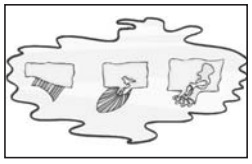

Is Intelligent Design "Scientific"?

Loren Haarsma

A central activity of science is the construction and testing of empirical models, utilizing known natural mechanisms, of parts of the natural world. Occasionally, some scientists tentatively conclude that some particular phenomenon is unexplainable in terms of any known natural mechanisms. I discuss some historical examples which have been resolved (e.g., the energy source of the sun) and some modern examples still under discussion (e.g., the Big Bang, first life) where at least some scientists have concluded that a phenomenon is unexplainable in terms of known natural mechanisms. In such circumstances, individual scientists have advocated a range of scientific and philosophical conclusions (e.g., unknown natural mechanisms, multiple universes, divine intervention).

The modern Intelligent Design (ID) movement can be understood as one particular instance of this. Some activities of ID are clearly "scientific" even under narrow definitions of that term, including modeling of evolutionary population dynamics, investigating the adequacy of known evolutionary mechanisms to account for specific instances of biological complexity, and investigating the general conditions under which self-organized complexity is possible. Other activities of ID clearly go beyond science into philosophy and theology; however, this fact does not render the scientific activities of ID any less scientific. Rather than debating the demarcation of science, the real questions we should be asking are: Are the scientific arguments of ID good science? Are the philosophical arguments of ID good philosophy? Are the theological arguments of ID good theology?[1]

Loren Haarsma

The real questions we should be asking are: Are the scientific parts of ID good science? Are the philosophical parts of ID good philosophy? and Are the theological parts of ID good theology?

The majority of modern arguments for Intelligent Design (ID) fall into one of two categories. The first category is that "biological complexity" (that is, the development of first life, plus some subsequent increases in complexity during biological history) cannot be explained via natural evolutionary mechanisms alone, and is best explained in terms of the actions of some intelligent agent. Sometimes, attempts are made to formalize this claim via probability arguments. The second category of arguments for ID is that the fundamental laws of nature appear to be "finely tuned" for life. This argument is typically left as an intuitive appeal, without attempting any formal probability calculations.

Within the past decade, considerable energy has been spent debating whether these sorts of arguments should be considered "scientific." I believe these debates over the demarcation of science have been unproductive because ID, as a whole package, is partly scientific, partly philosophical, and partly religious. So rather than debating whether ID as a whole should be entirely included in or entirely excluded from science, the real questions we should be asking are: Are the scientific parts of ID good science? Are the philosophical parts of ID good philosophy? and Are the theological parts of ID good theology?

Scientific Arguments

I will turn to the philosophical and religious parts of ID toward the end of this article, but start with the scientific questions. I believe that it is useful to have a broad picture of science which includes at least all of the following questions:

(B1) *The basis for science:* Can we discover new truths about nature, and if so, why?

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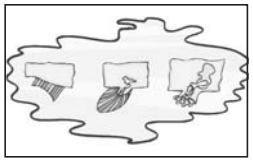


This narrower definition of science [to explain events in nature exclusively in terms of immediate, natural causes] is sometimes used by opponents of ID to argue that ID should not be considered "scientific." I do not agree that science must always, by definition, restrict itself in this way. I do, however, agree that models which restrict themselves to natural causes play a critical role in science.

(B2) *The processes of science:* What are effective scientific methods for learning about nature?

(B3) *The discoveries of science:* What do we learn about nature when we apply these methods?

(B4) *The inferences of science:* Do scientific discoveries have implications for society, philosophy, religion?

(B5) *The human aspect of science:* What are our motives, ethics, and goals for doing science?

Questions B2 and B3 typically are answered by scientists with little or no input from philosophy, religion, or other academic disciplines. The other questions in the list, however, are properly asked by scientists in conjunction with other disciplines, including philosophy and religion. Imagine telling a historian that the discipline of history should devote itself exclusively to discovering raw facts about the past—what events happened, where, and when. All questions about the psychological, social, philosophical, and religious implications of historical events belong outside the discipline of history, therefore they should be excluded from professional historical scholarship. Most historians would laugh at such a suggestion. History overlaps with other disciplines, and it is appropriate for historians to speak on these areas of overlap. In the same way, scientists who feel motivated and competent to do so should not be shy about addressing questions where science overlaps with sociology, philosophy, and religion.

