Faith and Philosophy: Journal of the Society of Christian Philosophers

1-1-2007

The Intelligent Design Theory and the Supernatural - The "God or Extra-Terrestrials" Reply

Elliott Sober

Follow this and additional works at: https://place.asburyseminary.edu/faithandphilosophy

INTELLIGENT DESIGN THEORY
AND THE SUPERNATURAL—
THE "GOD OR EXTRA-TERRESTRIALS" REPLY

Elliott Sober

When proponents of Intelligent Design (ID) theory deny that their theory is religious, the minimalistic theory they have in mind (the mini-ID theory) is the claim that the irreducibly complex adaptations found in nature were made by one or more intelligent designers. The denial that this theory is religious rests on the fact that it does not specify the identity of the designer—a supernatural God or a team of extra-terrestrials could have done the work. The present paper attempts to show that this reply underestimates the commitments of the mini-ID Theory. The mini-ID theory, when supplemented with four independently plausible further assumptions, entails the existence of a supernatural intelligent designer. It is further argued that scientific theories, such as the Darwinian theory of evolution, are neutral on the question of whether supernatural designers exist.

1. Will the Real ID Theory Please Stand Up?

What is Intelligent Design (ID) theory? Answering this question is complicated by the fact that one version of the theory is minimalistic, while others are more contentful. The minimalistic version, which I'll call the mini-ID theory, says only that the irreducibly complex adaptations that organisms possess were made by one or more intelligent designers (Behe 1996, 2005; Dembski 1995, 1998b, p.15). The identities of these designers are not specified; maybe the vertebrate eye was made by a team of Extra Terrestrials or by a God who lives outside of space and time. The mini-ID theory does not deny that human beings have common ancestors with other species, nor does it insist that the earth is young, nor does it offer an explanation of the origin of the universe. The mini-ID theory differs from some earlier versions of Creationism by virtue of its modesty.[1]

Defenders of the mini-ID theory have a lot more to say about intelligent design, and this is where more contentful versions of ID theory make their appearance. For example, Phillip Johnson (1996), one of the main architects of ID theory, endorses theistic realism, "affirm[ing] that God is objectively real as Creator, and that the reality of God is tangibly recorded in evidence accessible to science, particularly biology;" he says that this is "the defining concept of our movement." In their widely used ID textbook, *Of Pandas and People*, Percival Davis and Dean Kenyon (1993, pp. 7, 26, 100) frequently contrast "natural" and "intelligent" causes; this indicates that the intelligent

designers they have in mind are supernatural. And Dembski (1998b, p. 20) rejects theistic evolutionism, which is the thesis that God used the evolutionary process to produce organisms and their adaptive features. Dembski's gripe is with evolutionary theory, not with divine design.[2]

Given the many ways in which ID theorizing goes beyond the mini-ID theory, why was the mini-ID theory ever formulated as a separate claim? One reason is suggested by Johnson's comment that "people of differing theological views should learn who's close to them, form alliances and put aside divisive issues 'til later. . . . I say after we've settled the issue of a Creator, we'll have a wonderful time arguing about the age of the Earth" (quoted in Walker 1998, p. 24). A modest theory has the virtue of uniting the warring factions against a common enemy. In addition, by not using the word "God," the mini-ID theory may have a better chance than some of its Creationist predecessors of passing the Constitutional test that bars promoting religion in public schools.

Another motive is revealed by the Discovery Institute's "Wedge Strategy" (available at www.antievolution.org/features/wedge.htm). The Discovery Institute in Seattle is the flagship ID think tank and the "Wedge Strategy" is its political manifesto. The document is an internal memo that was leaked on the Internet in 1999; the Institute says its goal is to "replace materialistic explanations with the theistic understanding that nature and human beings are created by God." Phillip Johnson's (1991) critique of Darwinism and Michael Behe's (1995) application of the mini-ID theory to some complex biochemical adaptations are described as the "thin edge of the wedge," whose purpose is to split the "giant tree" of "materialistic science." According to the Wedge Strategy, "design theory promises to reverse the stifling dominance of the materialist worldview, and to replace it with a science consonant with Christian and theistic convictions."

