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The Wedge in Evolutionary Ideology: It's History, Strategy, and Agenda

by Phillip E. Johnson

The Beginning of the Wedge

The movement we now call the Wedge made its public debut at a conference of scientists and philosophers held at Southern Methodist University in March, 1992, following the publication of *Darwin on Trial*. The conference brought together as speakers some key Wedge figures, particularly Michael Behe, Stephen Meyer, William Dembski, and myself. It also brought a team of influential Darwinists, headed by Michael Ruse, to the table to discuss this proposition: "Darwinism and neo-Darwinism as generally held in our society carry with them an *a priori* commitment to metaphysical naturalism, which is essential to making a convincing case on their behalf." As I wrote in my introduction to the first edition of the papers from the conference,

> I do not think the issue was ever really confronted on this question . . . . What the anti-Darwinists called metaphysical naturalism the Darwinists called "science," and they insisted that for science to cease being naturalistic would be for it to cease being science. To put the matter in the simplest possible terms, the Darwinist response to the question presented was not "No, that is wrong, because the case for Darwinism can be made without assuming a naturalistic perspective." Instead, they answered "So what? All that you are really saying is that Darwinism is science."

That may seem a deadlock, but the amazing thing was that a respectable academic gathering was convened to discuss so inherently subversive a proposition. I was sure that in the long run discussions of that sort would be fatal for Darwinism, because they would reveal the fact that the theory finds its justification in philosophy, not evidence. Biologists have legitimate authority to tell us the facts which they observe in the field and in their laboratories. They have no authority to tell the rest of us what metaphysical assumptions we must adopt. Once it becomes clear that the Darwinian theory rests upon a dogmatic philosophy rather than the weight of the evidence, the way will be open for dissenting opinions to get a fair hearing. In a nutshell, that is the Wedge strategy. Now that several years have passed and a new century is

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Table of Contents

almost upon us, it is time to review how the Wedge has grown and progressed, and to evaluate how far we have come and to forecast what we expect to accomplish in the next decade. But first I need to explain the intellectual background in more detail.

The Background

Most persons who have written about creation and evolution have assumed that they were entering a debate over facts and evidence, and their objective accordingly has been to state in detail what they consider to be the facts and to support their conclusions with evidence. Darwinian evolutionary scientists assert confidently that the Genesis account is mythology, that the earth is billions of years old, that the first primitive living organism emerged from a chemical soup by some combination of chance and chemical laws, and that life thereafter evolved to its present diversity by natural means, guided by natural selection but not by God. Theistic evolutionists defend basically the same account, adding that the evolutionary process was sustained and guided by God in some manner which cannot be detected by scientific investigation. Biblical creationists defend the Genesis account, arguing that Darwinian evolution is bad or biased science while differing among themselves about such important details as whether the "days" of Genesis were twenty-four hour periods or geological epochs, and whether Noah's flood was worldwide or local. The argument never goes anywhere.

The Darwinians hold the dominant position, in the sense that only their position is taught in public education or promoted in the national media, but they are frustrated and worried that so much resistance remains, especially in North America. Scientists, educators, museum curators and others have made determined efforts to convince the public, but public opinion polls indicate that the public isn't getting the message. Over 40 percent of Americans seem to be outright creationists, and most of the remainder say they believe in God-guided evolution. Less than ten percent express agreement with the orthodox scientific doctrine that humans and all other living things evolved by a naturalistic process in which God played no discernible part. These figures, from recent polls, are practically unchanged from previous polls in the early 1980s. The Darwinists hold a commanding power position for the time being, but they have not convinced the masses. The situation is sufficiently precarious that in 1998 the National Academy of Sciences found it necessary to issue a guidebook on *Teaching About Evolution and the Nature of Science* (hereafter *Guidebook*) urging public school teachers to "teach evolution"—*i.e*., to promote the neo-Darwinian theory—regardless of local opposition.

By "teaching about evolution" the National Academy emphatically does *not* mean that the teachers should inform students candidly about why the subject is so controversial, and it especially does not want them to make students aware of the dissenting arguments (except perhaps in caricatured form, as presented by Darwinists like Carl Sagan and Stephen Jay Gould). Instead, the *Guidebook* encourages teachers to mollify the religious people with vague reassurances that "religious faith and scientific knowledge, which are both useful and important, are different," and to deny that there is any real controversy because "there is no debate within the scientific community over whether evolution has occurred." To make the controversy disappear, the *Guidebook* defines evolution so broadly ("descent with modification") that it "occurs" every time a baby is born. Who can deny that babies are born, and dogs are bred, or that the gene pool is constantly being modified?

This strategy of trivializing the subject might be effective if the science educators and their allies completely controlled the channels of communication, but increasing numbers of high school and college students come to the classroom already knowing that there are reasonable grounds for dissent, advocated by persons with impressive scientific and academic credentials. The best-informed students also know that prominent writers like Richard Dawkins, Carl Sagan, Edward O. Wilson, and Daniel Dennett promote atheism in the name of evolutionary science, with the apparent approval of the scientific establishment. (Other authorities like Stephen Jay Gould purport to be more friendly to "religious belief," but only on the condition that religious authorities stick to questions of moral values and defer to science on all issues of fact.) When the National Academy dodges all the tough questions with evasive platitudes, it effectively teaches independent-minded students to regard the pronouncements of science educators with no more trust than they regard political or commercial advertisements. Eventually the scientific community will pay a high price for this campaign of prevarication.

The Two Models of "Science"

The science educators don't want to be dishonest, but they don't know any other way to deal with people who are so irrational as to deny that our existence is best explained by evolution. The educators also think that they are giving as much respect to religious belief as they honestly can, and that to be more explicit on the subject would merely cause unnecessary offense and provoke emotional opposition. In consequence, they assume that an honest dialogue is impossible, and so they see no alternative but to counter the opposition with tactics of intimidation, evasion, and propaganda. Similarly, dissenters from evolutionary orthodoxy are often astonished that so many scientists cannot see that there is a genuine scientific case against Darwinism, and that widespread dissent cannot be dismissed out of hand as the product of ignorance or prejudice. Why can't eminent scientists seem to grasp the obvious point that finch-beak variation (see below) does not even remotely illustrate a process capable of making birds in the first place?

The reason for this deadlock is quite simple. In our culture there are two distinct models of the scientific enterprise, and the persuasiveness of the case for Darwinian evolution depends entirely on which model you adopt.

In the first, *materialist* model, science is seen as based by definition upon philosophical naturalism or materialism. For present purposes naturalism and materialism amount to the same thing. The first asserts that nature is all there is, while the second adds that nature is made up of matter, *i.e.*, the particles that physicists study, *and nothing else*. (Philosophers tend to prefer the less familiar term *physicalism*, because it avoids the ordinary-language distinction between matter and energy—energy being also a physical entity.) Whichever term is used, every event or phenomenon is conclusively presumed to have a material cause, at least after the ultimate beginning. Within this first model, to postulate a non-material cause—such as an unevolved intelligence or vital force—for any event is to depart altogether from science and enter the territory of *religion*. For scientific materialists, this is equivalent to departing from objective reality into subjective belief. What we call intelligent design in biology is by this definition inherently antithetical to science, and so there cannot conceivably be evidence for it.

The second, or *empirical* model defines science strictly in terms of accepted procedures for testing hypotheses, such as repeatable experiments. (I use the term "empirical" here in its dictionary sense of "arising from observation or experiment"—as opposed to arising by deductive reasoning from philosophical axioms.) Of course scientific materialists also employ these testing procedures, but only up to the point where materialism itself comes into question. For true empiricists, whatever is testable by scientific methods is eligible for consideration. Within science one cannot argue for supernatural creation (or anything else) on the basis of ancient traditions or mystical experiences, but one can present evidence that unintelligent material causes were not adequate to do the work of biological creation. Whether some phenomenon could have been produced by unintelligent material causes, or whether an intelligent cause must be postulated, is eligible for investigation whether the phenomenon in question is a possible prehistoric artifact, a radio signal from space, or a biological cell.