Although such a broad definition of science can be useful, it is also helpful to acknowledge that there is a narrower definition of science—one which most people today think of when they hear the word "science"—that restricts itself to questions B2 and B3 and acknowledges the critical role in science of constructing and testing explanatory models which refer only to natural causes. If we look at the history of science, we see that one important factor in the advancement of science was when scholars stopped thinking about natural events in terms of the activity of "nature spirits" or in Aristotelian terms, "final causes," and started trying to explain events in nature exclusively in terms of immediate, natural causes.

This narrower definition of science is sometimes used by opponents of ID to argue that ID should not be considered "scientific." I do not agree that science must always, by definition, restrict itself in this way. I do, however, agree that models which restrict themselves to natural causes play a critical role in science. Advocates of ID should agree with this point, because they themselves routinely construct scientific models which restrict themselves to natural causes—as a step toward trying to show that such models are inadequate.

When scientists confront a puzzling event in nature and try to explain that event using models which rely only on known natural mechanisms, their models can meet varying levels of success. Scientists can reach one of three general types of conclusions:[2]

(D1) *The event is explainable.* Good empirical models predict that known natural mechanisms can explain the event.

(D2) *The event is partially explainable.* Our empirical models are not sufficiently thorough to explain the event entirely. However, based upon what we know so far, we believe that known natural mechanisms are sufficient to account for the event. We believe that future advances will allow us to explain the event fully.

(D3) *The event is unexplainable via known natural mechanisms.* In fact, there are good, empirical reasons for ruling out any model which relies only on known natural mechanisms.

Many things in science are now in category D1—explainable in terms of known natural laws, e.g., the regular orbital motion of planets, the fuel source for the sun, how cold fronts cause rainfall. Perhaps the majority of things in science fall into category D2—partially explainable, e.g., how the first galaxies formed, how a tree can grow from a single seed into a mature plant, how birds learn when and where to migrate. We know some of the mechanisms in these processes, but we know that we do not know other mechanisms. We expect that future research will turn up some interesting facts, concepts, and surprises. However, even though we can only partially explain these things right now, it looks to us like known natural mechanisms will do the job. We do not expect that further research into these questions will show us anything which cannot be explained in terms of known natural processes.

Most scientific work consists of trying to move things from the category "partially explainable" to the category "fully explainable." Scientists make models, trying to explain events in terms of understandable natural processes. They test their models experimentally and theoretically, and usually they find that their models do not match the data. Very occasionally, when there are strong theoretical and experimental reasons, scientists hypothesize new natural laws which are consistent with known natural laws. Most of the time, however, scientists who confront a failed scientific model go back to work and make better models using only known natural mechanisms. This is how we make progress in science, most of the time.

There are, however, those rare occasions in science when an event seems to fall into the category of "unexplainable." Not only are we currently unable to construct a model of the event in terms of known natural laws, but we can even come up with good quantitative arguments why any model which relies only on known natural laws would seem to be excluded. A historical example of this occurred in the late 1800s when the energy source of the sun was a mystery. At that time, there was good evidence that the earth, and therefore the sun, was at least hundreds of millions of years old. But the known energy sources of chemical burning and gravitational collapse could be shown to be inadequate to fuel the sun for that long a period. The energy source of the sun was unexplainable in terms of natural mechanisms known at that time. The solution to this puzzle was the discovery of an entirely new natural process—nuclear fusion.

Today, the source of the Big Bang falls into category D3—unexplainable in terms of known natural laws. Scientists can and do hypothesize new natural laws, acting in some primordial vacuum or mother universe, which might cause a Big Bang. This is an ongoing area of research. However, there are no currently known natural laws, for which we have independent evidence, which could explain the source of the Big Bang.

Individual scientists could reach one of many different conclusions about the cause of a scientifically unexplained event. Five examples follow:

(E1) *An as-yet unknown natural law is responsible for the event.*

(E2) *A supernatural event occurred*—caused by an intelligent being of an entirely different reality than our universe.

(E3) *Super-human technology brought about the event*— caused by intelligent beings who are contained in and limited by our universe but with superior technology.

(E4) *A very improbable event simply happened.*

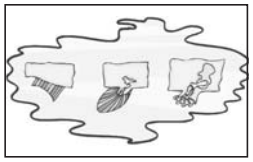
(E5) *There are many universes,* and we just happen to live in one where this improbable event happened.