What, then, is ID theory? Is it just the mini-ID theory, or the more contentful hypothesis that the adaptations of organisms and the universe itself were created by the Christian God, or is it something in between? The second of these is obviously religious in content, but the first, apparently, is not. It is not the point of the present paper to discuss any further the motives behind the construction of the mini-ID theory nor to argue that one of these versions of ID theory is the "real" theory of intelligent design. Rather, the goal is to trace out the implications of what the mini-ID theory actually asserts. The mini-ID theory *does* imply the existence of a supernatural intelligent designer when it is supplemented by four propositions that are independently supported.

2. A First Cause Argument Applied to the Mini-ID Theory

Consider the following argument, which owes a debt to Thomas Aquinas. It is not an argument that I am advocating, but one to which ID theorists need to respond.

1. If a system found in nature is irreducibly complex, then it was caused to exist by an intelligent designer.
2. Some of the minds found in nature are irreducibly complex.

3. Therefore some of the minds found in nature were caused to exist by an intelligent designer.

4. Any mind in nature that designs and builds an irreducibly complex system is itself irreducibly complex.

5. If the universe is finitely old and if cause precedes effect, then at least one of the minds found in nature was not created by any mind found in nature.

6. The universe is finitely old.

7. In nature, causes precede their effects.

8. Therefore, there exists a supernatural intelligent designer.

In this argument, apparently non-religious premises lead to an apparently religious conclusion.

3. Comments on the Argument

Premise (1) is the central claim of the mini-ID theory. I use Behe's (1996, p. 39) term "irreducible complexity," which he defines as "[A] single system composed of several well-matched, interacting parts that contribute to the basic function, wherein the removal of any one of the parts causes the system to effectively stop functioning."[3] Behe's idea is the same one that moved Paley (1800); the watch and the eye have functions (to measure time, to allow organisms to see) and each would fail to perform its function if one of its interacting parts were excised.

Premise (2) can be true even if we aren't certain about which natural systems have minds. I assume that human beings have minds. The accompanying Figure provides a reason for thinking that the human mind is irreducibly complex.[4] The overall function of the system is to allow individuals to navigate their environments effectively.[5] Our present beliefs and desires are influenced by the perceptual states we now are in, plus our memories; these beliefs and desires give rise to an intention (a plan of action) by passing into a decision procedure of some sort. Intentions issue in actions. If any of the parts depicted here were removed, the mind would be unable to perform its function. Premise (2) does not require that this division of the human mind into parts is complete. This division not only characterizes human beings; I suggest that it also describes the minds of intelligent beings who design and produce irreducibly complex systems, whether they happen to be human beings or not. This is the justification for premise (4).