If you adopt the materialist model, a materialistic evolutionary process that is at least roughly like neo-Darwinism follows as a matter of deductive logic, regardless of the evidence. Otherwise, how could complex organisms exist? To say that they are the product of design by an unevolved intelligence, even one which works by guiding evolution, would be to repudiate materialism and hence to abandon science. Before life, especially intelligent life, can come into existence it must evolve from unintelligent matter, by a naturalistic mechanism that must by definition be unintelligent. That mechanism must employ some combination of random variation and physical law (the principle of natural selection being a sort of law), because nothing else could have been available. This kind of deductive reasoning is so overpowering to materialists that Darwinists sometimes say that their theory is as self-evidently true as the basic principles of arithmetic.*

Scientific empiricists, as I use the term, hold that there are *three* kinds of causes to be considered rather than only two. Besides chance and law, there is also agency, which implies intelligence. Intelligence is not an occult entity, but a familiar aspect of everyday life and scientific practice. No one denies that such common technological artifacts as computers and automobiles are the product of intelligence, nor does anyone claim that this fact removes them from the territory of science and into that of religion. It is also common in scientific practice to infer the existence of something that is not observable (cold dark matter, extinct ancestors that were not fossilized) because it is thought necessary to explain the phenomena that *are* observable. For example Carl Sagan's SETI (Search for Extraterrestrial Intelligence) radio telescopes search the sky for evidence of radio signals from space aliens. If they were to receive a signal containing a sequence of prime numbers, as portrayed in the movie *Contact*, they would conclude that it came from intelligent beings—without the need for independent evidence of the existence and nature of the aliens. Evidence of intelligent design is permissible in such cases because it does not conflict with materialist metaphysics, the aliens being presumed to have evolved by natural selection. The proposition that the biological cell is the work of intelligence is out of the question for materialists not because of the evidence but because—in the words of famed Harvard University geneticist Richard Lewontin— "[our] materialism is absolute, for we cannot allow a Divine Foot in the door."

The confusion between these two models sets the stage for an unproductive argument that can never go anywhere. Scientific materialists think that advocates of intelligent design (ID) are either irrational or dishonest, because they are advocating as *science* a proposition that ought to be confined to *religion*, namely the claim that scientific evidence points to the reality of a designing intelligence in the origin and development of life. Moreover they claim to have positive evidence for intelligent design in biology, when the rules of science-as-materialism specify that such a thing cannot exist. Materialists classify such people not as empiricists but as "creationists," a term which in materialist jargon *means* Biblical literalism and is inherently pejorative, suggesting a combination of irrationality and intellectual dishonesty. Hence materialists insist that "creationism," including any consideration of ID, must be banned from scientific discussions, and even from public discourse altogether, as a reprehensible and unconstitutional attempt to pass off religion as science.

Persons who are willing to consider evidence for ID, on the other hand, think of ourselves as the true empiricists and hence the true practitioners of scientific thinking. From our standpoint it is the materialists who are the "fundamentalists," in the pejorative sense of the term, because they adhere to a metaphysical dogma in the teeth of contrary scientific evidence. If design is a legitimate subject for scientific investigation in the case of computers,

* Evolutionary biologist Paul Ewald exemplifies Darwinian logic by explaining that "Darwin only had a couple of basic tenets.... You have heritable variation, and you've got differences in survival and reproduction among the variants. That's the beauty of it. It has to be true — it's like arithmetic. And if there is life on other planets, natural selection has to be the fundamental organizing principle there, too." Jill Cooper, "A New Germ Theory," *The Atlantic*, February 1999. The fallacy is that the proposition "heritable variation and differential survival occur" does not entail the conclusion that these factors have any substantial creative power.

communications from space aliens, and peculiar markings on cave walls, why should it be arbitrarily excluded from consideration when dealing with the biological cell, or the conscious mind? Whether the evidence actually does support design hypotheses in biology is a point in dispute, of course, but in our opinion the scientific materialists effectively concede the point when they adamantly refuse to admit a distinction between "materialism" and "science." They must realize at some level that they cannot win the argument on the basis of evidence, and therefore must win it by imposing a definition of science that disqualifies their critics regardless of the evidence.

Two Examples from the National Academy of Sciences

The policy of supporting Darwinism and materialism leads science educators to present the subject in a manner that actively discourages students from cultivating the critical thinking skills which are essential in real scientific research. Students are also never prepared to understand public controversies over subjects like social Darwinism and genetic determinism, because the educators present a whitewashed version of their theory. I'll give two illustrations, both involving the National Academy's *Guidebook*. I choose this text because it is simple and recent, and has the official imprimatur of the nation's most prestigious scientific organization. Similar confusions abound in the literature of evolution at every level.

On page 19, the *Guidebook* describes one of the most frequently cited examples of natural selection, in a section titled "Ongoing Evolution Among Darwin's Finches." Here is the complete text:

> A particularly interesting example of contemporary evolution involves the 13 species of finches studied by Darwin on the Galapagos Islands, now known as Darwin's finches. A research group led by Peter and Rosemary Grant of Princeton University has shown that a single year of drought on the islands can drive evolutionary changes in the finches. Drought diminishes supplies of easily cracked nuts but permits the survival of plants that produce larger, tougher nuts. Drought thus favors birds with strong, wide beaks that can break these tougher seeds, producing populations of birds with these traits. The Grants have estimated that if droughts occur about once every 10 years on the islands, a new species of finch might arise in only about 200 years.

A good science teacher might employ humor to use that paragraph as an illustration of the fallacy of extrapolation. "If the average length of finch beaks in a population increases five per cent following drought years, and droughts occur every ten years, how long will it take the beaks to grow from an average of one inch in length to ten feet, or for finches to become eagles?" It is no wonder that the *Guidebook's* authors omitted to quote the title of the Grant's 1987 paper in *Nature*, "Oscillating Selection in Darwin's Finches," because that would have signaled to teachers, and perhaps also to bright students, that the finch-beak example involves no continuing directional change at all. The drought year in question was followed a few years later by floods, and the average beak size promptly went back to normal. But even if finches did grow steadily larger for a time, would this show that they can change into something completely different?

This example is not taken out of context, nor is it atypical. It follows the thesis of *The Beak of the Finch*, by Jonathan Weiner, a book which won the Pulitzer Prize in 1995 and has been enthusiastically recommended to the public by leading authorities, including the President of the National Academy of Sciences. It is easy to see why the Darwinists feel they have to present evidence in a selective and slanted manner. Under any kind of objective analysis, it would become apparent that the Darwinists have never discovered a mechanism capable of creating new complex organs, or changing one kind of body plan into another. (The finch-beak example is given top billing in the textbooks precisely because the other known examples of observed natural selection are even less impressive.) The Darwinist educators are determined to persuade rather than to educate, and so their textbooks have to bluff.

If a stock promoter drafted a prospectus the way the *Guidebook* presents the finch beak story, by padding assets and concealing liabilities, purchasers would be entitled to recover damages for fraud and the promoter might go to jail. Yet scientific materialists do not consider such presentations to be dishonest, for the same reason that they do not consider it dishonest to omit from the high school textbooks (as they do) any mention of the sudden and mysterious appearance of the animal phyla in the Cambrian explosion. Specific evidentiary problems can't be all that serious, they reason, since some materialist process has to have done all the creating regardless of the evidence. If the mechanism that produced the Cambrian explosion is not yet fully understood, this is a problem for advanced researchers. Students can't be taught everything at once, and to avoid encouraging them in unsound ways of thinking it is best not to make them aware of the kind of evidence that causes people to form doubts.

I could give many other examples of how Darwinian educational materials present scientific evidence selectively or misleadingly, but for my second example I would rather discuss an important sin of omission. Readers today are virtually assaulted with books by eminent scientific authorities presenting a materialist and determinist worldview in the name of science. The Harvard Zoologist Edward Wilson's 1998 book *Consilience* argues that not only scientists but theologians and literary scholars should base their work strictly on Darwinian assumptions. Philosopher Daniel Dennett describes Darwin's theory as a "universal acid; it eats through just about every traditional concept and leaves in its wake a revolutionized world view." (The view that God is a valid source of moral standards is one of those traditional concepts that Darwin's theory eats through, notwithstanding the vague reassurances science educators provide for religious parents.) Influential evolutionary psychologists like Steven Pinker and Robert Wright describe human behavior as the product of genetic

programs honed by natural selection, while eminent evolutionists of the political left, such as Stephen Jay Gould and Richard Lewontin, describe evolutionary psychology as a pseudoscience honed by prejudice. Molecular geneticists propose projects to alter the human genome, at first to eliminate specific genetic defects and then eventually to improve the species overall. They see no reason to respect the existing design of an organism that was produced by unintelligent mechanisms that could hardly be expected to do the job right.

Behind all the specific controversies lies one important question, which the educators systematically evade. Are evolutionary and materialist assumptions merely a convention of scientific investigation, or are they valid for all purposes? When science educators are trying to justify excluding non-materialistic thoughts from the science curriculum, they tend to portray science as merely "one way of knowing," with the implication that other ways of knowing are equally valid. When you press them to specify *which* other ways of knowing are as valid as science, they can't think of any examples. It turns out that what they really mean is that science is the *only* way of knowing, and outside of science there are only subjective beliefs and feelings. A typical comment is that one can "feel" a sense of awe or beauty towards some object like the rainbow, even though we know through scientific investigation how the color spectrum is produced. Religious "faith," aesthetic "feelings," and moral "beliefs" are continually contrasted with scientific "knowledge,"a division which assumes that only science provides truths that are valid for everybody.