Consider again the source of the Big Bang combined with the apparent fine-tuning of fundamental laws of nature for life, which are currently unexplainable in terms of known natural laws. A search through popular books and articles written by scientists turns up examples of each of these five types of conclusions. Although these five conclusions are very different from each other philosophically and religiously, empirical science alone cannot distinguish among the five. When someone selects one of these five options as being the most likely one, that selection goes beyond the narrow definition of science into the broader definition of science. The decision is based in part upon philosophical, historical, and religious considerations.

Some people believe that first life and biological complexity should be considered "partially explainable," and some believe that they should be considered "unexplainable."

There are other historical scientific puzzles which, at one time, at least some scientists claimed were scientifically "unexplainable" in terms of known natural laws. These instances are rare in the history of science, but they do happen. In light of this, we can examine the scientific puzzles of most interest to ID: the formation of first life on earth, and some subsequent increases in complexity during biological history.[3] The majority of scientists today, myself included, believe that the development of first life and of biological complexity belong in category D2 (partially explainable). There are many steps—perhaps some very important steps—which we do not understand in detail because the problem is so difficult; but we expect that the development of life and biological complexity ultimately will be explainable in terms of natural mechanisms. However, there are some people who believe that the formation of first life, in particular, belongs in category D3 (unexplainable in terms of known natural laws). Again, a survey of popular literature shows that all of hypotheses E1–E5 have been proposed to explain the formation of first life on earth.

Some people believe that first life and biological complexity should be considered "partially explainable," and some believe that they should be considered "unexplainable." How can we make progress? We make progress the way we always do in science: by trying to construct models for these phenomena, models which rely only on known natural mechanisms. We then test these models theoretically and experimentally. Advocates of evolution



If advocates of ID and advocates of evolution would limit themselves to … restrained statements, when they make public pronouncements to general audiences, I believe we could avoid some of the emotional heat which sometimes accompanies these debates.

try to show that biological complexity belongs in category D2, partially explainable, by arguing that the best natural mechanism-based models for the evolution of complexity—while, of course, incomplete—are compatible with the known data and suggestive of how to make progress. Advocates of ID try to show that biological complexity belongs in category D3, unexplainable, by arguing that the best natural mechanism-based models for the evolution of complexity are incompatible with the known data. Scientists on both sides are doing just what they are supposed to do; they are constructing competing models, testing them, and seeing which models work and which ones do not.

When advocates of ID try to show that some phenomenon belongs in the category of "unexplainable"—that is, when they attempt to show that conventional evolutionary models which rely only on known natural mechanisms do not match the data in some respects—they are definitely doing science, even under a narrow definition of science. Such arguments might be good, solid scientific arguments, or they might be poorly done, flawed scientific arguments, but they definitely fall into the category of "science."[4]

When advocates of ID try to argue that biological complexity is unexplainable in terms of known natural mechanisms, they face the special challenge of being as thorough as possible in accounting for known natural mechanisms. Failure to be thorough is one of the easiest ways to make flawed scientific arguments. Here are three examples.

1. We could imagine a warm pond of water with various simple molecules dissolved in it in various concentrations, and then calculate the probability that the right molecules will just randomly collide together, all at once, to spontaneously form a living cell. The probability of that happening is extremely low. Now, if we were to conclude on the basis of this calculation that first life on earth probably did not form *via that mechanism*, that would be a solid scientific conclusion. But if we were to conclude on the basis of this model that first life on earth probably did not form via *any* natural mechanisms, that would be a flawed scientific conclusion. Scientists who are researching the origin of life long ago rejected the idea that the first cell was formed via a single, random collision of millions of molecules. Scientists today have other natural mechanisms in mind for the origin of first life. If we are going to attempt a meaningful probability calculation, those other mechanisms need to be studied and taken into account.

2. Suppose we are trying to make an argument about biological complexity based on the concept of "information." It turns out that the idea of "information" has been defined in a number of different ways, in different contexts. We need to be careful how we define and use the term.

One definition of information has to do with how many bits of information are required to describe an environment. A simple environment requires only a few bits of information to specify, while a complex environment requires many bits. Under the right conditions, a combination of deterministic laws plus random processes can change a simple environment into a complicated environment. So under one definition of information, it really is possible to produce new information, *de novo*, via a combination of deterministic and random processes. This can be simulated on computers, and it happens constantly in the real world in various physical processes.

