journal* 10(1&2), 1990: 110–120.

"Converting Matter into Mind: Alchemy and the Philosopher's Stone in Cognitive Science." *Perspectives on Science and Christian Faith* 42(4), 1990: 202–226. Abridged version in *Epiphany Journal* 11(4), 1991: 50–76. My response to subsequent critical comment: "Conflating Matter and Mind" in *Perspectives on Science and Christian Faith* 43(2), 1991: 107–111.

"Inconvenient Facts: Miracles and the Skeptical Inquirer." *Philosophia Christi* (formerly *Bulletin of the Evangelical Philosophical Society*) 13, 1990: 18–45.

Professional Activities

2005

Debate on the scientific status of intelligent design with Lee Silver, Princeton University, 7 April, 2005.

"Intelligent Design's Place in the Natural Science" and "Searching Large Spaces." Talks to be presented as part of Trotter Prize Lectures, Texas A&M University, 4 April 2005.

"The Scientific Basis for Intelligent Design," presented at the Intelligent Design Symposium organized by the Intelligent Design and Evolution Awareness (IDEA) Club at the University of Texas at Dallas, 26 March 2005.

Debates and panel discussions on ID at Columbia University and NYU with Robert Shapiro, 8-10 February 2005.

2004

"Doubts about Unintelligent Evolution," Society of Christian Philosophers, invited lecture, with Sahotra Sarkar as respondent, annual AAR meeting, San Antonio, 22 November 2004.

"Darwin's Berlin Wall," Evangelical Philosophical Society, invited plenary lecture at annual ETS meeting, San Antonio, 18 November 2004.

Fall 2004: Lectures at University of New Mexico, Belhaven College, Wayne State University, and Taylor University

"Intelligent Design: The State of the Research Program," *National Faculty Leadership Conference*, organized by Christian Leadership Ministries, Washington, DC, 25 June 2004.

Lecture tour of Denmark: 10 May, University of Aarhus, Danish Science-Theology Forum; 11-12 May, University of Copenhagen, two lectures, Department of Systematic Theology; 12 May, Technical University of Denmark, "The Design Inference as an Extension of Fisherian Significance Testing"; 13 May, Niels Bohr Institute, "Intelligent Design and Self-Organization."

Speaker and panelist, conference titled *Intelligent Design and the Future of Science*, Biola University, 22–24 April 2004.

Dual debates at UCLA as part of Veritas Forum, Jeffrey Schwartz and William Dembski vs. Michael Shermer and Niall Shanks respectively, taped 21 April 2004 and subsequently televised by CSPAN2.

"Mathematics as an Experimental Science," talk given at Baylor conference titled *Christianity and the Soul of the University: Faith as a Foundation for Intellectual Community*, 26 March 2004. Based on paper titled "The Pragmatic Nature of Mathematical Inquiry," in the edited collection by James Bradley and Russ Howell.

Claremont-McKenna lectures on intelligent design, spring 2004 (featuring Michael Behe, Eugenie Scott, and William Dembski). Dembski spoke on 2 Marcy 2004.

Lectures on intelligent design at UC Davis and Grace Valley Christian Center, organized by Richard Spencer, 16–17 January 2004.

2003

Lectures at Oxford University on intelligent design at the Ian Ramsey Centre and Oxford Centre for Hindu Studies as well as to the Joseph Butler Society, 29–30 October 2003.

Extended academic debate over intelligent design with Michael Ruse, sponsored by the Honors College at the University of Central Arkansas, 14–16 October 2003.

SETI Institute radio debate with Massimo Pigliucci, moderated by Seth Shostak, 12 October 2003.

"Infinite Universe or Intelligent Design?" Paper delivered at 2003 Accelerating Change Conference at Stanford University, 13 September 2003. Available online at www.designinference.com.

Participant, seminar on the role of technology in culture and society, organized by Walter Bradley, Baylor University, 26 May – 6 June 2003.

"Making the Task of Theodicy Impossible? Intelligent Design and the Problem of Evil," invited paper delivered under the auspices of the Center for Theology and the Natural Sciences (CTNS) at the Graduate Theological Union (GTU) in Berkeley, 1 April 2003.

Speaking tour of Auckland, New Zealand, including seminars on intelligent design at the University of Auckland and various theological institutions, 10–19 March 2003.

"The Design Revolution." *Norton Lectures*, Southern Baptist Theological Seminary, Louisville, Kentucky, 11 & 12 February 2003. [**endowed lectures**]

Taping for JESUS Film Apologetics Version, Southern California, 15 January 2003.

Invited to speak on intelligent design at Southwest Texas State University (6 February), SMU (25 March), and University of Maine (9 April).

2002

"ID's Positive Contribution to Biology's Information Problem," *The Intelligent Design Debate*, symposium featuring also Michael Ruse, Larry Arnhart, Michael Behe, Mano Singham, Niles Eldredge, Jonathan Wells, Hillsdale College, 10–13 November 2002.

"Becoming a Disciplined Science: Prospects, Pitfalls, and Reality Check for ID," keynote address, *RAPID Conference* (Research and Progress in Intelligent Design), Biola University, La Mirada, California, 25–27 October 2002. Available online at www.designinference.com.

Debate titled "God or Luck: Creationism vs. Evolution," with Steven Darwin, professor of botany, Tulane University, New Orleans, 7 October 2002. Frank Tipler organized this debate.

"Skepticism's Prospects for Unseating Intelligent Design," Fourth World Skeptics Conference, *Prospects for Skepticism: The Next Twenty-Five Years*, Burbank, California, 20-23 June 2002. Symposium debate with Paul Nelson vs. Kenneth Miller and Wesley Elsberry.

Presenter on intelligent design, *Imago Dei AD 2002*, conference sponsored by Charles W. Colson and the Wilberforce Forum, Dallas, 15 June 2002.

"The Cultural Significance of Intelligent Design," *Imago Dei AD 2002: Incarnational Living in a Secular Society*, sponsored by BreakPoint, Irving, Texas, 15 June 2002.

"Does Evolution Even Have a Mechanism," symposium on intelligent design featuring also Michael Behe, Kenneth Miller, Robert Pennock, and Eugenie Scott, American Museum of Natural History, New York, 23 April 2002. Available online at http://www.iscid.org/papers/Dembski_DoesEvolution_050202.pdf. See also http://www.actionbioscience.org/evolution/nhmag.html.

"Blueprint for a Revolution," *Intelligent Design Conference*, Palm Beach Atlantic College, Palm Beach, Florida, 13-14 April 2002.

Canadian lecture tour on intelligent design (University of Guelph, University of Toronto, and McMasters University), sponsored by the Canadian Scientific and Christian Affiliation, 6–8 March 2002.

"Intelligent Design." *Staley Lectures*, Anderson College, Anderson, South Carolina, 15 & 16 January 2002. [**endowed lectures**]

2001

Founded with John Bracht and Micah Sparacio the International Society for Complexity, Information, and Design (www.iscid.org).

Program titled "Darwin under the Microscope," PBS television interview for *Uncommon Knowledge* with Peter Robinson facing Eugenie Scott and Robert Russell, 7 December 2001.

Public discussion with Stuart Kauffman, "Order for Free vs. No Free Lunch," Center for Advanced Studies, University of New Mexico, 13 November 2001.

Debate with Michael Shermer, "Does Science Prove God?" Clemson University, 7 November 2001.

Debate with Massimo Pigliucci, "Is Intelligent Design Smart Enough?" New York Academy of Sciences, 1 November 2001.

"Another Way to Detect Design?" "Why Natural Selection Can't Design Anything," and "The Chance of the Gaps." Three papers presented as keynote speaker at Society of Christian Philosophers meeting, Boulder, Colorado, 4–6 October 2001.

Panel discussion on Houston PBS station regarding PBS evolution series, which finished that night, 27 September 2001.

Presenter, on topic of detecting design, 23–27 July 2001 at Wycliffe Hall, Oxford University in the John Templeton Oxford Seminars on Science and Christianity.

Focus on the Family broadcast taping with James Dobson, 6 July 2001.

Presenter, Darwin, Design & Democracy II, conference organized by the Intelligent Design Network, Kansas City, Missouri, 29-30 June 2001.

"Intelligent Design as a Theory of Technological Evolution." *Interpreting Evolution*, AAAS conference at Haverford College, 14–19 June 2001. Paper available online at www.designinference.com.

Participant, "Mathematical Modeling and Complexity Seminar," organized by Michael Veatch at Calvin College, 2–4 June 2001.

"The Probabilistic Detection of Design" and "New Directions in Information Theory: From Shannon Information to Specified Complexity." Keynote talks at biannual meeting of the Association of Christians in the Mathematical Sciences, Calvin College, 31 May – 2 June 2001.

Participant, Symposium on Design Reasoning, Calvin College, 22–23 May 2001. Other participants were Stephen Meyer, Paul Nelson, Rob Koons, Del Ratzsch, Robin Collins, Tim & Lydia McGrew. Tim will edited the proceedings for an academic press.

Radio debate with Eugenie Scott, Diane Rehm Show, NPR, 18 April 2001 (in response to James Glanz's front page story on intelligent design in the *New York Times*, 8 April 2001).

Invited to speak on intelligent design at University of Georgia (21–23 February), University of South Carolina (1–3 April), UCSD (23–26 April), and SMU (11 September), Texas A&M (18 September), Fort Lewis College, Durango, Colorado (16 October)

2000

"No Free Lunch: Why Specified Complexity Requires Intelligence." *Science and Evidence for Design in the Universe*. Conference at Yale University, 2–4 November 2000.

Panelist, "Where Do We Go From Here?" at conference sponsored by ASA, IVCF, and Templeton in Mundelein, Illinois titled *Asking the Right Questions: Christian Faith and the Choice of Research Topic in the Natural and Applied Sciences*, 13–15 October 2000.

"Intelligent Design and the End of Reason," Houston Christian Worldview Conference, sponsored by Charles W. Colson and the Wilberforce Forum, 23 September 2000.

"Detecting Design in the Natural Sciences." Talks presented at two conferences: *Design and Its Critics* (Concordia University, Mequon, Wisconsin, 22–24 June 2000); *'Intelligent Design': Science and Theology in Consonance?* (University of New Brunswick, Fredericton, 15–16 September 2000).