For those who think that science is the only path to knowledge, and there are many such in the National Academy, it is important to extend the realm of science as far as possible to avoid a complete relativism on all subjects involving any question of value. This explains why pseudoscientific fads such as behaviorism, Freudianism, Marxism, and social Darwinism tend to gain so much influence, and to reappear in new guise every time they are discredited. It also explains why thinkers who don't claim scientific authority tend to teach that *all* knowledge is relative to particular interpretive communities. When only science is deemed capable of creating knowledge, ambitious worldview-proclaimers will either style themselves as scientists, or say that their nihilism is itself an inevitable consequence of scientific knowledge. Is it *true* that science is the only way of gaining objective knowledge, and that outside of science there is only subjective faith and belief? That is the message the National Academy apparently wishes to convey, but it does so by persistent insinuation rather than explicit statement in order to maintain the pose of neutrality towards "religious belief."

The Right Question

In short, our scientific leadership is in a philosophical muddle and is only making things worse with its campaign of intimidation, factual misrepresentation, and semantic legerdemain. To put things on a more rational basis, the first thing that has to be done is to get the Bible out of the discussion. Too many people, including journalists, have seen the movie of *Inherit the Wind* and have become convinced that everyone who questions Darwinism must want to remove the microscopes and textbooks from the biology classrooms and just read the book of Genesis to the students. It is vital not to give any encouragement to this prejudice, and to keep the discussion strictly on the scientific evidence and the philosophical assumptions. This is not to say that the biblical issues are unimportant; the point is rather that the time to address them will be after we have separated materialist prejudice from scientific fact.

The question for now is not whether the vast claims of Darwinian evolution conflict with Genesis, but whether they conflict with the evidence of biology. To make that question visible, it is necessary to distinguish between the dictates of materialist philosophy and the inferences that one might legitimately draw from the evidence in the absence of a materialist bias. So I put this simple question to the Darwinian establishment:

> What should we do if empirical evidence and materialist philosophy are going in different directions? Suppose, for example, that the evidence suggests that intelligent causes were involved in biological creation. Should we follow the evidence, or the philosophy?

Scientific materialists find that question impossible to answer, or even to comprehend, because they identify materialism not only with science, but with rationality itself. In their minds the only alternative to materialism is a chaotic animism in which science is impossible because all events occur at the whim of capricious spirits, a world in which every question about causation can be answered with a shrug and the remark "it must be the will of God." This is nonsense, of course. The very idea of natural laws stems from the concept that the world is ruled by a rational law giver, just as it is a historical fact that modern science grew out of a worldview guided by biblical theism. One of the absurdities of materialism is that it assumes that the world can be rationally comprehensible only if it is entirely the product of irrational, unguided mechanisms. Another absurdity is that the scientific mind itself was designed by natural selection, a force which rewards only superiority at reproduction and by whose standards the mind of the cockroach is every bit as effective as the mind of Einstein. On the contrary, the rationality and reliability of the scientific mind rests on the fact that the mind was designed in the image of the mind of the creator, who made both the laws and our capacity to understand them.

Diehard materialists will never agree that there can be a contradiction between the findings of empirical science and the dictates of materialist philosophy, but more open-minded thinkers will grasp the possibility at once. To get the necessary reconsideration going, the first priority for critics of scientific materialism is to state the critique of materialism and naturalism in language which the intellectual community can recognize as legitimate. In the university world it is not legitimate to set up the Bible as authority against the evidence of scientific observation, but

it is very legitimate to show that people who claim to be basing their ideology on observation or neutral reasoning are actually proceeding on the basis of powerful hidden assumptions. It is also legitimate to show that a specific scientific observation—such as the finch beak example—appears to be evidence that natural selection has creative power only if you interpret the evidence with a powerful materialist bias.

The Wedge Strategy

This is where the Wedge comes in. To get the intellectual world discussing a new and possibly unwelcome question, it is not enough just to write a book or make an argument. We have to inspire a lot of people to start doing intellectual work based on the right questions, work of such high quality and persuasive force that the world cannot avoid discussing it. These thinkers have to produce books and articles that explore in detail what happens when you call materialism into question rather than take it for granted. As the discussion proceeds, the intellectual world will become gradually accustomed to treating materialism and naturalism as subjects to be analyzed and debated, rather than as tacit foundational assumptions that can never be criticized. Eventually the answer to our prime question will become too obvious to be in doubt. When the philosophy conflicts with the evidence, real scientists follow the evidence. It will be equally obvious that thinkers outside of science should not allow scientists to abuse their proper authority by forcing dubious philosophical assumptions on the rest of the world. The answers will take care of themselves once the discussion is directed to the right questions.

The metaphor of the Wedge portrays the modernist scientific and intellectual world, with its materialist assumptions, as a thick and seemingly impenetrable log. Such a log can be split wide open, however, if you can find a crack and pound the sharp edge of a wedge into it. There are a number of inviting cracks in modernism, but probably the most important one involves its creation story, and the huge gap between the materialist and empiricist definitions of science. My own writing and speaking represents the sharp edge of the Wedge. I make the first penetration, seeking always only to legitimate a line of inquiry rather than to win a debate, measuring success by the number of significant thinkers I draw into the discussion rather than by the conclusions that they draw for the present.

There are some very gifted people following me into the gradually widening opening, taking the discussion to levels I could never reach by myself. The first and most famous example is Michael Behe. I explained in layman's terms why the Darwinian mechanism can't do what it has to do, and Behe explained in scientific terms exactly what that means when you understand how biology operates at the molecular level. Behe's book *Darwin's Black Box* has sold a lot of copies and received a lot of reviews. The reviewers say what I knew they would say: Behe's scientific description is accurate, but his thesis is unacceptable because it points to a conclusion that materialists are determined to avoid. Of course, the reviewers tend to be philosophically naive souls who mix the two models up in their minds. They think that sticking to the evidence means sticking to materialism regardless of the evidence. That kind of logic may satisfy those who are highly prejudiced in favor of materialism, but it will not work with those who are inclined to doubt.

After Behe comes William Dembski, with his remorselessly rigorous *The Design Inference*. Dembski's philosophical and mathematical reasoning is highly sophisticated, but his fundamental proposition is pure common sense. It is that intelligent causes can do things which unintelligent causes cannot do, and scientific investigation can tell the difference. I attended a seminar on Dembski's ideas recently at a major university philosophy department, where I saw from the reactions how common it is for clever people to deploy their mental agility in the service of obscurity. But Dembski put the concept of intelligent design on their mental maps, and eventually they will get used to it.

After Dembski comes a lot more. My sense is that the battle against the Darwinian mechanism has already been won at the intellectual level, although not at the political level. When I debate Darwinists, they rarely try to defend examples like finch-beak variation as showing a mechanism that can really create complex genetic information or the sort of molecular mechanisms that Behe's book describes. Instead, they shift the burden of proof to the skeptics, arguing that the mere fact we don't have a satisfactory mechanism for now doesn't necessarily mean that one will not be discovered at some time in the future. (For reasons previously explained, scientific materialists consider the promise of a materialist mechanism in the future to be equivalent to the demonstration of a mechanism in the present. If the whole system is as true as arithmetic, the missing mechanism will inevitably be discovered.) When they are on the defensive, Darwinists frequently dismiss the mechanism as a mere detail, insisting that all scientists are agreed that "evolution is a fact," even though they may disagree about exactly how it occurred. Evolution without a specific mechanism is too vague to be testable. The theory claims, for example, that an ancestral bacterium produced distant descendants as diverse as the worm and the lobster. How can one test such an ambitious claim if no details of the transformation are specified?

When the claim that large-scale evolutionary changes occur is made specific, then it is testable, and so far the claim is failing the tests. Wedge members Paul Nelson and Jonathan Wells have shown this by describing the dissimilarity of supposed evolutionary cousins at the earlier embryonic stages, and by reviewing the literature describing attempts by biologists to change the direction of embryonic development by inducing mutations in the DNA. What the results show is that mutations either have no effect on the developing embryo or they have a damaging effect, leading to death or birth defects unless the developmental repair mechanisms can fix the damage. What mutations never do is to change the direction of development, as would have to happen if evolutionary

transformation were to occur. To put it simply, you may believe on philosophical grounds that large-scale evolutionary transformations must have occurred, but this belief finds no support in the experimental evidence. If they did occur, no one knows how.