A second definition of information refers not to the environment as a whole, but to how many bits of information are required to specify an object within an environment. It is possible, under the right circumstances, to have simple components self-organize into a more complex object via a combination of deterministic and random processes.[5] Under this second definition of information, it can be argued that the deterministic and random processes are not producing new information, but rather, the information required for self-organization is already contained in the initial fine-tuning of the deterministic and random processes themselves.

Yet a third definition of information refers not to the total information required to describe an object, but only to the genomic information in a self-replicating object like a biological cell. This measures how much genomic information the self-replicator requires to survive and reproduce in a particular environment. Again, there are circumstances under which the genomic informa-

tion in a self-replicator can increase through processes of mutation and natural selection. In this case, the increased genomic information is not so much created *de novo* as transferred from the complicated environment into the self-replicator. From these examples, we see that if researchers wants to have sound scientific conclusions about evolution and information, they will need to be careful in how they define and use critical terms such as "information."

3. The simplest version of biological evolution—and this is how evolution is often presented in the popular literature—looks something like this: each gene produces only a single protein; each protein has only a single function in the cell; the only kinds of mutations are point mutations; and the only way in which a mutation can be fixed in a population is through natural selection. We can build a mathematical model of evolution using just that limited set of natural mechanisms, and we can calculate that, under those conditions, the evolution of certain kinds of biological complexity—the kind which Michael Behe called irreducible complexity—is extremely improbable. On the basis of this model, a solid scientific conclusion would be that biological complexity probably did not evolve via that limited set of mechanisms. A flawed scientific conclusion would be to claim that this model proves that biological complexity cannot evolve at all. We know that biological evolution is a lot more complicated than the simplified model which I just presented. A more thorough model of evolution would include an accounting of all the natural mechanisms of evolution which have been discovered and presented in the professional literature.[6]

Given how much we have yet to learn about the mechanisms of evolution, it seems to me that two limited types of scientific conclusions are accessible to advocates of ID. The first type would be:

> On the basis of specific models with well-defined assumptions, we can rule out certain limited sets of natural mechanisms as being adequate, by themselves, to account for first life or to account for specific examples of biological complexity. Any evolutionary account will need to make use of additional natural mechanisms that are not included in our initial models.[7]

A second type of scientific conclusion which I think is defensible would be for an advocate of ID to say,

> It seems to me (that is, it is my scientific intuition) that once all natural mechanisms are accounted for in detail, we will be able to show that first life and certain types of biological complexity (e.g., bacteria flagella) truly are unexplainable in terms of all known natural mechanisms. We cannot prove it for sure right now, but I believe that is where the data is pointing.

These are conservative claims, but given our current state of knowledge, it seems unwise for advocates of ID to claim that current scientific evidence warrants anything stronger. However, advocates of evolution should make similar sorts of restrained conclusions. One type of conclusion which an advocate of evolution could reach is,

> Using known natural mechanisms, we can construct plausible models for certain specific examples of biological complexity.[8]

This is not a claim that we currently can explain all biological complexity via evolution, only that we can currently explain certain specific instances of biological complexity.

A second type of restrained conclusion which an advocate of evolution could make is,

> It seems to me (that is, it is my scientific intuition) that once all natural mechanisms are accounted for in detail, we will be able to show that first life and all types of biological complexity can be explained in terms of known natural mechanisms. We cannot prove it for sure right now, but I believe that is where the data is pointing.

If advocates of ID and advocates of evolution would limit themselves to these sorts of restrained statements, when they make public pronouncements to general audiences, I believe we could avoid some of the emotional heat which sometimes accompanies these debates.