Contributor, "Prospects for Post-Darwinian Science," symposium, New College, Oxford, August 2000. Other contributors included Michael Denton, Peter Saunders, Mae-Wan Ho, David Berlinski, Jonathan Wells, Stephen Meyer, and Simon Conway Morris.

Seminar Organizer, "Design, Self-Organization, and the Integrity of Creation," Calvin College Seminar in Christian Scholarship, 19 June – 28 July 2000. Follow-up conference 24–26 May 2001 (speakers included Alvin Plantinga, John Haught, and Del Ratzsch).

Intelligent design lecture tour of South Korea, sponsored by Manmin Church, including lecture at Hankuk University of Foreign Studies on 17 May (moderator: Kwang-youl Kim; interpreter: Joon-ha Hwang).

"Can Evolutionary Algorithms Generate Specified Complexity?" *The Nature of Nature*. Conference on the role of naturalism in science, Baylor University, 12–15 April 2000.

The Nature of Nature, conference at Baylor University, 12–15 April 2000, organized by WmAD and Bruce Gordon. For details, see: http://www.designinference.com/documents/2000.04.nature_of_nature.htm

"Intelligent Design: Yesterday's Orthodoxy, Today's Heresy," Evangelical theological Society Southwest Regional Meeting, organized by Douglas Blount at Southwestern Baptist Theological Seminary, 7 April 2000.

"Intelligent Design: Bridging Science and Faith." *Staley Lectures*, Union University, Tennessee, 28 February – 1 March 2000. [**endowed lectures**]

Taught course on intelligent design, Trinity International University, Santa Ana, Calif., spring 2000.

1999

Symposiast at Templeton sponsored Santa Fe conference organized by Paul Davies titled *Complexity, Information, and Design: A Critical Appraisal*, 14–16 October 1999. Presented paper that in 2002 was published in an edited collection by fellow symposiast Niels Gregersen ("Can Evolutionary Algorithms Generate Specified Complexity?").

Participant, Templeton sponsored conference titled *Empathy, Altruism and Agape: Perspectives on Love in Science and Religion* at MIT, 1–3 October 1999.

"Detecting Design in Nature," symposium at NYU sponsored by the Homeland Foundation, fall 1999.

"The Third Mode of Explanation: Distinguishing Design from Chance and Necessity." Roundtable discussion with Archbishop Joseph Zycinski, University of Chicago, 22 April 1999.
"The Design Inference." 140th Anniversary of Darwin's *Origin of Species*, Trinity Graduate School, Fullerton, California, 13 March 1999.
Participant, Liberty Fund Colloquium, "Liberty and Responsibility in the Writings of Charles Darwin," Tucson, Arizona, 28–31 January 1999.
Invited to speak on intelligent design at Texas A&M (25-26 March, Walter Bradley, organizer), Wheaton College (April), MIT (7 April), Tufts (8 April), John Brown University (31 July, Amer. Sci. Aff. meeting), Texas Tech (29 October), GeorgiaTech (5 November), Lycoming College (18 November), Biola University (3 December).

1998

Discussion about *The Design Inference*, organized by Robert Koons, with Cory Juhl and Sahotra Sarkar, University of Texas, Austin, October 1998.
Lecture on Naturalism to the annual meeting of Salem Communications, Dallas, 30 October 1998.
"The Design Inference." World Congress of Philosophy, Boston, 14 August 1998.
"The Act of Creation: Bridging Transcendence and Immanence." Millstatt Forum, Strasbourg, France, 10 August 1998.
Faculty in theology and science at the C. S. Lewis International Centennial Celebration, *Loose in the Fire.* Oxford and Cambridge Universities, 19 July to 1 August 1998.
"Science, Theology, and Intelligent Design." *Staley Lectures*, Central College, Iowa, 4–5 March 1998. [**endowed lectures**]
Canadian lecture tour on intelligent design (Simon Fraser University, University of Calgary, and University of Saskatchewan), sponsored by the New Scholars Society, 4–6 February 1998.

1997

"Intelligent Design as a Theory of Information." *Naturalism, Theism, and the Scientific Enterprise*. Conference organized by Robert Koons on the scientific status of intelligent design at the University of Texas at Austin, 20 – 23 February 1997.

1996

"Redesigning Science." Presentation at *Mere Creation* conference.
Organizer with Richard McGee and Paul Nelson of *Mere Creation* conference on design and origins at Biola University, 14 – 17 November 1996.
PBS's *Inside the Law* with Jack Ford, program devoted to design and evolution, featuring William Dembski, Wendell Byrd, Charles Haynes, and Kevin Padian, taped 13 November 1996.

1995

Organized the Charles Hodge Society and the Princeton Apologetics Seminar at Princeton Theological Seminary (*Unapologetic Apologetics* emerged out of that seminar).

1994

Faculty in theology and science at the C. S. Lewis Summer Institute, *Cosmos and Creation.* Cambridge University, Queen's College, 10–23 July 1994.
Revived, with Richard Gardiner, the *Princeton Theological Review* at Princeton Theological Seminary. This journal is still in production: http://www.pfrenewal.org/clients/pfrenewal-org/downloads/publications_PTRSpring04.pdf

1993

"Theoretical Basis for the Design Inference." *The 48th Annual Meeting of the American Scientific Affiliation*, Seattle Pacific University, 9 August 1993.
Participant and speaker, The Status of Darwinian Theory and Origin of Life Studies, Pajaro Dunes, California, 22–24 June 1993.

1992 "Transcendent Causes and Computational Miracles." *International Conference on Science and Belief*, Pascal Centre, Ancaster, Ontario, Canada, 11–15 August 1992..

Summer research on design, Cambridge University, sponsored by Pascal Centre (Ancaster, Ontario, Canada), 1 July to 4 August 1992

"The Incompleteness of Scientific Naturalism." Symposium on Darwinism held at Southern Methodist University, 26–28 March 1992.

1991 "Detecting Design through Small Probabilities." *The 8th Biannual Conference of the Association of Christians in the Mathematical Sciences*, Wheaton College, 30 May 1991 and *The 46th Annual Meeting of the American Scientific Affiliation*, Wheaton College, 29 July 1991.

1990 Participant, *International Institute of Human Rights* in Strasbourg France, 28 June to 27 July 1990.

1988 "Truth in an Age of Uncertainty and Relativism." *Dom. Luke Child's Lecture*, Portsmouth Abbey School, 30 September 1988. [**endowed lecture**]

Appendix 2: Trotter Prize Press Release

[Note: past winners of this prize include Nobel laureates Charles Townes and Francis Crick.]

For Immediate Release: Tuesday, Mar. 29, 2005
http://www.science.tamu.edu/story3.asp?storyID=465

TROTTER PRIZE WINNERS TO EXPLORE ORIGIN OF LIFE

COLLEGE STATION – Two of the nation's top scientists will visit the Texas A&M University campus next week to discuss one of the hottest topics in modern science as part of the annual Trotter Endowed Lecture Series.

As recipients of Texas A&M's 2005 Trotter Prize, Dr. William Dembski, an associate research professor in the conceptual foundations of science at Baylor University, and Dr. Stuart Kauffman, director of the Institute for Biocomplexity and Informatics at the University of Calgary, will address the origin of life in a public lecture Monday (April 4) at 7 p.m. in Rudder Theatre. The presentation, which is free and open to the public, will be followed by a reception in the Rudder Exhibit Hall.

Two central questions will form the basis of their scholarly debate: What are the defining features of life, and what causal processes can originate life and subsequently increase its complexity? For Dembski and Kauffman, the answers depend largely on approach, not to mention widely differing perspectives.

Dembski, a proponent of intelligent design, approaches these questions through his notion of "specified complexity," which he claims resides in living systems and constitutes a form of information that only intelligent agents are capable of generating. His presentation, "Intelligent Design's Place in the Natural Sciences," centers on teleology, which is widely disregarded in current evolutionary theory. Dembski will outline intelligent design's attempts to bring it back into the natural sciences in a way that is rigorous, fruitful and empirically detectable, and also examine its prospects for success.

Kauffman, a self-organizational theorist, counters with his argument for "autonomous agents," which he characterizes as a self-reproducing system capable of carrying out thermodynamic work cycles. For Kauffman, it is these laws of self-organization, not intelligent design, that promise to explain how communities of autonomous agents can arise and evolve. In "Toward a Physical Definition of Life," he will analyze Schrodinger's "What is Life," which, for all its bio-molecular discoveries—DNA, the genetic code and gene self-regulation, to name but a few—may have missed the overall mark. Kauffman suggests Schrodinger overlooked some core concepts and that others from Darwin render the biosphere incapable of finite pre-description and, therefore, may bear on a response to intelligent design arguments.

"I'm very much looking forward to a spirited discussion among the speakers and the audience," said Dr. H. Joseph Newton, dean of the College of Science.

A mathematician and a philosopher, Dembski is a senior fellow with Discovery Institute's Center for Science and Culture in Seattle and also executive director of the International Society for Complexity, Information and Design. He has previously taught at Northwestern University, the University of Notre Dame and the University of Dallas and done postdoctoral work in mathematics at MIT, in physics at the University of Chicago, and in computer science at Princeton University. In addition, Dembski is the author/editor of 10 books, including "In The Design Inference: Eliminating Chance Through Small Probabilities."

Kauffman, professor emeritus of biology at the University of Pennsylvania and an external professor and co-founder of the Santa Fe Institute, is a leading thinker on self-organization and the science of complexity as applied to biology. Twenty-five years ago, he developed the Kauffman models, which are random networks exhibiting a kind of self-organization that he terms "order for free." A MacArthur Fellow, he is the founding general partner and chief scientific officer of The Bios Group, a company that applies the science of complexity to business management problems. Kauffman is also a physician, though he no longer practices, as well as a prolific author.

The Trotter Prize and Endowed Lecture Series, presented by the College of Science in collaboration with The Dwight Look College of Engineering, seeks to illuminate connections between science and religion, often viewed in academia as non-overlapping if not rival world views. The series was established by Ide P. Trotter Jr. and Luella H. Trotter with a matching contribution from ExxonMobil Corp. in 2001 to honor Ide P. Trotter Sr., former dean of Texas A&M University's Graduate School, and to recognize pioneering contributions to the understanding of the role of information, complexity and inference in illuminating the mechanisms and wonder of nature.

For more information on the event, contact Sidney Zubik in the College of Science Dean's Office at (979) 845-9642.