The Future

Persons who consider only the cultural power of evolutionary naturalism, and see how thoroughly it dominates the contemporary mind, may suppose that the Wedge's critique of scientific materialism is a quixotic venture that can never succeed. On the contrary, I think our success is all but inevitable. In arguing that we should distinguish between objective empirical testing on the one hand, and deductive reasoning from materialist philosophical assumptions, we are making a point of elementary logic which is irresistible once it is understood. The only obstacle to a breakthrough is the long standing prejudice, so deeply ingrained in educational practice, which says that materialism and science are the same thing, and that there cannot be evidence of design in biology because materialist prejudice forbids it. A prejudice like that can be protected for a while, but in the end reason always breaks through.

I measure our success in two ways. First, many thousands of high school and college students are reading our literature, and are responding very favorably. As they learn that the official textbooks present the evidence selectively, and even distort it in the manner illustrated by the finch-beak example, many become highly motivated to challenge the dogmatic system that is being foisted on them. The most talented of these will be the Wedge members of the future. Second, the Darwinists are completely unable to meet our challenge at the intellectual level, and scarcely try. Their literature continues to promote the view that the only dissenters from Darwinism are religious fundamentalists who don't know about the overwhelming evidence that proves that "evolution has occurred." This caricature of the opposition works only with people who have never heard the dissenting arguments first hand. With the growth of private schooling (including home schooling) and the Internet, it is no longer as easy as it was for the educators to ensure that students heard only the official version of the story. Once independent-thinking young people have read the dissenting literature, they are not likely to be impressed with the evasive statements of the Darwinist establishment.

Success for the Wedge does not mean replacing one dogmatic system with another. Our objective is not to impose a solution, but to open the most important areas of intellectual inquiry to fresh thinking. If the fall of Darwinism inspires materialists to develop a new theory that can survive unbiased scientific testing, then so be it. If they can't do that, then the world will face the astonishing truth than the evidence of biology actually *supports* the popular belief that living organisms are the product of an intelligent creator rather than a blind material force. When that realization sinks in, the next big project on the intellectual agenda will be to understand why so many brilliant people fooled themselves so completely for so long. Exploring that question will make the twenty-first century a very exciting time.

Admitting Design Into Science

by William A. Dembski

Introduction

When the physics of Galileo and Newton displaced the physics of Aristotle, deterministic natural laws became the preferred mode of scientific explanation. When the physics of Bohr and Heisenberg in turn displaced the physics of Galileo and Newton, the preferred mode of scientific explanation came to include both deterministic natural laws and chance processes. Chance and necessity, to use a phrase made famous by Jacques Monod, henceforth set the boundaries of scientific explanation, and woe to anyone who would reintroduce a sterile and moribund teleology into science.

Ironically, chance and necessity have proven too thin an explanatory soup on which to nourish a robust science. Without invoking the rightly discarded teleologies, entelechies, and vitalisms of the past, one can still see that chance and necessity together do not span the full range of scientific explanation. A third mode of explanation is required, namely, design. Chance, necessity, and design—these three modes of explanation—are needed to span the full range of scientific explanation.

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The first glimmer that excluding design artificially restricts science comes from admissions by scientists opposed to design. The arch-Darwinist Richard Dawkins begins his book *The Blind Watchmaker* by stating, "Biology is the study of complicated things that give the appearance of having been designed for a purpose." Statements like this echo throughout the biological literature. In *What Mad Pursuit* Francis Crick, Nobel laureate and co-discoverer of the structure of DNA, writes, "Biologists must constantly keep in mind that what they see was not designed, but rather evolved."

Granted, the biological community thinks it has accounted for the apparent design in nature apart from any actual design (typically through the Darwinian mechanism of mutation and selection). The point to appreciate, however, is that in accounting for the apparent design in nature, biologists regard themselves as having made a successful *scientific* argument against actual design. Scientific refutation is a double-edged sword. Claims that are refuted scientifically may be wrong, but they are not necessarily wrong. Alternatively, for a claim to be scientifically falsifiable, it must have the possibility of being true.

To see this, consider what would happen if microscopic examination revealed that every cell was inscribed with the phrase "Made by Yahweh." Of course cells don't have "Made by Yahweh" inscribed on them, but that's not the point. The point is that we wouldn't know this unless we actually looked at cells under the microscope.

Design always remains a live option in biology. A priori prohibitions against design are easily countered, especially in an age of diversity and multiculturalism where it is all too easy to ask, Who sets the rules for science? Nonetheless, once we admit that design cannot be excluded from science on first principles, a weightier question remains: Why should we want to admit design into science?

To answer this question, let us turn it around and ask instead, Why shouldn't we want to admit design into science? What's wrong with explaining something as designed by an intelligent agent? Certainly there are many everyday occurrences which we explain by appealing to design. Moreover, in our workaday lives it is absolutely crucial to distinguish accident from design. We demand answers to such questions as, Did she fall or was she pushed? Did someone die accidentally or commit suicide? Was this song conceived independently or was it plagiarized? Did someone just get lucky on the stock market or was there insider trading?

Not only do we demand answers to such questions, but entire industries are devoted to drawing the distinction between accident and design. Here we can include forensic science, intellectual property law, insurance claims investigation, cryptography, and random number generation—to name but a few. Science itself needs to draw this distinction to keep itself honest. In a recent issue of *Science* (January 23, 1998), a Medline websearch uncovered a "paper published in *Zentralblatt für Gynäkologie* in 1991 [containing] text that is almost identical to text from a paper published in 1979 in the *Journal of Maxillofacial Surgery*." Plagiarism and data falsification are far more common in science than we would like to admit. What keeps these abuses in check is our ability to detect them.

If design is so readily detectable outside science, and if its detectability is one of the key factors keeping scientists honest, why should design be barred from the content of science? With reference to biology, why should we have to constantly remind ourselves that biology studies things that only appear to be designed, but that in fact are not designed? Isn't it at least conceivable that there could be good positive reasons for thinking biological systems are in fact designed?

The biological community's response to these questions has been to resist design resolutely. The worry is that for natural objects (unlike human artifacts), the distinction between design and non-design cannot be reliably drawn. Consider, for instance, the following remark by Darwin in the concluding chapter of his *Origin of Species*: "Several eminent naturalists have of late published their belief that a multitude of reputed species in each genus are not real species; but that other species are real, that is, have been independently created . . . . Nevertheless they do not pretend that they can define, or even conjecture, which are the created forms of life, and which are those produced by secondary laws. They admit variation as a vera causa in one case, they arbitrarily reject it in another, without assigning any distinction in the two cases." It's this worry of falsely attributing something to design (here identified with creation) only to have it overturned later that has prevented design from entering science proper.

This worry, though perhaps justified in the past, is no longer tenable. There does in fact exist a rigorous criterion for distinguishing intelligently caused objects from unintelligently caused ones. Many special sciences already use this criterion, though in a pre-theoretic form (e.g., forensic science, artificial intelligence, cryptography, archeology, and the Search for Extra-Terrestrial Intelligence). The great breakthrough of the intelligent design movement has been to isolate and make precise this criterion. Michael Behe's criterion of irreducible complexity for establishing the design of biochemical systems is a special case of this general criterion for detecting design (cf. Behe's book *Darwin's Black Box*).

The Complexity-Specification Criterion

What does this criterion look like? Although a detailed explanation and justification of this criterion is fairly technical (for a full account see my book *The Design Inference*), the basic idea is straightforward and easily illustrated. Consider how the radio astronomers in the movie *Contact* detected an extra-terrestrial intelligence. This movie, which came out last summer and was based on a novel by Carl Sagan, was an enjoyable piece of propaganda for the SETI research program—the Search for Extra-Terrestrial Intelligence. To make the movie interesting, the SETI researchers actually had to find an

extra-terrestrial intelligence (the non-fictional SETI program has yet to be so fortunate).

How, then, did the SETI researchers in *Contact* find an extra-terrestrial intelligence? To increase their chances of finding an extra-terrestrial intelligence, SETI researchers monitor millions of radio signals from outer space. Many natural objects in space produce radio waves (e.g., pulsars). Looking for signs of design among all these naturally produced radio signals is like looking for a needle in a haystack. To sift through the haystack, SETI researchers run the signals they monitor through computers programmed with pattern-matchers. So long as a signal doesn't match one of the pre-set patterns, it will pass through the pattern-matching sieve (and that even if it has an intelligent source). If, on the other hand, it does match one of these patterns, then, depending on the pattern matched, the SETI researchers may have cause for celebration.