A schematic of the human mind that shows it to be an irreducibly complex system
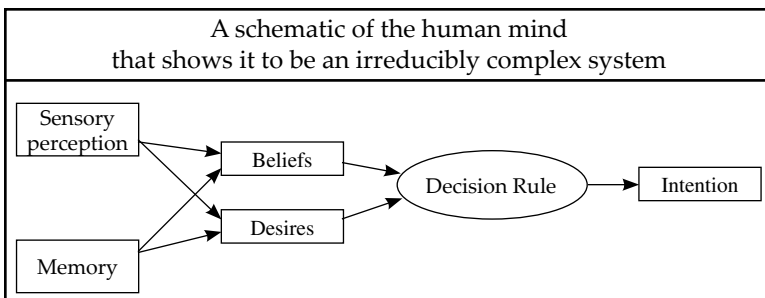
There is an objection to premise (2), and also to (4), that stems from an ambiguity in Behe's concept of irreducible complexity. There are many ways to segment a system into parts; whether a system is taken to be irreducibly complex depends on how fine-grained the division into parts is. Consider the eye. If the parts of someone's eye are taken to be the cornea, the retina, etc., the system will be judged to be irreducibly complex. However, if the parts of the eye are taken to be the atoms of which it is made, the conclusion that follows is that the system is not irreducibly complex; excise a single atom and the eye still sees. This suggests that what Behe intends is that a system should be judged irreducibly complex precisely when *some* segmentation into parts satisfies the condition, not that *every* segmentation must do so. However, this interpretation raises the problem that many highly redundant systems will be judged to be irreducibly complex when a coarse-grained division into parts is used. Consider the wine bottle. Its function, I take it, is to hold a certain liquid. There is a very fine-grained segmentation into parts that entails that the bottle is not irreducibly complex, since shaving a tiny slice off the surface does not impair the bottle's ability to hold a liquid. However, there is another division that leads to the opposite conclusion. Suppose we divide the bottle into a number of identically shaped top-to-bottom slices; if we remove any of these parts, the bottle no longer can serve as a container for liquids. A possible response to this problem is to claim that there is a uniquely correct segmentation of a system into parts; however, this raises the question of how that uniquely correct breakdown is to be defined and defended. I mention this problem because it shows that it is a mistake to argue against premise (2) by saying that a very fine-grained segmentation of the human mind into parts leads to the conclusion that the human mind is not irreducibly complex. I don't know how Behe's concept should be clarified, but it does seem that those who hold that the bacterial flagellum and the biochemistry of blood coagulation are irreducibly complex should also hold that the human mind is irreducibly complex.

Premise (6) is also not part of the mini-ID theory; rather, it is part of our current best scientific understanding of the world. Physics tells us that the universe is finitely old.[6] The same is true of premise (7); it isn't part of the mini-ID theory, though it seems entirely plausible that causes in nature precede their effects.[7]

To summarize the argument: If the human minds that now exist in nature are irreducibly complex, then each of them was caused to exist by one or more earlier intelligent designers. Consider one of those earlier designers; either it is found in nature or it is a supernatural being. If the latter, we're done—proposition (8) follows. So consider the former option. That intelligent designer, if it designed and produced an irreducibly complex mind, must have a mind that is irreducibly complex. If there is a finite amount of time ε such that it takes a mind in nature (e.g., a human agent) at least ε to design and build another irreducibly complex intelligent designer, then the causal chains that connect a later intelligent designer in nature to its earlier intelligent designer cause (also in nature) will have finitely many links. Each such chain, traced back into the finite past, must therefore reach a first intelligent designer in nature. But premise (1) says that these first natural minds, being irreducibly complex, must themselves be caused to exist by an intelligent designer,

so the argument leads to the conclusion that a *supernatural* intelligent designer must exist.[8]

Behe (1996, p. 249) seems to have something like this argument in mind in the following passage where he recognizes that there is a connection within the ID framework between the question of backwards causation and the question of whether a supernatural designer exists:

> Perhaps, then, biochemists in the future will send back cells to the early earth that contain the information for the irreducibly complex structures we observe today. In this scenario humans can be their own aliens, their own advanced civilizations. Of course, time travel leads to apparent paradoxes (things like grandsons shooting grandfathers before their offspring are born), but at least some physicists are ready to accept them. Most people, like me, will find these scenarios entirely unsatisfactory, but they are available for those who wish to avoid unpleasant theological implications.

Behe agrees with premise 7 in the Aquinas-style argument, in that he finds backwards causation, at least in this instance, "entirely unsatisfactory." There is even the suggestion that he embraces the "theological implications" that flow from the mini-ID theory.

4. Does the Mini-ID Theory Have Implications about the Existence of Supernatural Beings?

The previous argument relies on four assumptions that are not part of the mini-ID theory. The mini-ID theory does not say that the universe is finitely old,[9] it does not insist that causes in nature precede their effects, it does not say that the human mind is irreducibly complex, and it does not claim that the minds in nature that design and produce irreducibly complex systems are themselves irreducibly complex. What follows from the theory, understood narrowly, is just that *if* these four assumptions are correct, then there must be a supernatural intelligent designer. Do these four *ifs* save the mini-ID theory from having implications about the existence of supernatural beings? According to a narrow definition of this type of implication, they do:

(N)   A proposition *P* has implications about the existence of supernatural beings if and only if *P* entails that a supernatural being exists or entails that there are no supernatural beings.