Philosophical Arguments

In addition to scientific arguments, ID includes philosophical and religious arguments. I will start by listing five arguments, paraphrased from the writings of advocates of ID, which go beyond narrowly defined science and overlap into philosophy.[9]

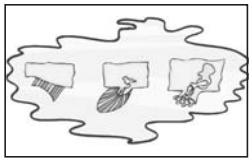
(G1) *When we see an event which had a very low probability of happening* and *for which there could plausibly be a beneficiary, we generally conclude the event was planned and executed by an intelligent agent.*

(G2) *Taking into account various philosophical, historical, and religious arguments, the most likely explanation for the fine-tuning of natural laws is that they were supernaturally planned.*

(G3) *If we can show that first life and biological complexity is unexplainable (highly improbable) in terms of known natural mechanisms, we will have proven that it was brought about by an intelligent agent.*

(G4) *If we can show that first life and biological complexity is unexplainable (highly improbable) in terms of known natural mechanisms, then if we also take into account various philosophical, historical, and religious arguments, the most likely explanation is that it was brought about by a supernatural agent.*

(G5) *"Intelligent Design" is a very good term to associate (equate) with the idea that biological complexity is unexplainable in terms of natural evolutionary mechanisms.*



Listen to church members and school boards and scientists. The message they have heard is, "evolution or design, one or the other." Philosophically, that is a flawed choice. Religiously, it is a dangerous message.

Each of these philosophical arguments can be debated as to its merits. Some of them seem sound. For example, I believe that strong arguments have been made in favor of G1. While G1 is not a rigorous proof, I believe it adds weight to ID arguments. I also agree with statement G2, which states that supernatural planning seems to be the strongest explanation for the fine-tuning of natural laws. The two main contenders for explaining the fine-tuning of the laws of nature are supernatural-creation and many-universes. I do not, however, believe that many-universes really solves the problem of fine-tuning. If there is some sort of mother universe which has a physical process that spawns off many baby universes, of which our universe is just one, then it seems to me that the laws of nature probably would need to be finely tuned in that mother universe as well.

The main reason that I think the laws of nature were created by God is that I believe Christianity is true. As I noted earlier, when we confront a scientifically unexplainable event and try to decide which option, among E1–E5, we believe is most likely to be true, it is appropriate—and even inevitable—that our worldview beliefs play a role in our selection. I believe that all of the historical and experiential and philosophical arguments which can be given in favor of theism in general, and Christianity in particular, add weight to the idea that the laws of nature were supernaturally planned. To put it more simply, because I believe in the God of the Bible, I am also inclined to believe that the best over-all explanation for our scientific observation of the fine-tuning of natural laws is that those fundamental laws were designed by God.

I disagree with the way argument G3 is phrased because it makes a strong claim about proving the activity of an intelligent agent. I noted earlier that events which are scientifically unexplainable allow for multiple explanations, not just intelligent agent activity. Claim G3 is, I think, particularly vulnerable to a version of the many-universes argument which notes that we now have some good evidence that the universe started by our Big Bang is probably much bigger than our visible universe.

However, if we rephrase statement G3 into something like statement G4, then I would be inclined to agree with it. Theologically, I believe that it is possible that God chose to design the laws of nature in such a way that certain kinds of biological complexity could not evolve, and then acted at certain points during biological history to overcome those limitations and assembled those complexities. So if biological complexity is ultimately shown to be unexplainable in terms of known natural laws, then—because I believe in the God of the Bible—I would be inclined to attribute biological complexity to God's miraculous activity.

I understand that some advocates of ID would like to have argument G3 classified under the rubric of "science" rather than the rubric of "philosophy." While I agree that G3 falls under science-defined-broadly, it is still the case that arguments like G3 fall outside of science-defined-narrowly, as most people understand the term "science" today. The demarcation lines between science and philosophy have shifted from time to time throughout the history of science. If biological complexity defies evolutionary explanation and if ID becomes a useful tool for guiding empirical studies of biology—in other words, if many scientists start to find ID useful for doing their science—then the demarcation lines around science will evolve to encompass ID. But in the meantime, my advice to advocates of ID is to be patient. Be content for now to have arguments like G3 discussed under the heading "philosophy" rather than "science," if that is what it takes to get opponents of ID to discuss the issue at all.

Of the various philosophical arguments around ID, some of my biggest concerns are with statements like G5, which involve the close association—indeed, the near equation—of the word "design" with the idea that biological complexity could not evolve. I can illustrate my concern as follows. Imagine a plastic bag containing the parts of an ordinary watch which I have disassembled. I could shake that bag 24 hours a day for years, and the watch would never reassemble itself. Now imagine a second bag with the parts of a disassembled watch that is designed to self- assemble. When I shake the second bag, a little spring hooks onto a little

screw and latches into place. The battery snaps into the battery holder and stays there. All the pieces of the watch are constructed so that, when two pieces that belong together collide with the right sort of trajectory, they hook together and stay hooked together. So if I shake the second bag for an hour or so, in the end, I will have an entire working watch—working, but with some tiny scratches here and there which indicate its history of being shaken together.