The SETI researchers in *Contact* did find a signal worthy of celebration, namely the following:

11011101111101111111011111111111011111111111
11011111111111111111011111111111111111110111
11111111111111111111011111111111111111111111
11111101111111111111111111111111111111011111
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11111111111111111111111111111101111111111111
11111111111111111111111111111110111111111111
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01111111111111111111111111111111111111111111
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11111111111111111111111111111111111111111111
11111111111101111111111111111111111111111111
11111111111111111111111111111111111111111111
11101111111111111111111111111111111111111111
11111111111111111111111111111111111111111111
01111111111111111111111111111111111111111111
11111111111111111111111111111111111111111111
11011111111111111111111111111111111111111111
11111111111111111111111111111111111111111111
11111111111101111111111111111111111111111111
11111111111111111111111111111111111111111111
11111111111111111111111

In this sequence of 1126 bits, 1's correspond to beats and 0's to pauses. This sequence represents the prime numbers from 2 to 101, where a given prime number is represented by the corresponding number of beats (i.e., 1's), and the individual prime numbers are separated by pauses (i.e., 0's).

The SETI researchers in *Contact* took this signal as decisive confirmation of an extra-terrestrial intelligence. What is it about this signal that decisively implicates design? Whenever we infer design, we must establish two things—*complexity* and *specification*. Complexity ensures that the object in question is not so simple that it can readily be explained by chance. Specification ensures that this object exhibits the type of pattern that is the trademark of intelligence.

To see why complexity is crucial for inferring design, consider the following sequence of bits:

110111011111

These are the first twelve bits in the previous sequence representing the prime numbers 2, 3, and 5 respectively. Now it is a sure bet that no SETI researcher, if confronted with this twelve-bit sequence, is going to contact the science editor at the *New York Times*, hold a press conference, and announce that an extra-terrestrial intelligence has been discovered. No headline is going to read, "Aliens Master First Three Prime Numbers!"

The problem is that this sequence is much too short (i.e., has too little complexity) to establish that an extra-terrestrial intelligence with knowledge of prime numbers produced it. A randomly beating radio source might by chance just happen to output the sequence "110111011111." A sequence of 1126 bits representing the prime numbers from 2 to 101, however, is a different story. Here the sequence is sufficiently long (i.e., has enough complexity) to confirm that an extra-terrestrial intelligence could have produced it.

Even so, complexity by itself isn't enough to eliminate chance and implicate design. If I flip a coin 1000 times, I'll participate in a highly complex (or what amounts to the same thing, highly improbable) event. Indeed, the sequence I end up flipping will be one in a trillion trillion trillion . . . where the ellipsis needs twenty-two more "trillions." This sequence of coin tosses won't, however, trigger a design inference. Though complex, this sequence won't exhibit a suitable pattern. Contrast this with the previous sequence representing the prime numbers from 2 to 101. Not only is this sequence complex, but it also embodies a suitable pattern. The SETI researcher who in the movie *Contact* discovered this sequence put it this way: "This isn't noise, this has structure."

What is a *suitable* pattern for inferring design? Not just any pattern will do. Some patterns can legitimately be employed to infer design whereas others cannot. The basic intuition underlying the distinction between patterns that alternately succeed or fail to implicate design is, however, easily motivated. Consider the case of an archer. Suppose an archer stands 50 meters from a large wall with bow and arrow in hand. The wall, let's say, is sufficiently large that the archer can't help but hit it. Now suppose each time the archer shoots an arrow at the wall, the archer paints a target around the arrow so that the arrow sits squarely in the bull's-eye. What can be concluded from this scenario? Absolutely nothing about the archer's ability as an archer. Yes, a pattern is being matched; but it is a pattern fixed only after the arrow has been shot. The pattern is thus purely *ad hoc*.

But suppose instead the archer paints a fixed target on the wall and then shoots at it. Suppose the archer shoots a

hundred arrows, and each time hits a perfect bull's-eye. What can be concluded from this second scenario? Confronted with this second scenario we are obligated to infer that here is a world-class archer, one whose shots cannot legitimately be referred to luck, but rather must be referred to the archer's skill and mastery. Skill and mastery are of course instances of design.

The type of pattern where the archer fixes a target first and then shoots at it is common to statistics, where it is known as setting a *rejection region* prior to an experiment. In statistics, if the outcome of an experiment falls within a rejection region, the chance hypothesis supposedly responsible for the outcome is rejected. Now a little reflection makes clear that a pattern need not be given prior to an event to eliminate chance and implicate design. Consider the following cipher text:

nfuijolt ju jt mjlf b xfbtfm

Initially this looks like a random sequence of letters and spaces—initially you lack any pattern for rejecting chance and inferring design.

But suppose next that someone comes along and tells you to treat this sequence as a Caesar cipher, moving each letter one notch down the alphabet. Behold, the sequence now reads,

methinks it is like a weasel

Even though the pattern is now given after the fact, it still is the right sort of pattern for eliminating chance and inferring design. In contrast to statistics, which always tries to identify its patterns before an experiment is performed, cryptanalysis must discover its patterns after the fact. In both instances, however, the patterns are suitable for inferring design.

Patterns divide into two types, those that in the presence of complexity warrant a design inference and those that despite the presence of complexity do not warrant a design inference. The first type of pattern is called a *specification*, the second a *fabrication*. Specifications are the non-*ad hoc* patterns that can legitimately be used to eliminate chance and warrant a design inference. In contrast, fabrications are the *ad hoc* patterns that cannot legitimately be used to warrant a design inference. This distinction between specifications and fabrications can be made with full statistical rigor (cf. my book *The Design Inference*).

Why the Criterion Works

Why does the complexity-specification criterion reliably detect design? To see why this criterion is exactly the right instrument for detecting design, we need to understand what it is about intelligent agents that makes them detectable in the first place. The principal characteristic of intelligent agency is choice. Whenever an intelligent agent acts, it chooses from a range of competing possibilities.

This is true not just of humans, but of animals as well as of extra-terrestrial intelligences. A rat navigating a maze must choose whether to go right or left at various points in the maze. When SETI researchers attempt to discover intelligence in the extra-terrestrial radio transmissions they are monitoring, they assume an extra-terrestrial intelligence could have chosen any number of possible radio transmissions, and then attempt to match the transmissions they observe with certain patterns as opposed to others. Whenever a human being utters meaningful speech, a choice is made from a range of possible sound combinations that might have been uttered. Intelligent agency always entails discrimination, choosing certain things, ruling out others.

Given this characterization of intelligent agency, the crucial question is how to recognize it. Intelligent agents act by making a choice. How then do we recognize that an intelligent agent has made a choice? A bottle of ink spills accidentally onto a sheet of paper; someone takes a fountain pen and writes a message on a sheet of paper. In both instances ink is applied to paper. In both instances one among an almost infinite set of possibilities is realized. In both instances a contingency is actualized and others are ruled out. Yet in one instance we ascribe agency, in the other chance.

What is the relevant difference? Not only do we need to observe that a contingency was actualized, but we ourselves need also to be able to specify that contingency. The contingency must conform to an independently given pattern, and we must be able independently to formulate that pattern. A random ink blot is unspecifiable; a message written with ink on paper is specifiable. Wittgenstein in *Culture and Value* made the same point: "We tend to take the speech of a Chinese for inarticulate gurgling. Someone who understands Chinese will recognize *language* in what he hears. Similarly I often cannot discern the *humanity* in man."

In hearing a Chinese utterance, someone who understands Chinese not only recognizes that one from a range of all possible utterances was actualized, but is also able to specify the utterance as coherent Chinese speech. Contrast this with someone who does not understand Chinese. In hearing a Chinese utterance, someone who does not understand Chinese also recognizes that one from a range of possible utterances was actualized, but this time, because lacking the ability to understand Chinese, is unable to specify the utterance as coherent speech.

To someone who does not understand Chinese, the utterance will appear gibberish. Gibberish—the utterance of nonsense syllables uninterpretable within any natural language—always actualizes one utterance from the range of possible utterances. Nevertheless, gibberish, by corresponding to nothing we can understand in any language, also cannot be specified. As a result, gibberish is never taken for intelligent communication, but always for what Wittgenstein calls "inarticulate gurgling."

This actualizing of one among several competing possibilities, ruling out the rest, and specifying the one that

was actualized encapsulates how we recognize intelligent agency, or equivalently, how we detect design. Experimental psychologists who study animal learning and behavior have known this all along. To learn a task an animal must acquire the ability to actualize behaviors suitable for the task as well as the ability to rule out behaviors unsuitable for the task. Moreover, for a psychologist to recognize that an animal has learned a task, it is necessary not only to observe the animal making the appropriate discrimination, but also to specify this discrimination.