The question is whether some broader interpretation of a theory's having "implications about the existence of supernatural beings" can be defined that is plausible. Here is a definition to consider:

(B)   A proposition *P* has implications about the existence of supernatural beings if and only if there exist true auxiliary assumptions *A* such that *P&A* entails that a supernatural being exists, or entails that there are no supernatural beings, but *A* by itself does not.

This broader criterion entails that the mini-ID theory has implications about the existence of supernatural beings. However, criterion (B) is problematic

because it entails that every false proposition has such implications. For if P is false, then "*notP* or supernatural beings exist" is true and P, when conjoined with this disjunction, entails that there are supernatural beings while the disjunction, by itself, does not. This defect in (B) is reminiscent of the problems the logical positivists uncovered when they tried to define what it means for a statement to have observational implications, and the repeated failures of different formulations of the verification theory of meaning should serve as a warning in connection with the present project (Hempel 1950).

I am inclined to think that the concept of having implications about the existence of supernatural beings, like the concept of having observational implications, cannot be spelled out by using just the tools of deductive logic. Rather, I suspect that both concepts are *epistemic*. With respect to the idea of observational testability, I suggest the following:

> (Ob) Proposition P now has observational implications if and only if there exist auxiliary assumptions A and an observation statement O such that (i) $P\&A$ entails O, but A by itself does not entail O, (ii) A is true, (iii) we now are justified in believing A, and (iv) the justification we now have for believing A does not depend on believing that P is true (or that it is false), and also does not depend on believing that O is true (or that it is false).

Further articulating this criterion would require discussing what an observation statement is (Sober 1999, 2006), but I think we can let that pass in the present context. Criterion (Ob) judges, correctly, that the laws of optics now have observational implications about the occurrence of eclipses. The laws, by themselves, do not make any such predictions, but when independently obtained information about the earth, sun, and moon are added, the resulting conjunction does have such implications.

Criterion (Ob) is time indexed ("now" represents any time t) so that a proposition can fail to have observational implications at one time though it has such implications at another. This reflects the fact that there is a perfectly legitimate sense in which a proposition might be empirically testable at one time but not at another. However, criterion (Ob) does not rule out the possibility that there might be other, more "modalized," explications of testability. For example, one might wish to define a timeless concept in which a proposition P is said to have observational consequences precisely when there exists a true auxiliary proposition A that *could* be justified independently of having a belief as to whether P is true and independently of having a belief as to whether O is true, where $P\&A$ entails O while A by itself does not. This more modal concept of testability would be needed if one wanted to say that some propositions not only can't be tested now but are intrinsically incapable of ever being tested. This is the idea of *untestability in principle* that the positivists wanted to isolate. There is no special problem in defining this concept (though the concept of possibility needs to be clarified); rather, the difficulty arises in connection with applying it. To say that a proposition is untestable in principle apparently requires omniscience about the future of inquiry; one would have to be able to say that no auxiliary principle A could ever be discovered that would permit P to have observational consequences. This is why I prefer the weaker, less

modal, concept of testability—the concept of testability *now*. Of course, if a proposition is *now* testable, it is testable *in principle*. But if a proposition now can't be tested and one can't imagine the situation ever changing, what does that show? Is the proposition untestable in principle or is one simply guilty of a failure of imagination? There is no need to address this question here.

The following definition of what it means for a proposition now to have implications about the existence of supernatural beings parallels the definition of observational implication provided by (Ob):

(E)   Proposition *P* now has implications about the existence of super-natural beings if and only if there exist auxiliary assumptions *A* such that (i) *P&A* entails that there are supernatural beings, or entails that there are none, but *A* by itself does not have either implication, (ii) *A* is true, (iii) we now are justified in believing *A*, and (iv) the justification we now have for believing *A* does not depend on believing that *P* is true (or that it is false), and also does not depend on believing that there are supernatural beings (or on believing that there are none).