Now consider the ordinary watch and the watch which can self-assemble, and ask the following question: Which watch is more cleverly designed? I believe that most people would answer that the self-assembling watch is more cleverly designed. My point with this illustration is not to argue that God creating life-forms through evolution is somehow "better" than God creating life-forms through miracles. My point, rather, is that self-assembly is not the opposite of "design." Watches and biological life-forms can, in principle, be designed to self-assemble from simpler component pieces.

This illustration raises a potential conflict between the fine-tuning argument for ID and the biological complexity argument for ID. The laws of nature are finely tuned not only for the existence of atoms and stars and planets. The laws of nature are so finely tuned that atoms and stars and galaxies self-assemble out of the fundamental particles produced by the Big Bang. And after nucleosynthesis in first-generation stars, the laws of nature bring about the self-assembly of heavier elements, like carbon and oxygen, and simple molecules, and planets with dry land, atmospheres, and water oceans. This self-assembly of all the physical forms of the universe is possible because of the fine-tuning of the laws of nature. I believe this a powerful intuitive argument in favor of the fundamental laws of nature being designed. But suppose the fine-tuning does not stop there. Suppose the laws of nature are fine-tuned not only for the self-assembly of molecules and stars and planets, but also for the self-assembly of biological life and biological complexity. If the laws of nature are so exquisitely fine-tuned that life and complexity can self-assemble, should that be considered evidence for design, or evidence against design? It seems to me that it should be considered as evidence for design. But that is not how it is presented by most advocates of ID. Most advocates of ID essentially argue that if biological life and biological complexity can self-organize, then that should be counted as evidence against design.

The way that ID is typically presented, by advocates of ID, is that we face a choice: either evolution is true or things were intelligently designed. It is evolution or design, one or the other. It is true that some advocates have made the point that this is a false choice. Some advocates of ID have made the following distinction: if biological complexity cannot evolve, then we have detected evidence of intelligent design action in biological history; however, if biological complexity can evolve, that neither proves nor disproves design, it merely means that we cannot unambiguously detect it. That is a very good point, and I am glad that a few advocates of ID have made it. However, that point is not being communicated to most audiences. Most audiences are hearing a very simple message: evolution or design; one or the other. Listen to church members and school boards and scientists. The message they have heard is, "evolution or design, one or the other." Philosophically, that is a flawed choice. Religiously, it is a dangerous message.

Theological Arguments

Unavoidably, ID includes a religious dimension. ID is sometimes presented as if it could be separated from religion, and I have already acknowledged that parts of ID can be evaluated on their scientific and philosophical merits, apart from religious considerations. However, everybody knows that ID has religious implications. Advocates of ID themselves frequently raise theological arguments when they speak and write to Christian audiences. I will briefly paraphrase six theological arguments from the writings of ID advocates, which go beyond narrowly defined science and overlap into theology.[10]

(H1) *Christians should embrace ID as a way to oppose atheism.*

(H2) *The "theistic" part of "theistic evolution" is essentially meaningless.*

(H3) *Theistic evolution is dangerous to the Christian faith.*

(H4) *God definitely used (scientifically detectable) supernatural events to create biological complexity.*

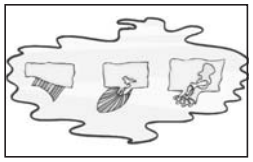
(H5) *It is reasonable to believe that God might have used (scientifically detectable) supernatural events to create first life and biological complexity.*

(H6) *Good theology and hermeneutics should lead us to conclude that ID is more likely to be true than theistic evolution.*

Each of these arguments is worthy of being debated and discussed on its theological merits. Most of them I believe to be seriously flawed. Statement H5, on the other hand, I agree with. I disagree with statement H6; I believe that a strong cumulative case in favor of evolutionary creation can be made using scientific, philosophical, theological and hermeneutical arguments. However, I believe that statement H6 is phrased in a particularly useful way. Phrased this way, it could be the starting point for a spirited but friendly debate among Christian scholars.

Conclusion

If ID is partly scientific, partly philosophical, and partly religious, how can the debate over ID be conducted most productively?