Thus to recognize whether a rat has successfully learned how to traverse a maze, a psychologist must first specify which sequence of right and left turns conducts the rat out of the maze. No doubt, a rat randomly wandering a maze also discriminates a sequence of right and left turns. But by randomly wandering the maze, the rat gives no indication that it can discriminate the appropriate sequence of right and left turns for exiting the maze. Consequently, the psychologist studying the rat will have no reason to think the rat has learned how to traverse the maze.

Only if the rat executes the sequence of right and left turns specified by the psychologist will the psychologist recognize that the rat has learned how to traverse the maze. Now it is precisely the learned behaviors we regard as intelligent in animals. Hence it is no surprise that the same scheme for recognizing animal learning recurs for recognizing intelligent agency generally, to wit: actualizing one among several competing possibilities, ruling out the others, and specifying the one chosen.

Note that complexity is implicit here as well. To see this, consider again a rat traversing a maze, but now take a very simple maze in which two right turns conduct the rat out of the maze. How will a psychologist studying the rat determine whether it has learned to exit the maze? Just putting the rat in the maze will not be enough. Because the maze is so simple, the rat could by chance just happen to take two right turns, and thereby exit the maze. The psychologist will therefore be uncertain whether the rat actually learned to exit this maze, or whether the rat just got lucky.

But contrast this now with a complicated maze in which a rat must take just the right sequence of left and right turns to exit the maze. Suppose the rat must take one hundred appropriate right and left turns, and that any mistake will prevent the rat from exiting the maze. A psychologist who sees the rat take no erroneous turns and in short order exit the maze will be convinced that the rat has indeed learned how to exit the maze, and that this was not dumb luck.

This general scheme for recognizing intelligent agency is but a thinly disguised form of the complexity-specification criterion. In general, to recognize intelligent agency we must observe a choice among competing possibilities, note which possibilities were not chosen, and then be able to specify the possibility that was chosen. What's more, the competing possibilities that were ruled out must be live possibilities, and sufficiently numerous so that specifying the possibility that was chosen cannot be attributed to chance. In terms of complexity, this is just another way of saying that the range of possibilities is complex.

All the elements in this general scheme for recognizing intelligent agency (i.e., choosing, ruling out, and specifying) find their counterpart in the complexity-specification criterion. It follows that this criterion formalizes what we have been doing right along when we recognize intelligent agency. The complexity-specification criterion pinpoints what we need to be looking for when we detect design.

As a postscript it's worth pondering the etymology of the word "intelligent." The word "intelligent" derives from two Latin words, the preposition *inter*, meaning between, and the verb *lego*, meaning to choose or select. Thus according to its etymology, intelligence consists in *choosing between.* It follows that the etymology of the word "intelligent" parallels the formal analysis of intelligent agency inherent in the complexity-specification criterion.

Application to Biology

Perhaps the most compelling evidence for design in biology comes from biochemistry. In a recent issue of *Cell* (February 8, 1998), Bruce Alberts, president of the National Academy of Sciences, remarked, "The entire cell can be viewed as a factory that contains an elaborate network of interlocking assembly lines, each of which is composed of large protein machines . . . .Why do we call the large protein assemblies that underlie cell function *machines*? Precisely because, like the machines invented by humans to deal efficiently with the macroscopic world, these protein assemblies contain highly coordinated moving parts."

Even so, Alberts sides with the majority of biologists in regarding the cell's marvelous complexity as only apparently designed. The Lehigh University biochemist Michael Behe disagrees. In *Darwin's Black Box* (Free Press, 1996) Behe presents a powerful argument for actual design in the cell. Central to his argument is his notion of *irreducible complexity.* A system is irreducibly complex if it consists of several interrelated parts so that removing even one part completely destroys the system's function. As an example of irreducible complexity Behe offers the mousetrap. A mousetrap consists of a platform, a hammer, a spring, a catch, and a holding bar. Remove any one of these five components, and it is impossible to construct a functional mousetrap.

Irreducible complexity needs to be contrasted with *cumulative complexity*. A system is cumulatively complex if the components of the system can be arranged sequentially so that the successive removal of components never leads to the complete loss of function. An example of a cumulatively complex system is a city. It is possible successively to remove people and services from a city until one is down to a tiny village—all without losing the sense of community, which in this case constitutes function.

From this characterization of cumulative complexity, it is clear that the Darwinian mechanism of selection and mutation can readily account for cumulative complexity. Indeed, the gradual accrual of complexity via selection mirrors the retention of function as components are successively removed from a cumulatively complex system.

But what about irreducible complexity? Can the Darwinian mechanism account for irreducible complexity? Certainly, if selection acts with reference to a goal, it can produce irreducible complexity. Take Behe's mousetrap. Given the goal of constructing a mousetrap, one can specify a goal-directed selection process that in turn selects a platform, a hammer, a spring, a catch, and a holding bar, and at the end puts all these components together to form a functional mousetrap. Given a pre-specified goal, selection has no difficulty producing irreducibly complex systems.

But the selection operating in biology is Darwinian natural selection. And this form of selection operates without goals, has neither plan nor purpose, and is wholly undirected. The great appeal of Darwin's selection mechanism was, after all, that it would eliminate teleology from biology. Yet by making selection an undirected process, Darwin drastically abridged the type of complexity biological systems could manifest. Henceforth biological systems could manifest only cumulative complexity, not irreducible complexity.

Why is this? As Behe explains in *Darwin's Black Box*, "An irreducibly complex system cannot be produced. . .by slight, successive modifications of a precursor system, because any precursor to an irreducibly complex system that is missing a part is by definition nonfunctional. . . . Since natural selection can only choose systems that are already working, then if a biological system cannot be produced gradually it would have to arise as an integrated unit, in one fell swoop, for natural selection to have anything to act on."

For an irreducibly complex system, function is attained only when all components of the system are in place simultaneously. It follows that natural selection, if it is going to produce an irreducibly complex system, has to produce it all at once or not at all. This would not be a problem if the systems in question were simple. But they're not. The irreducibly complex biochemical systems Behe considers are protein machines consisting of numerous distinct proteins, each indispensable for function, and together beyond what natural selection can muster in a single generation.

One such irreducibly complex biochemical system that Behe considers is the bacterial flagellum. The flagellum is a whip-like rotary motor that enables a bacterium to navigate through its environment. The flagellum includes an acid powered rotary engine, a stator, O-rings, bushings, and a drive shaft. The intricate machinery of this molecular motor requires approximately fifty proteins. Yet the absence of any one of these proteins results in the complete loss of motor function.

The irreducible complexity of such biochemical systems counts powerfully against the Darwinian mechanism, and indeed against any naturalistic evolutionary mechanism proposed to date. Moreover, because irreducible complexity occurs at the biochemical level, there is no more fundamental level of biological analysis to which the irreducible complexity of biochemical systems can be referred, and at which a Darwinian analysis in terms of selection and mutation can still hope for success. Undergirding biochemistry is ordinary chemistry and physics, neither of which can account for biological information. Also, whether a biochemical system is irreducibly complex is a fully empirical question: Individually knock out each protein constituting a biochemical system to determine whether function is lost. If so, we are dealing with an irreducibly complex system. Mutagenesis experiments of this sort are routine in biology.

The connection between Behe's notion of irreducible complexity and my complexity-specification criterion is now straightforward. The irreducibly complex systems Behe considers require numerous components specifically adapted to each other and each necessary for function. On any formal complexity-theoretic analysis, they are complex in the sense required by the complexity-specification criterion. Moreover, in virtue of their function, these systems embody patterns independent of the actual living systems. Hence these systems are also specified in the sense required by the complexity-specification criterion.

Biological specification always denotes function. An organism is a functional system comprising many functional subsystems. The functionality of organisms can be cashed out in any number of ways. Arno Wouters cashes it out globally in terms of the *viability* of whole organisms. Michael Behe cashes it out in terms of the *minimal function* of biochemical systems. Even the staunch Darwinist Richard Dawkins will admit that life is specified functionally, cashing out functionality in terms of the *reproduction* of genes. Thus in *The Blind Watchmaker* Dawkins will write, "Complicated things have some quality, specifiable in advance, that is highly unlikely to have been acquired by random chance alone. In the case of living things, the quality that is specified in advance is. . . the ability to propagate genes in reproduction."

So What?

There exists a reliable criterion for detecting design. This criterion detects design strictly from observational features of the world. Moreover, it belongs to probability and complexity theory, not to metaphysics and theology. And although it cannot achieve logical demonstration, it does achieve statistical justification so compelling as to demand assent. This criterion is relevant to biology. When applied to the complex, information-rich structures of biology, it detects design. In particular, the complexity-specification criterion shows that Michael Behe's irreducibly complex biochemical systems are designed.