This epistemic criterion entails that the mini-ID theory now has implications about the existence of supernatural beings; this is because we now are justified in believing the four assumptions used in the argument presented earlier and our justification for these four beliefs does not depend on our assuming the mini-ID theory (or its negation), nor does it depend on our having a belief as to whether supernatural beings exist.

Why accept the epistemic characterization (E) of what it takes for a proposition to have implications about the existence of supernatural beings? Why not reject this and embrace only the narrower criterion (N)? The parallel with the problem of defining the concept of observational implication provides a reason. Duhem (1914) was right that physical theories, *by themselves*, do not have observational consequences. But it would be a mistake to conclude that these theories have no observational consequences. In just the same way, it is true that men, *by themselves*, do not have children, but it would be a mistake to conclude that men never have children. A concept of observational implication is needed that takes Duhem's point into account but explains how theories manage to make observational predictions. Criterion (Ob) does this. The same approach leads to the proposal embodied in (E).

Criterion (E) defines the concept of having implications about the existence of supernatural beings, but not the broader concept of having implications about the supernatural. To see the difference, consider the thesis that *at most one supernatural being exists*. This thesis does not entail that a supernatural being exists, nor does it entail that none does, but the statement nonetheless has implications about the supernatural in some intuitive sense. I don't know how to circumscribe this broader category, but doing so isn't necessary for present purposes.

Does criterion (E) also judge that the Darwinian theory of evolution now has implications about the existence of supernatural beings? I believe that the answer is *no*. By "Darwinian theory," I mean a pair of claims—that all the organisms alive today (on earth) trace back to a common ancestor[10]

and that natural selection has been an important cause of the similarities and differences we observe among extant organisms.[11] With Darwinian theory understood in this way, consider the following two statements: (i) either the Darwinian theory is false or a supernatural being exists; (ii) either the Darwinian theory is false or no supernatural beings exist. Of course, a theist who thinks that God is a supernatural being will endorse (i) and a naturalist will endorse (ii). But notice that someone who has no opinion on whether naturalism is true and has the same agnostic attitude towards Darwinian theory has no basis for accepting either. In this sense, Darwinian theory is at present *neutral* on the question of whether there are supernatural beings.[12] Here we find an important difference between ID theory (whether it is minimalistic or more contentful) and the theory of evolution.

5. Is the Supernatural Implication Religious?

The epistemic criterion (E) judges that the mini-ID theory now implies that there exists a supernatural intelligent designer who created one or more of the minds found in nature. Should this existence claim be viewed as a *religious* statement? Obviously, the claim falls short of asserting that the designer in question has all the characteristics of the Christian God. However, that isn't enough to show that the mini-ID theory isn't religious; after all, there are religions other than Christianity. Perhaps, if the supernatural intelligence to whose existence the mini-ID theory is committed were *worthy of veneration*, that would show that the theory has religious, and not just supernatural, implications. If ID theorists wish to deny this, they need to explain why.

I formulated premise (1) so that it is restricted to objects *in nature* that exhibit irreducibly complex features. Defenders of the mini-ID theory need to explain why their theory should be restricted in this way. Perhaps they will want to argue that a supernatural intelligent designer is an *eternal* and *self-sustaining* being, and thus does not need a cause external to itself to come into existence or to remain in existence. Or perhaps they will maintain that a supernatural designer is a *simple* being, and therefore won't exhibits complex features at all. Their answer can't be that their theory is agnostic about the existence of supernatural designers, for as we have just seen, it is not.

6. Conclusion

Deciding whether the mini-ID theory has supernatural and religious implications is not as straightforward as seeing whether the word "God" appears in the statement "each irreducibly complex system found in nature was designed and produced by an intelligent being." When independently plausible further assumptions are taken into account, the mini-ID theory entails the existence of a supernatural intelligent designer who made at least one of the minds found in nature.