– 30 –

Contact: Shana K. Hutchins, (979) 862-1237 or shutchins@science.tamu.edu

Appendix 3: Ten Peer-Reviewed ID Articles (with Annotations)

Does research supporting intelligent design appear in the peer-reviewed scientific literature? In a recent interview with *USA Today* (March 23, 2005), Barbara Forrest, a professor of philosophy at Southeastern Louisiana University and a critic of intelligent design, incorrectly states that "[design theorists] aren't published because they don't have any scientific data."[57] In fact, they are published and they have scientific data.

What follows is a list of ten peer-reviewed publications that support intelligent design in biology written by proponents of intelligent design. Note, in particular, the two articles by Douglas Axe, which describe experiments in molecular biology and thus present "scientific data" that support intelligent design. Note, in addition, that there is a widely recognized peer-reviewed literature in physics and cosmology that supports intelligent design—see, for instance, the work of Fred Hoyle, Paul Davies, and Guillermo Gonzalez.[58]

- W.A. Dembski, *The Design Inference: Eliminating Chance through Small Probabilities* (Cambridge: Cambridge University Pres, 1998).

  This book was published by Cambridge University Press and peer-reviewed as part of a distinguished monograph series, *Cambridge Studies in Probability, Induction, and Decision Theory*. The editorial board of that series includes members of the National Academy of Sciences as well as one Nobel laureate, John Harsanyi, who shared the prize in 1994 with John Nash, the protagonist in the film *A Beautiful Mind*. Commenting on the ideas in *The Design Inference*, well-known physicist and science writer Paul Davies remarks: "Dembski's attempt to quantify design, or provide mathematical criteria for design, is extremely useful. I'm concerned that the suspicion of a hidden agenda is going to prevent that sort of work from receiving the recognition it deserves." Quoted in L. Witham, *By Design* (San Francisco: Encounter Books, 2003), p. 149. For more about the peer-review of this book, see Appendices 6 and 7.

- D.D. Axe, "Extreme Functional Sensitivity to Conservative Amino Acid Changes on Enzyme Exteriors," *Journal of Molecular Biology*, 301(3) (2000): 585–595.

- D.D. Axe, "Estimating the Prevalence of Protein Sequences Adopting Functional Enzyme Folds," *Journal of Molecular Biology*, 341(5) (2004):1295–1315.

  These two articles by Douglas Axe show that certain enzymes are extremely sensitive to perturbation. Perturbation in this case does not simply diminish existing function or alter function, but removes all possibility of biological function (in this case, any biologically useful catalytic activity). This implies that neo-Darwinian theory has no purchase on these systems—these systems are unevolvable by Darwinian means. Moreover, the probabilities implicit in such extreme-functional-sensitivity analyses are precisely those needed for a design inference.

- S.C. Meyer, "The Origin of Biological Information and the Higher Taxonomic Categories," *Proceedings of the Biological Society of Washington*, 117(2) (2004): 213–239.

  This article explicitly argues for intelligent design in the origination of the Cambrian fauna. It created an international firestorm within the scientific community when it was published. See the *Wall Street Journal* article in Appendix 8 as well as the following website by the editor who oversaw the article's peer-review process: http://www.rsternberg.net.

- M.J. Behe and D.W. Snoke, "Simulating Evolution by Gene Duplication of Protein Features That Require Multiple Amino Acid Residues," *Protein Science*, 13 (2004): 2651–2664.

  Behe and Snoke show in this article how difficult it is for unguided evolutionary processes to take existing proteins structures and add novel proteins whose interface compatibility is such that they could combine functionally with the original proteins. By demonstrating inherent limitations to unguided evolutionary processes, this work gives indirect scientific support to intelligent design.

- W.-E. Loennig & H. Saedler, "Chromosome Rearrangements and Transposable Elements," *Annual Review of Genetics*, 36 (2002): 389–410.

  This article examines the role of transposons in the abrupt origin of new species and the possibility of a partly predetermined generation of biodiversity and new species. The authors' approach in non-Darwinian, and they cite favorably the work of Michael Behe and William Dembski.

- D.K.Y. Chiu & T.H. Lui, "Integrated Use of Multiple Interdependent Patterns for Biomolecular Sequence Analysis," *International Journal of Fuzzy Systems*, 4(3) (September 2002): 766–775.

  The opening paragraph of this article reads: "Detection of complex specified information is introduced to infer unknown underlying causes for observed patterns [10]. By complex information, it refers to information obtained from observed pattern or patterns that are highly improbable by random chance alone. We evaluate here the complex pattern corresponding to multiple observations of statistical interdependency such that they all deviate significantly from the prior or null hypothesis [8]. Such multiple interdependent patterns when consistently observed can be a powerful indication of common underlying causes. That is, detection of significant multiple interdependent patterns in a consistent way can lead to the discovery of possible new or hidden knowledge." Reference number [10] here is to *The Design Inference*.

- M.J. Denton & J.C. Marshall, "The Laws of Form Revisited," *Nature*, 410 (22 March 2001): 417; M.J. Denton, J.C. Marshall & M. Legge, (2002) "The Protein Folds as Platonic Forms: New Support for the pre-Darwinian Conception of Evolution by Natural Law," *Journal of Theoretical Biology* 219 (2002): 325–342.

  This research is thoroughly non-Darwinian and teleological. It looks to laws of form embedded in nature to bring about biological structures. The intelligent design research program is broad, and design like this that's programmed into nature falls within its ambit.

- J. Barham, "Biofunctional Realism and the Problem of Teleology," *Evolution and Cognition*, 6(1) (2000): 2–34.

  This paper looks to self-organizational properties of matter to argue for a fundamental teleology or intelligence as responsible for the origin and evolution of biological systems. The teleology here is nonreductionist but rather emergentist. Barham's approach is thus thoroughly non-Darwinian. And although his approach does not locate teleology in an extramaterial source, it does argue that teleology plays an ineliminable role in biological origins and diversification.

- M. Barbieri, *The Organic Codes: The Birth of Semantic Biology* (Ancona, Italy: peQuod).

  This monograph summarizes Marcello Barbieri's longstanding work in formulating a semantic, and therefore intelligence-based, biology. Barbieri has published aspects of this monograph in such peer-reviewed journals as *Journal of Theoretical Biology* and *Rivista di Biologia* (see the monograph's bibliography).

Appendix 4: Fifteen Intelligent Design Research Themes

1. ***Methods of Design Detection***. Methods of design detection are widely employed in various special sciences (e.g., archeology, cryptography, and the Search for Extraterrestrial Intelligence or SETI). Research by design theorists in this area is ongoing. William Dembski's *The Design Inference* began research in this area (see Appendix 3).

2. ***Biological Information***. What is the nature of biological information? How do function and fitness relate to it? What are the obstacles that face material mechanisms in attempting to generate biological information? What are the theoretical and empirical grounds for thinking that intelligence is indispensable to the origin of biological information? Stephen Meyer's article in the *Proceedings of the Biological Society of Washington* illustrates this line of research (see Appendix 3).

3. ***Evolvability***. Evolutionary biology's preferred research strategy consists in taking distinct biological systems and finding similarities that might be the result of a common evolutionary ancestor. Intelligent design, by contrast, focuses on a different strategy, namely, taking individual biological systems and perturbing them (both intelligently and randomly) to see how much the systems can evolve. Within this latter research strategy, limitations on evolvability by material mechanisms constitute evidence for design. Douglas Axe's research illustrates this research theme (see the two articles by him listed in Appendix 3).

4. ***Evolutionary Computation***. Organisms employ evolutionary computation to solve many of the tasks of living (cf. the immune system in vertebrates). But does this show that organisms originate through some form of evolutionary computation (as through a Darwinian evolutionary process)? Are GPGAs (General Purpose Genetic Algorithms) like the immune system designed or the result of evolutionary computation? Need these be mutually exclusive? Evolutionary computation occurs in the behavioral repertoire of organisms but is also used to account for the origination of certain features of organisms. What is the relationship between these two types of evolutionary computation as well as any design intrinsic to them? William Dembski's work in chapter 4 of *No Free Lunch* lays out some of the theoretical groundwork here. He is also one of the programmers of a computational simulation that investigates the scope and limits of evolutionary computation, namely, the MESA program (Monotonic Evolutionary Simulation Algorithm), which is additionally also due to Micah Sparacio and John Bracht. This program is available online at www.iscid.org/mesa.

5. ***Technological Evolution (TRIZ)***. The only well-documented example we have of the evolution of complex multipart integrated functional systems (as we see in biology) is the technological evolution of human inventions. In the second half of

the twentieth century, Russian scientists and engineers studied hundreds of thousands of patents to determine how technologies evolve. They codified their findings in a theory to which they gave the acronym TRIZ, which in English translates to Theory of Inventive Problem Solving (see Semyon Savransky, *Engineering of Creativity: Introduction to TRIZ Methodology of Inventive Problem Solving*, CRC Publishers, 2000). The picture of technological evolution that emerges out of TRIZ maps especially well onto the history of life as we see it in the fossil record and includes the following:

- New technologies (cf. major groups like phyla and classes) emerge suddenly as solutions to inventive problems. Such solutions require major conceptual leaps (i.e., design).
- Existing technologies (cf. species and genera) can, by contrast, be modified by trial-and-error tinkering (cf. Darwinian evolution), which amounts to solving routine rather than inventive problems. (The distinction between routine and inventive problems is central to TRIZ. In biology, irreducible complexity suggests one way of making the analytic cut between these types of problems. Are there other ways?)
- Technologies approach ideality (cf. local optimization by means of natural selection) and thereafter tend not to change (cf. stasis).
- New technologies, by supplanting old technologies, can upset the ideality and stasis of the old technologies, thus forcing them to evolve in new directions (requiring the solution of new inventive problems, as in an arms race) or by driving them to extinction.

Mapping TRIZ onto biological evolution provides an especially promising avenue of design-theoretic research and preserves the best in Niles Eldredge and Stephen Jay Gould's model of punctuated equilibrium.[59]

6. ***Principle of Methodological Engineering***. Evolutionary biology has lost its sense of proportion about how much evolution is possible as a result purely of blind material mechanisms (like random variation and natural selection) because it floats free of the science of engineering. At every crucial juncture where some major evolutionary transition needs to be accounted for, evolutionary biology invokes a designer-substitute (like natural selection, lateral gene transfer, or symbiogenesis) to do the necessary design work. Yet, unlike the science of engineering, evolutionary biology does not actually perform the necessary design work or specify a detailed procedure by which it might be accomplished. Intelligent design, by contrast, takes what may be called "methodological engineering" as a fundamental regulative principle for understanding biological systems. According to this principle, biological systems are to be understood, at least to a first approximation, as engineering systems. To be sure, biological systems (and humans in particular), are more than engineering systems; but they are at least that. In consequence, the origin, construction, operation, break down, wearing out, repair, and above all history of modifications (both designed and accidental) of such systems are all to be understood in engineering terms. Intelligent design promises to

inspire advanced academic programs in biotic engineering that will take over much of what is currently being taught under the rubric of evolutionary biology.