What are we to make of these developments? Many scientists remain unconvinced. So what if we have a reliable criterion for detecting design and so what if that criterion tells us that biological systems are designed? How is looking at a biological system and inferring it's designed any better than shrugging our shoulders and saying God did it? The fear is that design cannot help but stifle scientific inquiry.

Design is not a science stopper. Indeed, design can foster inquiry where traditional evolutionary approaches obstruct it. Consider the term "junk DNA." Implicit in this term is the view that because the genome of an organism has been cobbled together through a long, undirected evolutionary process, the genome is a patchwork of which only limited portions are essential to the organism. Thus on an evolutionary view we expect a lot of useless DNA. If, on the other hand, organisms are designed, we expect DNA, as much as possible, to exhibit function. And indeed, the most recent findings suggest that designating DNA as "junk" merely cloaks our current lack of knowledge about function. For instance, in a recent issue of the *Journal of Theoretical Biology*, John Bodnar describes how "non-coding DNA in eukaryotic genomes encodes a language which programs organismal growth and development." Design encourages scientists to look for function where evolution discourages it.

Or consider vestigial organs that later are found to have a function after all. Evolutionary biology texts often cite the human coccyx as a "vestigial structure" that hearkens back to vertebrate ancestors with tails. Yet if one looks at a recent edition of *Gray's Anatomy*, one finds that the coccyx is a crucial point of contact with muscles that attach to the pelvic floor. Now anatomy is nothing else than an exercise in design, studying the large scale design plans/blueprints for bodies. Thus here again we find design encouraging scientists to look for function where evolution discourages it. Examples where the phrase "vestigial structure" merely cloaks our current lack of knowledge about function can be multiplied. The human appendix, formerly thought to be vestigial, is now known to be a functioning component of the immune system.

Admitting design into science can only enrich science. All the tried and true tools of science will remain intact. But design also adds a new tool to the scientist's explanatory tool chest. Moreover, design raises a whole new set of research questions. Once we know that something is designed, we will want to know how it was produced, to what extent the design is optimal, and what is its purpose. Note that we can detect design without knowing what something was designed for. There is a room at the Smithsonian filled with obviously designed objects for which no one has a clue about their purpose.

Design also implies constraints. An object that is designed functions within certain design constraints. Transgress those constraints and the object functions poorly or breaks. Moreover, we can discover those constraints empirically by seeing what does and doesn't work. This simple insight has tremendous implications not just for science but also for ethics. If humans are in fact designed, then we can expect psychosocial constraints to be hardwired into us. Transgress those constraints, and we personally as well as our society will suffer. There's plenty of empirical evidence to suggest that many of the attitudes and behaviors our society promotes undermine human flourishing. Design promises to reinvigorate that ethical stream running from Aristotle through Aquinas known as natural law.

By admitting design into science, we do much more than simply critique scientific reductionism. Scientific reductionism holds that everything is reducible to scientific categories. Scientific reductionism is self-refuting and easily seen to be self-refuting. The existence of the world, the laws by which the world operates, the intelligibility of the world, and the unreasonable effectiveness of mathematics for comprehending the world are just a few of the questions that science raises, but that science is incapable of answering.

Simply critiquing scientific reductionism, however, is not enough. Critiquing scientific reductionism does nothing to change science. And it is science that must change. By eschewing design, science has for too long operated with an inadequate set of conceptual categories. This has led to a constricted vision of reality, skewing how science understands not just the world, but also ourselves. Evolutionary psychology, which justifies everything from infanticide to adultery, is just one symptom of this inadequate conception of science.

Martin Heidegger remarked in *Being and Time*, "A science's level of development is determined by the extent to which it is *capable* of a crisis in its basic concepts." The basic concepts with which science has operated these last several hundred years are no longer adequate, certainly not in an information age, certainly not in an age where design is empirically detectable. Science faces a crisis of basic concepts. The way out of this crisis is to expand science to include design. To admit design into science is to liberate science, freeing it from restrictions that can no longer be justified.

The Evolution Debate is Central to Theology

by Susan Cyre, Editor

The Apostolic faith expressed in the Apostles' Creed proclaims, "I believe in God the Father almighty maker of heaven and earth." Yet, some Christians have also accepted the secular teaching that creation is the result of a mindless natural evolutionary process. You can't have it both ways. If God is not creator, He is not Lord and human beings are.

If God did not create all that exists out of nothing, then the material world is beyond God's domain and He is not Lord of all. If God is not the creator, He is not the sovereign, all powerful ruler. If God is not the creator, God has no right to impose His laws on us. If God is not the creator, human beings are not created in the image of God with special value and special responsibility.

If human beings are the result of natural evolutionary forces, then human beings are at the center of the universe, the end product of an upward momentum evolving to perfection. Human beings instead of being "wretched" and sinful, are the pinnacle of evolution so far, free to determine what laws they will follow and to what authority they will submit. They are confident that the past is imperfect and the future is higher and more perfect, as society, human beings, and nature move ever upward until perhaps one day they evolve into divine perfection.

On the other hand, if God is the creator, as the Bible teaches and Christian doctrine affirms, creation will always remain substantively distinct from its creator. God rules over all and we stand under His Lordship.

The Confessions

A Study of the Book of Confessions
Study 8 - Holy Spirit, the Sanctifier

by Rev. Theresa Ip Froehlich

Leonard lived what appeared to be a normal life until age fifteen when a rare disease struck him. The symptoms initially looked like a loss of interest in activities but very quickly degenerated into a total inability to physically respond to any stimulation in his environment. He became catatonic.

Leonard was placed in a long-term care facility along with other catatonic patients. For over twenty years, his family and the medical staff had accepted his catatonic condition as incurable and settled for maintenance care. Then one day, Dr. Malcolm Sayer, a shy research physician, arrived as a new staff physician. As he took care of Leonard, his curiosity and compassion drove him to search for a ray of hope for Leonard. And Dr. Sayer found this hope in an experimental drug which "awakened" Leonard, the first patient to receive the controversial treatment. Leonard was then able to walk and talk, laugh and cry, respond and react to stimuli.

The awakening and "rebirth" of Leonard filled Dr. Sayer with awe and enthusiasm. Encouraged by Leonard's stunning recovery, Dr. Sayer administered the drug to other patients but not all of them responded to the drug.

Dr. Sayer's story is a striking parallel to the relationship between the Holy Spirit and us humans who are dead in our sin. The Holy Spirit is the third person of the Godhead whose job is to "awaken" us to a new life so that our hearts may once again turn to God in love and obedience.

Holy Spirit, the Misunderstood God

In the daily life of the church, the Holy Spirit has been treated like a neglected or misunderstood spouse: neglected because the Spirit has not enjoyed equal attention as the Son, misunderstood because many professing Christians have gross misconceptions of the role of the Spirit. In our time, some of the common misconceptions of the role of the Holy Spirit are:

* The Holy Spirit is the Royal Rubber Stamp that authorizes the church to embrace cultural trends, whether they be pleasing or displeasing to God. After all, the church once reformed is always reforming.
* The Holy Spirit is the Robin Hood who saves us from the unreasonable, unjust, outdated and irrelevant demands of God's law given in Scripture. With Robin Hood on our side, all humans may enjoy equal rights and equal access to all privileges and resources so that church of Jesus Christ may finally become the ideal "rainbow community" where no one or anyone is excluded.
* The Holy Spirit is the Cosmic Masseur who massages our fears, anxieties and hurts to calm us and make us feel good. After all, the Spirit's alias is Comforter. This feeds our twentieth-century lust for "feel-good religion" by psychologizing the third person of the Trinity, stripping the Holy Spirit of theological content, and turning the Spirit into our servant.

These misconceptions represent the human tendency to create a god in our own image, to fashion a god according to our own passions and purposes, and to confine God to the imagination of the unregenerate human mind. To have an accurate perception of the Holy Spirit, the people of

God must rise above our own fallen human passions, purposes and imagination. The church must once again seek to know the Holy Spirit through God's Word, his very own self-revelation.

The Holy Spirit and the Confessions

In contrast to the cultural misconceptions which subjugate the Holy Spirit to human sovereignty, the Scriptures and the Confessions teach that the Holy Spirit plays a sovereign role as the Sanctifier:[1] the role of a powerful and sovereign Change Agent in the lives of human beings.