Along the way, I argued that the Darwinian theory of evolution is silent on the question of whether God (assumed to be a supernatural being) exists. Can the same be said of other contemporary scientific theories? Johnson (1991, pp. xxx, 114–15) contends that naturalism (the view that there are no

supernatural beings) has become the reigning ideology within science. He regards this as a prejudice that needs to be overcome, urging that science as a whole (and not just evolutionary biology) should be transformed into a more open-minded enterprise in which hypotheses about the supernatural are given a fair hearing. Richard Lewontin (1997), a prominent evolutionary biologist, agrees that contemporary scientists accept a commitment to naturalism, but does not regard this as a defect; Lewontin contends that scientific inquiry requires an *a priori* commitment to materialism, and hence to naturalism.

Robert Pennock (1999) replies to Johnson by distinguishing *methodological* from *metaphysical* naturalism, claiming that science is committed only to the former. Science must restrict itself to naturalistic explanations, according to Pennock, not because it assumes that there are no supernatural beings, but because claims about supernatural beings cannot be tested. This is not the place to examine Pennock's methodological thesis, though it is worth noting that some claims about supernatural beings (e.g., the claim that an omnipotent supernatural being wanted above all that everything in nature be purple) are testable (Sober 1993). The point I would make here is a different one—as Pennock (1999) notes, the Darwinian theory of evolution is silent on the question of whether a supernatural intelligent designer exists. This is not true of the mini-ID theory. In terms of the *contents* of theories, it is ID theory, not evolutionary theory, that has implications concerning the existence of supernatural designers.[13]

University of Wisconsin, Madison

NOTES

1.   Although some ID theorists deny that the ID theory is a kind of Creationism on the grounds that the mini-ID theory makes no mention of God, not all ID theorists agree; William Dembski (1995), for example, says that "creationism broadly construed" is "the belief that God or some intelligent agent has produced life with a purpose in mind [italics mine]."

2.   ID theorists frequently depart from the minimality of the mini-ID theory in another respect. Davis and Kenyon (1993, p. 39) deny that organisms in different "higher level categories" have common ancestors and Dembski (1995) maintains that human beings were specially created. Behe seems to be the only leading ID theorist who accepts (albeit "provisionally") the notion of common ancestry (Dembski 1999, p. 250).

3.   I use this phrase even though it suggests, misleadingly in my view, that reductionism is the issue.

4.   It suffices for the argument if *some* human minds are irreducibly complex; it isn't essential that *all* of them are.

5.   It might be suggested that the mind's function should be described with greater specificity. This will be a problem for Behe if the specificity of the function description affects whether a system is judged to be irreducibly complex. However, with respect to the Figure, a more specific function ascription (e.g., "permits individuals to navigate their environments effectively by constructing and manipulating mental representations") seems not to affect the verdict.

6.　See, for example, Penrose's (2005, p. 704) summary of the evidence for the claim that "the Big Bang . . . took place some 1.4×10^{10} years ago."

7.　Notice that the argument does not require that causes in nature must *always* precede their effects, but just that this is so when the causal agent is an intelligent designer in nature who designs and constructs an irreducibly complex system in nature and the effect is that system's existing and being irreducibly complex.

8.　Notice that the argument does not require that the universe be finite in its spatial extent, nor that there be finitely many intelligent designers in nature.

9.　Some ID theorists do cite the finite age of the universe. For example, Ross (1998, p. 373) mentions this as part of his formulation of a fine-tuning argument for the existence of God.

10.　Darwin was usually careful to say that the tracing back leads to "one or a few" original progenitors; see, for example, Darwin (1859, p. 490). Standard formulations of contemporary evolutionary theory now usually go farther, based on evidence that Darwin did not have.

11.　Evolutionary biologists who are adaptationists go farther, claiming that natural selection is the *most* important or the *only* important cause of the similarities and differences we observe among organisms.