7. ***The Psychology of Design Detection***. There is a large literature in the field of experimental psychology on human reasoning and problem solving, and specifically on humans as intuitive probabilists or statisticians.[60] One line of research suggests that humans are poor intuitive probabilists when they need to update the likelihood of events in light of competing prior probabilities without the benefit of pencil and paper—i.e., without being able to explicitly apply probability theory. Put another way, this research suggests that humans are not good at intuitively applying Bayes's theorem.[61] Nonetheless, design detection based on probabilistic considerations is something humans do intuitively all the time.[62] It is an open question how good human intuition is at detecting design. This is a question for experimental psychologists, whose experimental protocols will involve comparing the performance of humans at detecting design in various experimental setups with the performance of design detection criteria at detecting design.

8. ***Strong Irreducible Complexity of Functional Proteins and Protein Systems***. Those who encounter molecular machines like the bacterial flagellum for the first time but have no prior commitment to Darwinism find it intuitively unconvincing that such systems can be explained in Darwinian terms. But those who have spent decades thinking of all complex cellular machinery in Darwinian terms will not arrive at this intuition just by being shown examples of systems they think they already understand. Hence, for biologists to be convinced that Darwinian explanations are inadequate, they will need to see *compelling new evidence* that Darwinian explanations of these systems really are inadequate. Recent research by Douglas Axe (see Appendix 3) provides such evidence in the form of a rigorous experimental assessment of the rarity of function-bearing protein sequences. By addressing this problem at the level of single protein molecules, this work provides an empirical basis for deeming functional proteins and systems of functional proteins to be unequivocally beyond Darwinian explanation.

9. ***Natural and Artificial Biological Design (Bioterrorist Genetic Engineering)***. We are on the cusp of a bioengineering revolution whose fallout is likely to include bioterrorism. Thus we can expect to see bioterror forensics emerge as a practical scientific discipline. How will such forensic experts distinguish the terrorists' biological designs from naturally occurring biological designs? Intelligent design and not contemporary evolutionary theory provides the theoretical frame for answering this question.

10. ***Design of the Environment and Ecological Fine-Tuning***. The idea that ecosystems are fine-tuned to support a harmonious balance of plant and animal life is old. How does this balance come about? Is it the result of blind Darwinian material forces competing with one another and leading to a stable equilibrium? Or is there design built into such ecosystems? Can such ecosystems be improved

through conscious design or is "monkeying" with such systems invariably counterproductive? Intelligent design to become a significant voice in scientific debates over the environment.

11. ***Steganographic Layering of Biological Information***. Steganography belongs to the field of digital data embedding technologies (DDET), which also include information hiding, steganalysis, watermarking, embedded data extraction, and digital data forensics. Steganography seeks efficient (high data rate) and robust (insensitive to common distortions) algorithms that can embed a high volume of hidden message bits within a cover message (typically imagery, video, or audio) without their presence being detected. Conversely, steganalysis seeks statistical tests that will detect the presence of steganography in a cover message. A key research question for intelligent design is to what degree do biological systems incorporate steganography, and if so, is biosteganography demonstrably designed?

12. ***Cosmological Fine-Tuning and Anthropic Coincidences***. Although this is a well worn area of study, there are some new developments here that derive from a specifically design-theoretic perspective. Guillermo Gonzalez, assistant professor of physics and astronomy at Iowa State University, and Jay Richards, a senior fellow with Seattle's Discovery Institute, have published *The Privileged Planet* in which they make a case for planet earth as intelligently designed not only for life but also for scientific discovery. In other words, they argue that our world is designed to facilitate scientific discovery of its own design. This work has been featured on the front cover of the October 2001 *Scientific American*. It connects intelligent design in biology to intelligent design in cosmology.

13. ***Astrobiology, SETI, and the Search for a General Biology***. What might life on other planets look like? Is it realistic to think that there is life, and even conscious life, on other planets? What are the defining features that any material system must possess to be alive? How simple can a material system be and still be alive (John von Neumann posed this question over half a century ago in the context of cellular automata[63])? Insofar as such systems display intelligent behavior, must that intelligence be derived entirely from its material constitution or can it transcend yet nevertheless guide its behavior (cf. the mechanism vs. vitalism debate)? Is there a testable way to decide this last question? How, if at all, does quantum mechanics challenge a purely mechanistic conception of life? The intelligent design community is at the forefront in raising and answering such questions.

14. ***Consciousness, Free Will, and Mind-Brain Studies***. Is conscious will an illusion—we think that we have acted freely and deliberately toward some end, but in fact our brain acted on its own and then deceived us into thinking that we acted deliberately. This is the majority position in the cognitive neuroscience community, and a recent book makes just that claim in its title: *The Illusion of Conscious Will* by Harvard psychologist Daniel Wegner.[64] But there is now growing evidence that consciousness is not reducible to material processes of the brain and that free will is

in fact real. Jeffrey Schwartz at UCLA along with quantum physicist Henry Stapp at the Lawrence Berkeley National Laboratory are two of the key researchers presently providing experimental and theoretical support for the irreducibility of mind to brain.[65]

15. ***Autonomy vs. Guidance***. Many scientists worry that intelligent design attempts to usurp nature's autonomy. But that is not the case. Intelligent design is attempting to restore a proper balance between nature's autonomy and teleologic guidance. Prior to the rise of modern science, all the emphasis was on teleologic guidance (typically in the form of divine design). Now the pendulum has swung to the opposite extreme, and all the emphasis is on nature's autonomy (an absolute autonomy that excludes design). Where is the point of balance that properly respects both, and in which design becomes empirically evident? The search for that balance-point needs always to be in the back of our minds as we engage in design-theoretic research. It's not all design or all nature but a synergy of the two. Unpacking that synergy is the intelligent design research program in a nutshell.

Appendix 5: W. A. Dembski's Testimony at Textbook Hearing (Exhibit)

Testimony for Textbook Hearing, Austin, Texas, September 10, 2003

<available at www.designinference.com after September 10, 2003>

My name is William Dembski. I'm an associate research professor in the conceptual foundations of science at Baylor University. I hold a Ph.D. in mathematics is from the University of Chicago. One of the things I do for a living is study the probabilistic underpinnings of neo-Darwinian evolution.

In his testimony to you on July 9th, UT biology professor David Hillis claimed, "There is no debate about the existence of evolution in scientific circles." That may be, depending on how you define evolution. But there is considerable debate in scientific circles about the *mechanism* of evolution, namely, how it happened. Cambridge paleontologist Simon Conway Morris, writing for the premier biology journal *Cell*, remarks: "When discussing organic evolution the only point of agreement seems to be: 'It happened.' Thereafter, there is little consensus...." (Jan. 7, 2000)

Despite that, the illusion of scientific consensus is all we get in the textbooks. What's more, pro-Darwinian lobbyists, like Eugenie Scott, strive to maintain that illusion. In an interview with *Salon* (May 4, 2001), Scott tells us why. According to her, for textbooks to admit the lack of consensus over how evolution happened will "confuse kids about the soundness of evolution as a science."

Whatever happened to science education nurturing the capacity of young minds for critical thought? Whatever happened to exposing students to as much information as required to form balanced scientific judgments? All the textbooks under consideration grossly exaggerate the evidence for neo-Darwinian evolution, pretending that its mechanism of natural selection acting on random genetic change is a slam-dunk. Not so.

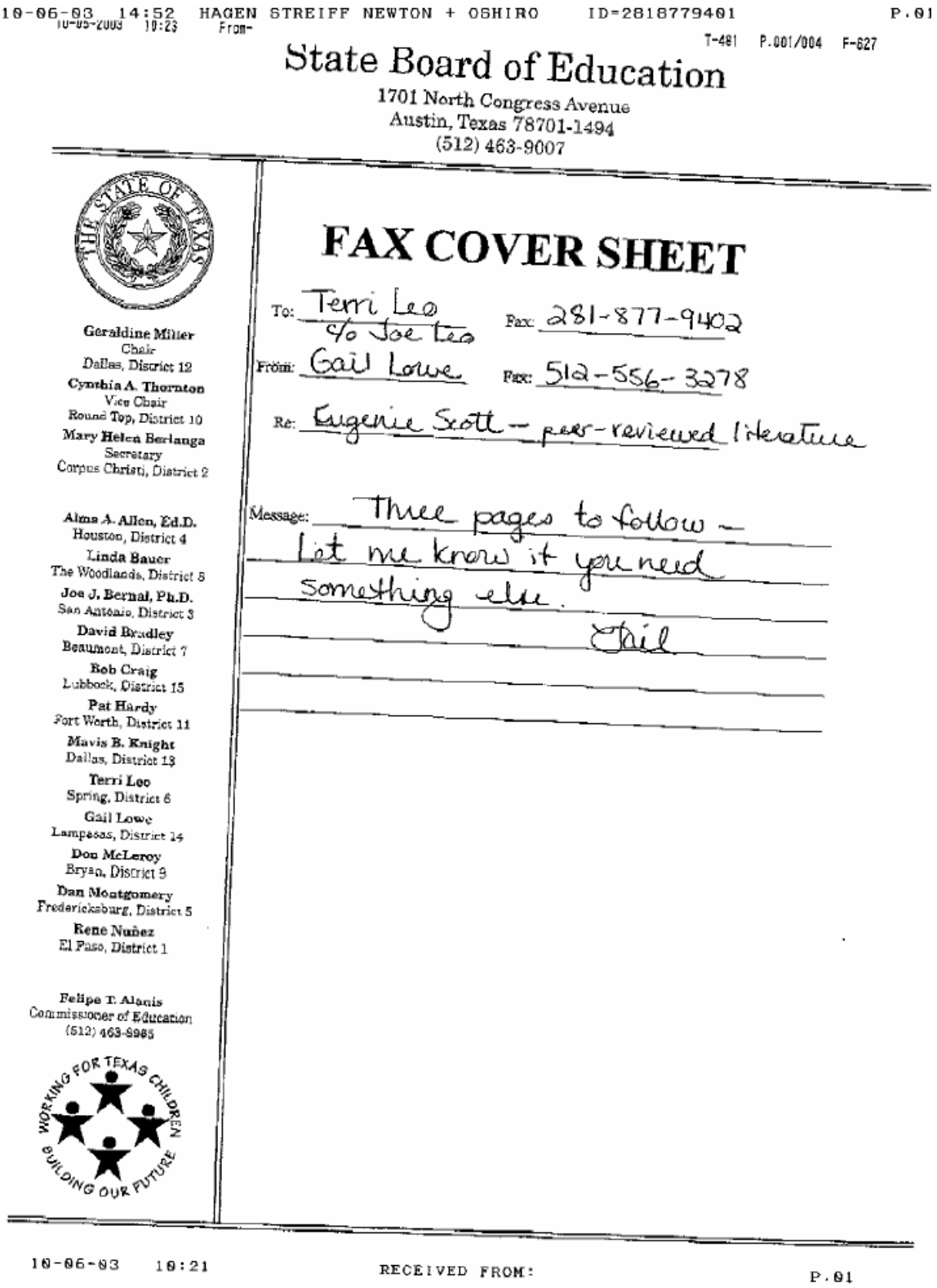
As a probability theorist, I, and many other mathematically-trained scientists, regard claims for the creative power of natural selection as implausible in the extreme. To see why, MIT's Murray Eden asks us to imagine a library evolving from a single phrase: "Begin with a meaningful phrase, retype it with a few mistakes, make it longer by adding letters, and rearrange subsequences in the string of letters; then examine the result to see if the new phrase is meaningful. Repeat until the library is complete." (Wistar Symposium, p. 110) From the standpoint of probability, neo-Darwinism is even more absurd.