* The Holy Spirit is the agent of effectual calling to salvation.[2] Indeed "no one can say Jesus is Lord except by the Holy Spirit" (1 Corinthians 12:3). The Holy Spirit calls us out of the state of sin and death and empowers us to enter the state of grace and salvation.
* The Holy Spirit is the agent of justification.[3] The Spirit applies Christ's benefits to the elect of God.
* The Holy Spirit is the agent of sanctification causing the believers to repent and to grow in obedience to God.[4]
* The Holy Spirit causes the saints to persevere.[5] "This perseverance of the saints depends, not upon their own free-will, but upon . . . the abiding of the Spirit . . . ."[6]

Translated into everyday language, the Holy Spirit, the Divine Change Agent, initiates a change process in the person who is converted to Christ and causes the believer to persevere in the change process to continue toward the right direction and destination.

Holy Spirit, the Divine Change Agent

The Heidelberg Catechism succinctly summarizes this change in its first question:[7]

Question: What is your only comfort, in life and in death?" Answer: That I belong—body and soul, in life and in death—not to myself but to my faithful Savior Jesus Christ . . . Therefore, by his Holy Spirit, he also assures me of eternal life, and makes me wholeheartedly willing and ready from now on to live for him."

The Heidelberg answer highlights two facts about the Christian life:

* The Christian is under the new ownership of Jesus Christ. The believer who has come to a saving faith in Christ accepts, receives and rests upon Christ alone for justification, sanctification, and eternal life.[8] The believer submits and surrenders to the lordship of Jesus Christ.
* The Christian necessarily has a new orientation for living. The believer no longer lives for himself—-his own passions, purposes and imaginations—-but he lives for Christ. "And [Christ] died for all, that those who live should no longer live for themselves but for him who died for them and was raised again" (2 Corinthians 5:15).

In the same way that Leonard was "awakened" and became able to respond to his environment, the believer is awakened to the new life in Christ by the Holy Spirit and is enabled to respond in ways pleasing to God. A changed life is the evidence and the fruit of conversion to Christ[9] because Jesus said, "By their fruit you shall recognize them . . . ." (Matthew 7:16).

What Does This New Life Look Like?

The new life in Christ is marked by a number of characteristics which serve as the fingerprints of God or the signatures of the Holy Spirit.

(1) New Purpose

The women and men who have come into a new relationship with Christ embrace a new goal, a new journey toward a new destination, and live by a new standard (Colossians 3:9-10). This new purpose is holiness.[10]

Holiness is separation from sin, without which "no one will see the Lord" (Hebrews 12:14). The Holy Spirit is the Divine Change Agent who initiates the 180-degree turnaround so the heart of the converted is turned toward holiness instead of sin. The apostle Paul describes the Spirit as the "Spirit of holiness" (Romans 1:4).

(2) New Perspective on Sin

The women and men who are now under the new ownership of Christ also develop a new perspective on sin. What used to be detestable to God but pleasurable to humans now becomes also detestable to the believers. This new perspective on sin, along with changed behavior, is the evidence of true repentance. The Westminster Larger Catechism defines "repentance" this way:

> Repentance unto life is a saving grace, wrought in the heart of a sinner by the Spirit and the Word of God, whereby out of the sight and sense, not only of the danger, but also of the filthiness and odiousness of his sins, and upon the apprehension of God's mercy in Christ to such as are penitent, he so grieves for, and hates his sins, as that he turns from them all to God, purposing and endeavoring constantly to walk with him in all the ways of new obedience.[11]

(3) New Perspective on Scripture

Coupled with a new perspective on sin, the believer also develops a new perspective on God's law in Scripture. Unregenerate humans legalistically observe the Torah or recklessly ignore God's law; but those who are "awakened" and enlivened by the Spirit now "sweetly comply with it: the Spirit of Christ subduing and enabling the will of man to do that freely and cheerfully, which the will of God, revealed in the law, requireth to be done."[12] By means of a saving faith, "a Christian believeth to be true whatsoever is revealed in the Word, for the authority of God himself speaking therein . . . yielding obedience to the commands."[13] The true believer has a new respect for the final authority of Scripture. "For as God alone is a fit witness of himself in his Word, so also the Word will not find acceptance in men's hearts before it is sealed by the inward testimony of the Spirit."[14] This same Spirit testifies to the truth of Scripture and is recognized in his agreement with Scripture. "He is the Author of the Scriptures: he cannot vary and differ from himself."[15]

(4) New Process
At conversion, the Holy Spirit initiates a continuous process of conviction to cause the convert to keep moving the same direction toward God. The regenerate person who at one time was a comrade to sin is now in conflict with sin. The control center is shifted from sin to Spirit; sin is no longer the commanding officer. "They who are effectually called and regenerated, having a new heart and a new spirit created in them, are further sanctified, really and personally, through the virtue of Christ's death and resurrection by his Word and Spirit dwelling in them; the dominion of the whole body of sin is destroyed, and the several lusts thereof are more and more weakened and mortified, and they more and more quickened and strengthened, in all saving graces, to the practice of true holiness without which no man shall see the Lord."[16] Throughout this process, the Spirit empowers, influences, and persuades the believer to act in obedience to God's Word.[17]

(5) New Person
As the apostle Paul writes in 2 Corinthians 5:17, "If anyone is in Christ, he is a new creation." When the Holy Spirit transforms a sinner into a new person, the Spirit nurtures and demonstrates the evidence of this new life in a variety of ways:
* Life simultaneously governed by God's Word and Spirit because the Spirit who inspired the writing of Scripture does not contradict himself;
* Life demonstrating a pattern of growth in the direction of holiness;
* Character renewed in the image of God, continuously and increasingly demonstrating Christlike character (Colossians 3:9-10; Ephesians 4:22-24).

Conclusion

To rediscover the role of the Holy Spirit as the Sanctifier is to recommit our hearts to the Spirit as the powerful and sovereign God. This calls for our personal surrender to the Holy Spirit, the Divine Change Agent, who intervenes in our lives in accordance with the Scriptures so that we can keep moving toward the goal of holiness.

Gordon Fee sums this up well: "Thus believers live 'between the times.' The already crippled flesh will be finally brought to ruin at the coming of Christ. The Spirit already a present possession, will be fully realized at the same coming. To the degree that the old aeon has not yet passed away, we still must learn 'to walk by the Spirit,' to behave 'in keeping with the Spirit,' and to 'sow to the Spirit.' But we do so precisely because the Spirit is sufficient, not because we live simultaneously 'according to the flesh' and 'according to the Spirit.' In Paul's view, we live 'in the flesh,' meaning in the body and subject to the realities of the present age; but we do not walk 'according to the flesh.' Such a way of life belongs to the past, and those who so live 'shall not inherit the [final, eschatological] kingdom of God'" (Galatians 5:21).[18]

Questions

1. What are the reasons for the church's neglect and misunderstanding of the Holy Spirit?
2. Why is it important to have a correct understanding of the Holy Spirit? How can we acquire this correct understanding?
3. Name some ways in which Christians misuse the Holy Spirit.
4. Survey the references in the Endnotes Section. Write a paragraph on the work of the Holy Spirit in each of the following areas: Salvation, Justification, Sanctification, Perseverance.
5. Jesus said, "By their fruit you shall recognize them..." (Matthew 7:16). Why is this significant?
6. If the new purpose is new life in holiness, then this new life must necessarily involve conflict with the culture of the fallen world. What does it mean to live "in the flesh" but not "according to the flesh?" What does it mean "to walk by the Spirit?" How should Christians relate to the culture around us?
7. Why is it not possible for the Spirit to contradict Scripture? How does the authority of Scripture relate to the authority of the Holy Spirit?

1 Westminster 6.053.
2 Westminster 6.052, 6.064-5; Shorter Catechism 7.031; Larger Catechism 7.169, 7.177.
3 Nicene 1.3; Westminster 6.071; Brief Statement of Faith, line 54.
4 Westminster 6.050, 6.053-4, 6.075, 6.107; Larger Catechism 7.185-6.
5 Westminster 6.095; Larger Catechism 7.189.
6 Westminster 6.095
7 Heidelberg 4.001
8 Westminster 6.079.
9 Larger Catechism 7.185; 1967 Confession 9.21.
10 Westminster 6.054, 6.075; Larger Catechism 7.185, 7.265; 1967 Confession 9.21.
11 Larger Catechism 7.186.
12 Westminster 6.107.
13 Westminster 6.079.
14 Calvin's Institutes, Book I, Ch. VII, para. 4.
15 Calvin's Institutes, Book I, Ch. IX, para. 2.
16 Westminster 6.075.
17 Westminster, 6.107, 6.089, 6.050.
18 Fee, Gordon D., God's Empowering Presence: The Holy Spirit in the Letters of Paul, Hendrickson Publishers, Inc., Massachusetts 1994, p. 822

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