12.　The claim that our current knowledge does not provide us with an independently attested auxiliary proposition that shows that Darwinian theory has implications about whether supernatural designers exist is consistent with the situation's changing as knowledge grows. I do not expect this to happen; however, the present argument does not depend on making forecasts.

13.　My thanks to Glenn Branch, David Christensen, Juan Comesaña, Matthew Davidson, Branden Fitelson, Daniel Hausman, Christopher Hitchcock, David Malament, William Mann, Gregory Mougin, Ronald Numbers, Robert Pennock, Carolina Sartorio, Larry Shapiro, and the editor and anonymous referees of this journal for useful suggestions.

REFERENCES

Behe, M. 1996. *Darwin's Black Box*. New York: Free Press.

————. 2005. "Design for Living." *New York Times*, February 7, p. A27.

Darwin, C. 1859. *On the Origin of Species*. Cambridge: Harvard University Press, 1964.

Davis, P. and D. Kenyon 1993. *Of Pandas and People—the Central Question of Biological Origins*. Dallas, Texas: Haughton Publishing Co., 2nd edition

Dembski, W. 1995. "What Every Theologian Should Know about Creation, Evolution, and Design." *Center for Interdisciplinary Studies Transactions*. 3(2): pp. 1–8. *Access Research Network* www.arn.org/docs/demski/wd.theologn.htm.

————. 1998a. *The Design Inference*. Cambridge: Cambridge University Press.

————. 1998b. "Introduction." *Mere Creation—Science, Faith, and Intelligent Design*. Downers Grove, IL: InterVarsity. pp. 13–32.

————. 2004. *The Design Revolution—Answering the Toughest Questions about Intelligent Design*. Downers Grove, IL: InterVarsity Press.

Duhem, P. 1914. *The Aim and Structure of Physical Theory*. Princeton: Princeton University Press, 1954.

Hempel, C. 1950. "Problems and Changes in the Empiricist Criterion of Meaning." *Revue Internationale de Philosophie* 11: pp. 41–63. Reprinted with additions and changes as "Empiricist Criteria of Cognitive Significance—Problems and Changes." In *Aspects of Scientific Explanation and Other Essays*. New York: Free Press, 1965.

Johnson, P. 1991. *Darwin on Trial*. Downers Grove, IL: InterVarsity Press.
————. 1996. "Starting a Conversation about Evolution—a review of *The Battle of the Beginnings—Why Neither Side is Winning the Creation-Evolution Debate* by Del Ratzsch." *Access Research Network*, www.arn.org/docs/johnson/ratzsch.htm.
Lewontin, R. 1997. "Billions and Billions of Demons." *New York Review of Books*. January 9, pp. 28–32.
Paley, W. 1800. *Natural Theology, or, Evidences of the Existence and Attributes of the Deity, Collected from the Appearances of Nature*. London: Rivington.
Pennock, R. 1999. *Tower of Babel—the Evidence against the New Creationism*. Cambridge: MIT Press.
Penrose, R. 2005. *The Road to Reality—A Complete Guide to the Laws of the Universe*. New York: Knopf.
Ross, H. 1993. *Philosophy of Biology*. Boulder, Colorado: Westview Press.
————. 1998. "Big Bang Model Refined by Fire." in *Mere Creation—Science, Faith, and Intelligent Design*, ed. W. Dembski. Downers Grove, IL: InterVarsity. pp. 363–84.
————. 1999. "Testability." *Proceedings and Addresses of the American Philosophical Association* 73: pp. 47–76.
————. 2002. "Intelligent Design and Probability Reasoning." *International Journal for the Philosophy of Religion* 52: pp. 65–80.
————. 2004. "The Design Argument." In *The Blackwell Companion to Philosophy of Religion*, ed. W. Mann. New York: Blackwell, pp. 117–47.
————. 2006. "Empiricism." In *The Routledge Companion to the Philosophy of Science*, ed. M. Curd and S. Psillos, forthcoming.
Walker, K. 1998. "Young-Earth Theory Gains Advocates." *Christianity Today*. 45: p. 2.