Mathematicians aren't the only ones criticizing neo-Darwinism. Consider Franklin Harold, a professor emeritus of cell biology at Colorado State University. In 2001 he published *The Way of the Cell* with Oxford University Press. He remarked: "There are presently no detailed Darwinian accounts of the evolution of any biochemical or cellular system, only a variety of wishful speculations." (p. 205)

Last year I debated Brown University biologist Kenneth Miller, the lead author for one of the biology textbooks under consideration here (Fourth World Skeptics Conference, June 21, 2002). At that debate I read Harold's criticism. Miller didn't dispute the truth of Harold's statement, but merely made the irrelevant observation that Harold had retired fifteen years earlier. Sadly, such failures to address meaningful criticism of neo-Darwinian theory also pervade Miller's textbook and the others under consideration.

In his July testimony David Hillis implored you to "ignore the push to take the science out of our school science textbooks." Hillis missed the point entirely. The point is to put *more* science into our textbooks by including not only the strengths but also the weaknesses of neo-Darwinian evolutionary theory. Don't believe for one moment that all meaningful scientific debate about biological evolution has ceased or that it is only about loose ends and trivial details. If that were the case, none of us would be here today.

Appendix 6: Eugenie Scott on Peer Review (Exhibit)



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FAX COVER SHEET

To: Terri Leo c/o Joe Tes Fax: 281-877-9402

From: Gail Lowe Fax: 512-556-3278

Re: Eugenie Scott – peer-reviewed literature

Message: Three pages to follow – let me know if you need something else.

Gail

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National Center for Science Education, Inc.

Defending the Teaching of Evolution in the Public Schools

Executive Director

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September 30, 2003

Gail Lowe
Texas Board of Education
by fax to 512/556-3278
3 pages total

Dear Ms. Lowe,

The Texas Freedom Network (TFN) received a request from one of the members of the Texas State Board of Education for a definition of the term "peer reviewed journal" and an analysis of whether Discovery Institute personnel publish in such journals. Because NCSE is an organization of scientists and teachers, TFN requested we prepare a brief essay responding to this board member's question.

Thinking that this information might be useful to other members of the SBoE, I have taken the liberty of sending it to you as well.

I hope you will not hesitate to contact me if you have any questions about this issue. The National Center for Science Education is a clearinghouse for information on the creationism/evolution controversy, and for over twenty years has provided information to scientists, teachers, parents and other citizens, as well as school boards.

Sincerely yours

Eugenie C. Scott, Ph.D.
Executive Director, NCSE

1. What constitutes a scientific peer-reviewed journal?

Peer-reviewed scientific research articles are the articles that actually report the experiments, measurements, calculations, and so forth that scientists make. They are often formidably technical, impersonal, and dry; they are written by working research scientists for other working research scientists in the same field. To say that a scientific article is peer-reviewed is to say that it has been evaluated by other scientists with a comparable knowledge of the field who ask: Is the writing style clear? Are the materials and methods explicitly stated, and in enough detail that another researcher would know how to try to reproduce the results? Does the paper show an understanding of previous results in the field? Does it add anything new to the body of scientific knowledge? And perhaps most importantly, do the results support the conclusions? The purpose of peer-review is not, as the Discovery Institute might like you to believe, to censor the scientific literature, but to ensure that there is scientific evidence for the claims made in it. Many more papers are submitted for publication than are printed; this is true both of mundane and cutting-edge research.

The system of peer review is not perfect, of course. There are worthy papers that fail peer-review (but usually their authors can find another journal in which to publish); there are unworthy papers that pass peer-review. For all its faults, however, the system is the best we have. The Discovery Institute is fond of pointing out that On the Origin of Species was not peer-reviewed, which is true: the system of peer-review did not exist in 1859, and even today books are not generally thought of as part of the peer-reviewed scientific research literature. But this is irrelevant. What matters is that unlike today's antievolutionists, Darwin was working within the norms of the scientific community: he was already a well-respected scientist when he published the Origin, and he and Wallace presented a joint paper at the Linnean Society in 1858 on natural selection. But the DI doesn't want to play by the rules.

A peer-reviewed scientific journal is simply a scientific journal that uses peer-review (as described above) in its editorial decisions of which papers to publish. Some peer-reviewed scientific journals publish only peer-reviewed papers; some -- including the two most prestigious journals, Science and Nature -- publish other sorts of articles as well, such as letters to the editor, opinion pieces, book reviews, news pieces, and so on, but it's always clear which articles are the peer-reviewed scientific research articles and which aren't. (The DI is not always clear about this, however. Trisha Gura's article in Nature, item 9 in the DI bibliography of "44 peer-reviewed articles," appeared there under the rubric "News Feature," suggesting that it wasn't in fact peer-reviewed. That doesn't make it a bad article; in fact, since it's written more for the general reader than for the working research scientist, it's probably more useful for classrooms than most of the other publications in the bibliography!)

2. Has Discovery published scientific peer-reviewed papers?

There are, to be sure, scientists associated with the DI who publish in the peer-reviewed scientific research literature (e.g., Michael Behe, Scott Minnich, Henry Schaefer). But they are not publishing anything there that supports "intelligent design" or that casts doubt on evolution. Indeed, as far as we know, they are not even *submitting* any original research on "intelligent design" to the scientific journals, preferring instead to publish editorials, popular articles, and books. (Occasionally they publish articles in peer-reviewed journals in philosophy, rhetoric, or similar fields.) William Dembski told the Chronicle of Higher Education: "I've just gotten kind of blase about submitting things to journals where you often wait two years to get things into print ... And I find I can actually get the turnaround faster by writing a book and getting the ideas expressed there. My books sell well. I get a royalty. And the material gets read more." (December 21, 2001).

Many of the books published by Fellows of the DI are published by popular and/or religious presses, whose major criterion for publication is whether there is a sufficient market to sell enough copies to make a profit. The Discovery Institute has reportedly been claiming that books like William

Dembski's *The Design Inference* (Cambridge University Press, 1998) or *Darwinism, Design, and Public Education*, ed. John Angus Campbell and Stephen C. Meyer (Michigan State University Press, 2003) are peer-reviewed. They may have undergone a degree of editoral review; they did not undergo peer-review in the sense in which scientific research articles are peer-reviewed. Moreover, these are not books that present scientific research -- Dembski's book was published as a philosophy book, Campbell and Meyer's as a rhetoric book. To say, as DI Fellow Francis Beckwith has, that the DI includes "credentialed scholars whose works have been published by university press monographs and in peer-reviewed periodicals" is to evade the central question: are they publishing good science?

3. Does Discovery misquote real scientists?

At the outset, it is important to note that the charge is not one of misquotation. During the September hearing of the Texas BOE, Ms. Leo on several occasions contended that "the quotations are accurate." But of course the DI is capable of reproducing the words of scientists accurately. The charge is rather twofold: that the DI is choosing from all of the scientific literature only the articles that they think will support their position without any consideration of opposing scientific viewpoints in other articles and then taking quotations out of context in such a way as to distort the author's intended meaning. (These tactics are so common in the antievolutionist literature that they've received colloquial names: "cherry-picking" for the former; "quote-mining" for the latter.)

One flagrant example of quote-mining occurred during William Dembski's testimony before the Texas BOE. He said:

In an interview with Salon (May 4, 2001), Scott tells us why. According to her, for textbooks to admit the lack of consensus over how evolution happened will "confuse kids about the soundness of evolution as a science."
http://www.designinference.com/documents/2003.09.TSBoE_Testimony.pdf

He gets the words right but the meaning wrong. If you consult the Salon article in question at:
http://dir.salon.com/news/feature/2001/05/04/darwin/index.html?pn=2
you find that Eugenie C. Scott (NCSE's executive director) was not discussing textbooks but disclaimers stating that "evolution is just a theory." More importantly, contrary to what Dembski says, she was not discussing doubts about *how* evolution happened but rather doubts about *whether* evolution happened.

In that article, Scott did not deny that scientists avidly debate the "hows" of evolution; in fact, she has clearly and repeatedly stated that such topics are appropriate for the science classroom. But Dembski says, "According to her, for textbooks to admit the lack of consensus over how evolution happened will 'confuse kids about the soundness of evolution as a science.'" He thereby implies that Scott believes that textbooks should not discuss arguments about how evolution occurs, which she does not. Attributing ideas to people that they do not hold is considered either exceedingly poor scholarship or, worse, willful polemicizing.