To advocates of ID, I recommend the following: Do not pretend that ID can be evaluated purely as science without consideration of religious implications. … To opponents of ID, I recommend the following: Do not play the demarcation game, that is, do not insist on definitions of science which try wholly to exclude ID.

To advocates of ID, I recommend the following: Do not pretend that ID can be evaluated purely as science without consideration of religious implications. ID has religious implications, and everyone knows it. If someone asks you, "Who is the designer?" do not try to be coy and say, "I don't know" or "It doesn't matter." Instead answer, "That is a philosophical and religious question and I will be happy to tell you my beliefs and the reasons for my beliefs; however, can we also discuss the scientific arguments on their scientific merits?" If someone tells you that ID is not "scientific," reply by saying, "Yes, it's partly scientific and partly philosophical. But regardless of how you classify it, are the arguments themselves sound or unsound?" If you help your critics separate your scientific and philosophical arguments into categories with which they are comfortable, you can, I hope, avoid the unproductive demarcation argument and instead encourage your critics to confront and evaluate the strengths of your scientific, philosophical, and religious arguments, each in turn.

To opponents of ID, I recommend the following: Do not play the demarcation game, that is, do not insist on definitions of science which try wholly to exclude ID. Do not insist that ID must make specific empirical predictions in order to be "scientific." Understand that in science, it is okay sometimes to challenge the validity of one scientific model without immediately proposing an alternative model in detail. It can be scientifically valid and useful sometimes to argue that some particular event is unexplainable in terms of known natural laws. When advocates of ID are making such scientific arguments, do not try to trap them or shift the terms of the debate by asking, "Who is the designer?" Instead, evaluate the scientific parts of ID on their scientific merits; evaluate the philosophical parts of ID on their philosophical merits; and evaluate the theological parts of ID on their theological merits. ✹

Notes

[1]Originally given as a lecture at the American Scientific Affiliation Annual Conference, Aug. 5–8, 2005, Messiah College, Grantham, PA.

[2]L. Haarsma, "Does Science Exclude God? Natural Law, Chance, Miracles, and Scientific Practice" in *Perspectives on an Evolving Creation,* ed. K. B. Miller (Grand Rapids, MI: Eerdmans, 2003).

[3]Leaders of the ID movement have argued for this in numerous books and articles. Some of the most widely known are: Phillip Johnson, *Darwin on Trial* (Downers Grove, IN: InterVarsity Press, 1993); Michael Behe, *Darwin's Black Box* (New York: Touchstone Press, 1996); William Dembski, *The Design Inference* (Cambridge: Cambridge University Press, 1998); Charles B. Thaxton, Walter L. Bradley, and Roger L. Olsen, *The Mystery of Life's Origin* (New York: Philosophical Library, 1984); William Dembski, *No Free Lunch: Why Specified Complexity Cannot Be Purchased without Intelligence* (Lanham, MD: Rowman & Littlefield, 2001).

[4]A carefully reasoned book which discusses the interplay of science and philosophy in the area of design—and in particular what additional features might lead one to conclude that something is the result of supernatural activity—can be found in Del Ratzsch, *Nature, Design, and Science* (Albany, NY: Statue University of New York Press, 2001).

[5]L. Haarsma and T. Gray, "Self-organized Complexity and Design" in *Perspectives on an Evolving Creation.*

[6]A partial and illustrative list of additional evolutionary mechanisms include reproductive isolation, founder effects, neutral drift, sexual selection, environment-dependent gene expression, gene duplication, horizontal gene transfer, allopolyploidy, endosymbiont capture, differential RNA editing, ambiguous tRNA sequences, multiple proteins encoded by the same gene, and multiple functions for a single protein.

[7]A published example in which I believe the authors did a good job of specifying their models and their assumptions at the outset of the paper, and in which the authors reached just this sort of limited conclusion, is Michael Behe and David Snoke, "Simulating Evolution by Gene Duplication …" *Protein Science* 13 (2004): 2651.

[8]From my own area of research, I would say that there is strong evidence that certain types of ion channels which display biochemical irreducible complexity evolved into their present forms via gene duplication.

[9]These arguments, in various forms, can be found in many books, published articles, and web articles written by advocates of ID. They also have been discussed many times on the American Scientific Affiliation e-mail discussion list, archived at www.asa3.org/archive/asa/, and it is primarily from this source that I paraphrased these statements.

[10]Ibid.