Further examples of the DI's quote-mining are available on the NCSE web site at:
http://www.ncseweb.org/article.asp?category=12
and at:
http://www.ncseweb.org/resources/articles/3878_analysis_of_the_discovery_inst_4_5_2002.asp
The latter document compiles the reactions of many of the scientists whose work was misrepresented in the DI's bibliography of 44 publications from the scientific literature. With few exceptions, the DI did not make clerical errors in reproducing statements from these articles. It was their selection of statements out of context -- the quote-mining -- that the authors protest, because such selection misrepresents the meaning of their articles.

Appendix 7: W. A. Dembski's Response to Eugenie Scott (Exhibit)

Peer Review — Response to Eugenie Scott and the NCSE
By William A. Dembski
October 10, 2003

Eugenie Scott's letter of September 30, 2003 to members of the Texas State Board of Education purports to show that intelligent design research is not published in the peer-reviewed literature. But, in fact, Scott has purposely failed to disclose certain key items of information which demonstrate that intelligent design research is now part of the mainstream peer-reviewed scientific literature.

I can substantiate the charge that Scott has purposely failed to disclose key information in this regard. Scott and I have met at several conferences and debates, and we correspond typically a few times a year by email. Here is a paragraph from an email she sent me on December 3, 2002 (in context, Scott was disparaging my work on intelligent design because, so she claims, it has not been cited in the appropriate peer-reviewed literature):

> "It would perhaps be more interesting (and something for you to take rather more pride in) if it were the case that the scientific, engineering, and mathematical applications of evolutionary algorithms, fuzzy logic and evolution, etc., referenced TDI or your other publications and criticisms. In a quick survey of a few of the more scholarly works, I didn't see any, but perhaps you or someone else might know of them."

The abbreviation "TDI" here refers to my book *The Design Inference* (more about this book in a moment because Scott disparages it also in her letter of September 30, 2003). Now, the fact is that this book has been cited in precisely the literature that Scott claims has ignored it. I pointed this out to her in an email dated December 6, 2002. Here is the key bibliographic reference, along with the annotation, that I sent her:

> Chiu, D.K.Y. and Lui, T.H. Integrated use of multiple interdependent patterns for biomolecular sequence analysis. *International Journal of Fuzzy Systems*. Vol.4, No.3, Sept. 2002, pp.766–775.
>
> The article begins:
>
> "Detection of complex specified information is introduced to infer unknown underlying causes for observed patterns [10]. By complex information, it refers to information obtained from observed pattern or patterns that are highly improbable by random chance alone. We evaluate here the complex pattern corresponding to multiple observations of statistical interdependency such that they all deviate significantly from the prior or null hypothesis [8]. Such multiple interdependent patterns when consistently observed can be a powerful indication of common underlying causes. That is, detection of significant multiple interdependent patterns in a consistent way can lead to the discovery of possible new or hidden knowledge."
>
> Reference number [10] here is to *The Design Inference*.

Not only does this article cite my work favorably, but it makes my work in *The Design Inference* the basis for the entire article. When I sent Scott this information by email, she never got back to me. Interestingly, though, she has since that exchange dropped a line of criticism that she had previously adopted, namely, she had claimed that intelligent design is unscientific because intelligent design research is not cited in the peer-reviewed scientific literature. There's no question that it is cited (and favorably at that) in the peer-reviewed scientific literature.

What about actual intelligent design research being published in the peer-reviewed scientific literature? Scott doesn't want to allow that my book *The Design Inference* properly belongs to this literature. In her letter of September 30, 2003, she remarks that this book "may have undergone a degree of editorial review" but it "did not undergo peer-review in the sense in which scientific research articles are peer-reviewed." She then adds that *The Design Inference* "does not present scientific research — Dembski's book was published as a philosophy book."

Every one of these remarks is false. What's more, their falsity is readily established. Editorial review refers to a book submitted to a publisher for which the editors, who are employees of the publisher and in the business of trying to acquire, produce, and market books that are profitable, decide whether or not to accept the book for publication. Editorial review may look to expert advice regarding the accuracy, merit, or originality of the book, but the decision to publish rests solely with the editors and publishers. Peer-review, on the other hand, refers to journal articles and academic monographs (these are articles that are too long to be published in a journal and which therefore appear in book form) that are submitted to referees who are experts in the topic being addressed and who must give a positive review of the article or monograph if it is to be published at all. *The Design Inference* went through peer-review and not merely editorial review.

To see this, it is enough to note that *The Design Inference* was published by Cambridge University Press as part of a Cambridge monograph series: *Cambridge Studies in Probability, Induction, and Decision Theory*. Scott doesn't point this out in her letter of September 30, 2003 because if she had, her claim that my book was editorially reviewed but not peer-reviewed would have instantly collapsed. Academic monograph series, like the Cambridge series that published my book, have an academic review board that is structured and functions identically to the review boards of academic journals. At the time of my book's publication, the review board for *Cambridge Studies in Probability, Induction, and Decision Theory* included members of the National Academy of Sciences as well as one Nobel laureate, John Harsanyi, who shared the prize in 1994 with John Nash, the protagonist in the film *A Beautiful Mind*. As it is, *The Design Inference* had to pass peer-review with three anonymous referees before Brian Skyrms, who heads the academic review board for this Cambridge series, would recommend it for publication to the Cambridge University Press editors in New York. Brian Skyrms is on the faculty of the University of California at Irvine and is a member of the National Academic of Sciences. It is easy enough to confirm what I'm saying here by contacting him [his email address is bskyrms@uci.edu]. Scott either got her facts wrong or never bothered to check them in the first place.

What about Scott's claim that *The Design Inference* "does not present scientific research — Dembski's book was published as a philosophy book." It is true that Cambridge University Press

officially lists this book as a philosophy monograph. But why should how the book is listed by its publisher be relevant to deciding whether it does or does not contain genuine scientific content? The Library of Congress Control Number (LCCN) for *The Design Inference* is QA279.D455. As any mathematician knows, QA refers to mathematics and the 270s refer to probability and statistics. Is Scott therefore willing to accept that *The Design Inference* does present scientific research after all because the Library of Congress treats it as a mathematical and statistical monograph rather than as a philosophical monograph?

How this book is listed is beside the point. I submit that the book makes a genuine contribution to the statistical literature, laying out in full technical detail a method of design detection applicable to biology. Scott can dispute this if she likes, but to do so she needs to engage the actual content of my book and not dismiss it simply because the publisher lists it one way or another. Also, it's worth noting that up until I pointed out to her that *The Design Inference* is cited in the peer-reviewed mathematical and biological literature, her main line of argument against the scientific merit of my work was that it wasn't being cited in the peer-reviewed scientific literature. As I showed above, this line of criticism is no longer tenable.

I have discussed at length Scott's treatment of my own work because this is where I'm best qualified to speak to the issue of peer review in relation to intelligent design. As for the other claims in her letter of September 30, 2003, let me offer three remarks:

- Seattle's Discovery Institute is only the tip of the iceberg for scientists who support intelligent design. Intelligent design research is being published in precisely the places Scott claims it is not being published [see Appendix 3]. Moreover, intelligent design has a developing research program. For more information on this, see the ID FAQ on my website: http://www.designinference.com/documents/2003.09.ID_FAQ.pdf [the relevant portion of this FAQ appears, in beefed-up form, in Appendix 4].

- Scott's charge that critics of Darwinian evolution, like me and my colleagues at the Discovery Institute, "misquote" or "quote-mine" the work of scientists has degenerated into a slogan. As a slogan, its effect is to shut down discussion before it can get started. Scientists have no special privileges over anyone else. If they say things that are false or inaccurate, they need to be called to account. Reasoned discourse in a free society demands that people, and that includes scientists, confront the record of their words. One can dispute what the words meant in context, but it is not enough merely to assert that the words were quoted out of context.

- Finally, in her letter of September 30, 2003, Scott objects to my use of a statement she made in an interview with *Salon*. According to her letter, I implied that "Scott believes that textbooks should not discuss arguments about how evolution occurs." She protests that she "was not discussing doubts about *how* evolution happened but rather doubts about *whether* evolution happened." (Emphasis hers.) But if she really believes that there are many views of how evolution occurred, why does she and her lobbying group the NCSE [National Center for Science Education] support only one view on how evolution occurred, namely, the neo-Darwinian view? Why, for instance, isn't she demanding that the biology textbooks describe the controversy

between neo-Darwinists (like John Maynard Smith) and self-organizational theorists (like Stuart Kauffman)? Neither disputes whether evolution has happened. Yet, the self-organizational theorists strongly dispute that the neo-Darwinian view adequately explains how evolution occurred. All the textbooks ignore the self-organizational challenge to neo-Darwinism. If Scott (and the NCSE) is such a champion of pluralism concerning how evolution happened, why isn't she pressing for the inclusion of self-organizational theory in the biology textbooks? Why do all her lobbying efforts promote neo-Darwinism as the only view appropriate for the textbooks of how evolution occurred? I submit it is because, as she said in her *Salon* interview, to do otherwise will only "confuse kids about the soundness of evolution as a science." In other words, to ensure that kids are not confused about *whether* evolution occurred, textbooks need to tell them only one story about *how* evolution occurred, namely, the neo-Darwinian story. This isn't education. It's indoctrination.

Appendix 8: Wall Street Journal on Peer Review (Exhibit)

The Branding of a Heretic
Are religious scientists unwelcome at the Smithsonian?
BY DAVID KLINGHOFFER
Wall Street Journal
Friday, January 28, 2005 12:01 a.m. EST
http://www.opinionjournal.com/taste/?id=110006220

The question of whether Intelligent Design (ID) may be presented to public-school students alongside neo-Darwinian evolution has roiled parents and teachers in various communities lately. Whether ID may be presented to adult scientific professionals is another question altogether but also controversial. It is now roiling the government-supported Smithsonian Institution, where one scientist has had his career all but ruined over it.

The scientist is Richard Sternberg, a research associate at the Smithsonian's National Museum of Natural History in Washington. The holder of two Ph.D.s in biology, Mr. Sternberg was until recently the managing editor of a nominally independent journal published at the museum, Proceedings of the Biological Society of Washington, where he exercised final editorial authority. The August issue included typical articles on taxonomical topics--e.g., on a new species of hermit crab. It also included an atypical article, "The Origin of Biological Information and the Higher Taxonomic Categories." Here was trouble.

The piece happened to be the first peer-reviewed article to appear in a technical biology journal laying out the evidential case for Intelligent Design. According to ID theory, certain features of living organisms--such as the miniature machines and complex circuits within cells--are better explained by an unspecified designing intelligence than by an undirected natural process like random mutation and natural selection.

Mr. Sternberg's editorship has since expired, as it was scheduled to anyway, but his future as a researcher is in jeopardy--and that he had not planned on at all. He has been penalized by the museum's Department of Zoology, his religious and political beliefs questioned. He now rests his hope for vindication on his complaint filed with the U.S. Office of Special Counsel (OSC) that he was subjected to discrimination on the basis of perceived religious beliefs. A museum spokesman confirms that the OSC is investigating. Says Mr. Sternberg: "I'm spending my time trying to figure out how to salvage a scientific career."

The offending review-essay was written by Stephen Meyer, who holds a Cambridge University doctorate in the philosophy of biology. In the

article, he cites biologists and paleontologists critical of certain aspects of Darwinism--mainstream scientists at places like the University of Chicago, Yale, Cambridge and Oxford. Mr. Meyer gathers the threads of their comments to make his own case. He points, for example, to the Cambrian explosion 530 million years ago, when between 19 and 34 animal phyla (body plans) sprang into existence. He argues that, relying on only the Darwinian mechanism, there was not enough time for the necessary genetic "information" to be generated. ID, he believes, offers a better explanation.

Whatever the article's ultimate merits--beyond the judgment of a layman--it was indeed subject to peer review, the gold standard of academic science. Not that such review saved Mr. Sternberg from infamy. Soon after the article appeared, Hans Sues--the museum's No. 2 senior scientist--denounced it to colleagues and then sent a widely forwarded e-mail calling it "unscientific garbage."

Meanwhile, the chairman of the Zoology Department, Jonathan Coddington, called Mr. Sternberg's supervisor. According to Mr. Sternberg's OSC complaint: "First, he asked whether Sternberg was a religious fundamentalist. She told him no. Coddington then asked if Sternberg was affiliated with or belonged to any religious organization. . . . He then asked where Sternberg stood politically; . . . he asked, 'Is he a right-winger? What is his political affiliation?' " The supervisor (who did not return my phone messages) recounted the conversation to Mr. Sternberg, who also quotes her observing: "There are Christians here, but they keep their heads down."

Worries about being perceived as "religious" spread at the museum. One curator, who generally confirmed the conversation when I spoke to him, told Mr. Sternberg about a gathering where he offered a Jewish prayer for a colleague about to retire. The curator fretted: "So now they're going to think that I'm a religious person, and that's not a good thing at the museum."

In October, as the OSC complaint recounts, Mr. Coddington told Mr. Sternberg to give up his office and turn in his keys to the departmental floor, thus denying him access to the specimen collections he needs. Mr. Sternberg was also assigned to the close oversight of a curator with whom he had professional disagreements unrelated to evolution. "I'm going to be straightforward with you," said Mr. Coddington, according to the complaint. "Yes, you are being singled out." Neither Mr. Coddington nor Mr. Sues returned repeated phone messages asking for their version of events.

Mr. Sternberg begged a friendly curator for alternative research space, and he still works at the museum. But many colleagues now ignore him when he greets them in the hall, and his office sits empty as "unclaimed space." Old colleagues at other institutions now refuse to work with him on publication projects, citing the Meyer episode.

The Biological Society of Washington released a vaguely ecclesiastical statement regretting its association with the article. It did not address its arguments but denied its orthodoxy, citing a resolution of the American Association for the Advancement of Science that defined ID as, by its very nature, unscientific.

It may or may not be, but surely the matter can be debated on scientific grounds, responded to with argument instead of invective and stigma. Note the circularity: Critics of ID have long argued that the theory was unscientific because it had not been put forward in a peer-reviewed scientific journal. Now that it has, they argue that it shouldn't have been because it's unscientific. They banish certain ideas from certain venues as if by holy writ, and brand heretics too. In any case, the heretic here is Mr. Meyer, a fellow at Seattle's Discovery Institute, not Mr. Sternberg, who isn't himself an advocate of Intelligent Design.

According to the OSC complaint, one museum specialist chided him by saying: "I think you are a religiously motivated person and you have dragged down the Proceedings because of your religiously motivated agenda." Definitely not, says Mr. Sternberg. He is a Catholic who attends Mass but notes: "I would call myself a believer with a lot of questions, about everything. I'm in the postmodern predicament."

Intelligent Design, in any event, is hardly a made-to-order prop for any particular religion. When the British atheist philosopher Antony Flew made news this winter by declaring that he had become a deist--a believer in an unbiblical "god of the philosophers" who takes no notice of our lives--he pointed to the plausibility of ID theory.

Darwinism, by contrast, is an essential ingredient in secularism, that aggressive, quasi-religious faith without a deity. The Sternberg case seems, in many ways, an instance of one religion persecuting a rival, demanding loyalty from anyone who enters one of its churches--like the National Museum of Natural History.

Mr. Klinghoffer, a columnist for the Jewish Forward, is the author of "Why the Jews Rejected Jesus," to be published by Doubleday in March.

Endnotes

[1]Peter Slevin, "Battle on Teaching Evolution Sharpens," *Washington Post* (March 14, 2005): A1.

[2]Jakob Wolf, "What Kind of Revolution Is the Design Revolution?" *Metanexus* (May 12, 2004): available online at http://www.metanexus.net/metanexus_online/show_article.asp?8846 (last accessed March 15, 2005). See also Jakob Wolf's analysis of intelligent design titled *The Cry of the Rose: Intelligent Design in Nature and the Critique of Darwinism* (Copenhagen: ANIS Publishers, 2004). The original title in Danish reads *Rosens Råb: Intelligent Design I Naturen, Opgør Med Darwinismen*.

[3]See William A. Dembski, *No Free Lunch: Why Specified Complexity Cannot Be Purchased without Intelligence* (Lanham, Md.: Rowman and Littlefield, 2002), ch. 6.

[4]Thomas Kuhn, *The Structure of Scientific Revolutions*, 2nd ed. (Chicago: University of Chicago Press, 1970).

[5]For the current view, see Philip Kearey and Frederick J. Vine, *Global Tectonics* (Oxford: Blackwell Sciences, 1996). For the former view, known as the geosynclinal theory, which was subsequently discarded, see Thomas H. Clark and Colin W. Stearn, *The Geological Evolution of North America* (New York: Ronald Press, 1960). On page 43, Clark and Stearn remark: "The geosynclinal theory is one of the great unifying principles in geology. In many ways its role in geology is similar to that of the theory of evolution, which serves to integrate the many branches of the biological sciences.... Just as the doctrine of evolution is universally accepted among biologists, so also the geosynclinal origin of the major mountain systems is an established principle in geology." The geosynclinal theory is now dead and buried.

[6]The fellows of the International Society for Complexity, Information, and Design are a case in point: http://www.iscid.org/fellows.php (last accessed March 15, 2005). Here is a list of internationally recognized scientists from around the globe, all of whom accept that intelligent design is a legitimate scientific theory.

[7]Stephen Jay Gould, *Ever Since Darwin: Reflections in Natural History* (New York: W. W. Norton 1977), 267.

[8]Richard Dawkins, *The Blind Watchmaker* (New York: Norton, 1986), 6.

[9]Peter Singer, *A Darwinian Left: Politics, Evolution, and Cooperation* (New Haven, Conn.: Yale University Press, 2000), 6.

[10]Compare my explicitly theological book *Intelligent Design: The Bridge between Science and Theology* (Downers Grove, Ill.: InterVarsity, 1999), published with a religious publisher, with my peer-reviewed research monograph *The Design Inference: Eliminating Chance through Small Probabilities* (Cambridge: Cambridge University Press, 1998), which appeared in *Cambridge Studies in Probability, Induction, and Decision Theory*.

[11]David Lindley, *The End of Physics: The Myth of a Unified Theory* (New York: Basic Books, 1993).

[12]Michael Crichton, "Aliens Cause Global Warming," Caltech Michelin Lecture (January 17, 2003): available online at http://www.crichton-official.com/speeches/speeches_quote04.html (last accessed March 15, 2005).

[13]NASA funding of SETI ended in 1993. See http://www.setileague.org/general/history.htm (last accessed March 15, 2005).

[14]Two prominent SETI projects currently under way are Paul Davies's research with the Australian Centre for Astrobiology (http://aca.mq.edu.au, last accessed March 15, 2005) and the SETI@home project at the University of California at Berkeley (http://setiathome.ssl.berkeley.edu, last accessed March 15, 2005).

[15]See Dembski, *The Design Inference*, chs. 5 and 6 as well as the epilogue and Dembski, *No Free Lunch*, chs. 2 and 3. Note that in *The Design Inference*, the actual phrase *specified complexity* does not appear. There it is expressed as *specified improbability* or *specified events of small probability*. The two notions are logically equivalent.

[16]Carl Sagan, *Contact* (New York: Simon Schuster, 1985).

[17] Dembski, *The Design Inference*, chs. 1 and 2.

[18]See, for instance, William A. Dembski and Michael Ruse, eds., *Debating Design: From Darwin to DNA* (Cambridge: Cambridge University Press, 2004), pt. IV.

[19]For such design-theoretic arguments at the level of cosmology, see Guillermo Gonzalez and Jay Wesley Richards, *The Privileged Planet: How Our Place in the Cosmos Is Designed for Discovery* (Washington, D.C.: Regnery, 2004). For such design-theoretic arguments at the level of biology, see Michael Behe, *Darwin's Black Box: The Biochemical Challenge to Evolution* (New York: Free Press, 1996) as well as Dembski, *No Free Lunch*, ch. 5.

[20]Two of the principal purveyors of this view in the United States are the Institute for Creation Research (www.icr.org) and Answers in Genesis (www.answersingenesis.org).

[21]See Phillip Johnson's essay "Evolution as Dogma: The Establishment of Naturalism" in William A. Dembski, ed., *Uncommon Dissent: Intellectuals Who Find Darwinism Unconvincing* (Wilmington, Del.: ISI Books, 2004).

[22]See Aristotle's *Physics* as well as his *Metaphysics* in *The Basic Works of Aristotle*, ed. R. McKeon (New York: Random House, 1941).

[23] See the AP article "Famous Atheist Now Believes in God" (December 9, 2004): http://abcnews.go.com/US/wireStory?id=315976 (last accessed March 25, 2005).

[24]See the interview between Antony Flew and Gary Habermas at http://www.biola.edu/antonyflew (last accessed March 25, 2005).

[25]See Robert Pennock's *Tower of Babel* (Cambridge, Mass.: MIT Press, 1999) and his edited collection *Intelligent Design Creationism and its Critics* (Cambridge, Mass: MIT Press, 2001) as well as Barbara Forrest and Paul Gross's *Creationism's Trojan Horse: The Wedge of Intelligent Design* (Oxford: Oxford University Press, 2004). The identification of intelligent design with creationism is evident from the very titles of the two latter books.

[26]Kenneth R. Miller, *Finding Darwin's God: A Scientist's Search for Common Ground between God and Evolution* (New York: HarperCollins, 1999), 226–232.

[27]Frederick C. Crews, "Saving Us from Darwin, Part II," *The New York Review of Books* (October 18, 2001): available online at http://www.nybooks.com/articles/article-preview?article_id=14622 (last accessed March 25, 2005).

[28]Quoted in Henry Margenau and Roy Varghese, eds., *Cosmos, Bios, and Theos* (LaSalle, Ill.: Open Court, 1992), 83.

[29]Paul Davies, *The Cosmic Blueprint: New Discoveries in Nature's Creative Ability to Order the Universe* (New York: Simon and Schuster, 1988), 203.

[30]Paul Davies, *Superforce: The Search for a Grand Unified Theory of Nature* (New York: Simon and Schuster, 1984), 243.

[31]See note 58.

[32]Pierre Duhem, *To Save the Phenomena: An Essay on the Idea of Physical Theory from Plato to Galileo*, E. Dolan and C. Maschler, trans. (Chicago: University of Chicago Press, 1969).

[33]Pierre Duhem, *The Aim and Structure of Physical Theory*, P. P. Wiener, trans. (Princeton: Princeton University Press, 1954).

[34]Kuhn, *The Structure of Scientific Revolutions*, ch. 10.

[35]In the sixth edition of Darwin's *Origin of Species*, there is exactly one diagram, namely, one that depicts the evolution of organisms as a gradually branching tree. See Charles Darwin, *The Origin of Species*, 6th ed. (London: John Murray, 1872), 90–91.

[36]Stephen Jay Gould, "Evolution's Erratic Pace," *Natural History* 86(5) (May 1977): 12–16.

[37]Niles Eldredge and Stephen Jay Gould, "Punctuated Equilibria: An Alternative to Phyletic Gradualism," 82–115 in *Models in Paleobiology*, ed. T. J. M. Schopf (San Francisco: Freeman, 1973).

[38]Lynn Margulis and Dorion Sagan, *Acquiring Genomes: A Theory of the Origins of Species* (New York: Basic Books, 2002), 103.

[39]Robert B. Laughlin, *A Different Universe: Reinventing Physics from the Bottom Down* (New York: Basic Books, 2005), 168–169.

[40]Consider the following remark by Simon Conway Morris: "When discussing organic evolution the only point of agreement seems to be: 'It happened.' Thereafter, there is little consensus...." Quoted from his article "Evolution: Bringing Molecules into the Fold," *Cell* 100 (January 7, 2000): 1–11.

[41]Criticism of intelligent design in the mainstream biological literature is now so extensive that I give only a few examples: R. H. Thornhill and D. W. Ussery, "A Classification of Possible Routes of Darwinian Evolution," *Journal of Theoretical Biology* 203 (2000): 111–116. This paper presents a conceptual analysis of Michael Behe's claim that irreducible complexity poses an obstacle to Darwinian evolution. Thomas D. Schneider, "Evolution of Biological Information," *Nucleic Acids Research* 28(14) (2000): 2794–2799 and Richard E. Lenski, Charles Ofria, Robert T. Pennock, and Christoph Adami, "The Evolutionary Origin of Complex Features," *Nature* 423 (May 8, 2003): 139–144. These last two papers offer computational simulations that are supposed to demonstrate Darwinian evolutionary pathways leading to irreducible complexity. Reviews of intelligent design books are also increasingly common in the biological literature. For instance, my book *No Free Lunch* received the following review in *Nature*: Brian Charlesworth, "Evolution by Design?" *Nature* 418 (July 11, 2002): 129.

[42]Eugenie Scott, "'Science and Religion', 'Christian Scholarship', and 'Theistic Science': Some Comparisons," *Reports of the National Center for Science Education* 18(2) (1998): 30–32. Available online at http://www.ncseweb.org/resources/articles/6149_science_and_religion_chris_3_1_1998.asp (last accessed March 29, 2005).

[43]Jacket endorsement of William A. Dembski's anthology *Uncommon Dissent: Intellectuals Who Find Darwinism Unconvincing* (Wilmington, Del.: ISI Books, 2004).

[44]Larry Arnhart, *Darwinian Natural Right: The Biological Ethics of Human Nature* (Albany, N.Y.: State University of New York Press, 1998).

[45]Arnhart made this point with special clarity at a several-day symposium devoted to intelligent design at Hillsdale College. The symposium was titled "The Debate over Intelligent Design" and took place November 10-13, 2002. For details, see http://www.hillsdale.edu/cca/2002/IntelligentDesign/default.htm (last accessed March 28, 2005). Representing the Darwinian side at this symposium were Larry Arnhart, Michael Ruse, Mano Singham, and Niles Eldredge. Representing the intelligent design side at this symposium were Michael Behe, Jonathan Wells, and William Dembski.

[46]Charles Darwin, *On the Origin of Species*, facsimile 1st ed. (1859; reprinted Cambridge, Mass.: Harvard University Press, 1964), 2.

[47]See http://www.whitehat.com.au/Australia/People/Bragg.asp (last accessed March 28, 2005).

[48]James A. Shapiro and Richard von Sternberg, "Why Repetitive DNA Is Essential to Genome Function," *Biological Reviews* 80 (2005): 1–24.

[49]Roy J. Britten, "Coding Sequences of Functioning Human Genes Derived Entirely from Mobile Element Sequences," *Proceedings of the National Academy of Sciences* 101(48) (November 30, 2004): 16825–16830.

[50]Email correspondence from David Raup addressed to me and dated July 18, 2001.

[51]Percival Davis and Dean Kenyon, *Of Pandas and People: The Central Question of Biological Origins*, 2nd ed. (Dallas: Haughton, 1993). The first edition was published in 1989.

[52]See http://www.fteonline.com (last accessed March 29, 2005).

[53]Chapters in the two editions are identical. Pagination is virtually identical. Illustrations are largely unchanged, though there are some exceptions. A few illustrations have been replaced (compare the illustrations on pages 36 and 37 in the two editions). Some have been added (see the illustrations on pages 142 and 143 in the second edition). And some have been deleted (for instance, the illustration on page 76 of the first edition). The glossary in the second

edition is considerably beefed up when compared to the first edition. As for sections within chapters, these are essentially identical until the last chapter, which is titled "Biochemical Similarities." At the end of that chapter, some sections in the first edition on molecular clocks were replaced in the second edition with some sections on the blood-clotting mechanism. Chapter endings in the second edition include endnotes whereas the first edition did not. Changes in the actual text between the two editions is minimal, focusing on clarifications and improvements.

[54]Jonathan Wells, *Icons of Evolution: Why Much of What We Teach about Evolution Is Wrong* (Washington, D.C.: Regnery, 2000).

[55]Ibid., ch. 2 and appendix 1.

[56]See Charles Thaxton, Walter Bradley, and Roger Olsen, *The Mystery of Life's Origin: Reassessing Current Theories* (New York: Philosophical Library, 1984); Robert Shapiro, *Origins, A Skeptics Guide to the Creation of Life on Earth* (New York: Summit Books, 1986); Hubert Yockey, *Information Theory and Molecular Biology* (Cambridge: Cambridge University Press, 1992), chs. 8, 9, and 10; Gordon Mills and Dean Kenyon, "The RNA World: A Critique," *Origins & Design* 17(1) (1996): 9–14; and Paul Davies, *The Fifth Miracle: The Search for the Origin and Meaning of Life* (New York: Simon & Schuster, 1999). According to Davies (p. 17), we are "a very long way from comprehending" how life originated. "This gulf in understanding is not merely ignorance about certain technical details, it is a major conceptual lacuna.... My personal belief, for what it is worth, is that a fully satisfactory theory of the origin of life demands some radically new ideas."

[57]Dan Vergano and Greg Toppo, "'Call to Arms' on Evolution," *USA Today* (March 23, 2005): available online at http://www.usatoday.com/news/education/2005-03-23-evolution_x.htm?POE=click-refer (last accessed March 29, 2005).

[58]According to Fred Hoyle, one of the great theoretical astronomers of the twentieth century, "A common sense interpretation of the facts suggests that a superintellect has monkeyed with physics, as well as with chemistry and biology, and that there are no blind forces worth speaking about in nature. The numbers one calculates from the facts seem to me so overwhelming as to put this conclusion almost beyond question." Quoted from Fred Hoyle, "The Universe: Past and Present Reflections," *Annual Reviews of Astronomy and Astrophysics* 20 (1982): 16. See also P. C. W. Davies, "Emergent Biological Principles and the Computational Properties of the Universe," *Complexity* 10(2) (2004): 11–15 as well as Guillermo Gonzalez, Donald Brownlee, and Peter Ward, "The Galactic Habitable Zone: Galactic Chemical Evolution," *Icarus* 152(1) (July 1, 2001): 185-200. The full design-theoretic implications of the latter article can be found in Gonzalez and Richards, *The Privileged Planet*.

[59]Eldredge and Gould, "Punctuated Equilibria."

[60]Daniel Kahneman, Paul Slovic, and Amos Tversky, ed., *Judgment under Uncertainty: Heuristics and Biases* (Cambridge: Cambridge University Press, 1982).

[61]Ibid. See especially the seminal articles in this collection that are jointly authored by Amos Tversky and Daniel Kahneman.

[62]See Dembski, *The Design Inference*, chs. 1 and 2.

[63]John von Neumann, *The Theory of Self-Reproducing Automata*, A. Burks, ed. (Urbana, Ill.: University of Illinois Press, 1966).

[64]Daniel M. Wegner, *The Illusion of Conscious Will* (Cambridge, Mass.: MIT Press, 2002).

[65]See Jeffrey Schwartz and Sharon Begley, *The Mind and the Brain: Neuroplasticity and the Power of Mental Force* (New York: HarperCollins, 2002).