

Intelligent Design, Science Education, and Public Reason

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Intelligent Design, Science Education, and Public Reason

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The Poynter Center for the Study of Ethics and American Institutions
Indiana University

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PRELIMINARIES

1. Introduction

We are scholars and educators at Indiana University, Bloomington, who are concerned with the growing challenges to science and science education across the United States over the past several years.⁴ The principal focus of these challenges has been evolutionary theory in the biological sciences, but other scientific disciplines have been targeted as well. Since 2000, state and local legislative initiatives that affect the content of secondary school curricula have been introduced in Ohio, Maryland, Utah, California, Pennsylvania, Kansas, Oklahoma, Michigan, Mississippi, Alabama, Georgia, South Carolina, Arkansas, Missouri, New York, Tennessee, Texas, Minnesota, Louisiana, Wisconsin, Colorado, Washington, and our own state of Indiana.⁵ Most of these antievolution efforts have been voted down (or were not voted on at all), some were initially endorsed only to be overturned later, some have ended up in the courts, and some are still yet to be decided. Many of these efforts have been driven by religious believers and express theological convictions about the origins and development of human and non-human life. Whatever the ultimate outcome of these antievolution measures, the mere fact that such efforts are so frequent across so much of the United States is something that has engendered a legitimate worry among educators at both the secondary school and university levels. We write to address educators, policy makers, and the interested public with an eye to clarifying basic concerns regarding the scientific, religious, educational, and legal dimensions of this recent challenge.

The driving force behind these antievolution measures, and the focus of this White Paper, is a supposedly scientific account of the origin, development and diversity of life on earth called *intelligent design theory* by its defenders and put forth as an

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⁴ In addition to the authors, see those listed in the Acknowledgment at the end of the White Paper.

⁵ The website of the National Center for Science Education updates and archives science education legislation news from across the United States. See <http://www.ncseweb.org/>. So, too, do the Public Policy Office of the American Institute of Biological Sciences (see http://www.aibs.org/public-policy/evolution_state_news.html) and the Government Affairs Program of the American Geological Institute (see <http://www.agiweb.org/gap/evolution/>).

alternative to evolutionary theory. Intelligent design theory stands at the heart of a diffuse set of initiatives, ideas, and policy proposals regarding science education in the United States. Those who wish to advance the theory, discussed further below, claim that:

- evolutionary theory, as developed and defended by scientists since first articulated by Charles Darwin in the mid-1800s, is an incomplete and in important respects incorrect account of life's origin, development and diversity; and
- intelligent design theory is a better scientific account of these same phenomena.

We believe that both of these claims are false. While we acknowledge that evolutionary theory—like most theories in most sciences—is incomplete, we deny that its main components are incorrect and that intelligent design theory is a better account of the phenomena dealt with by evolutionary theory. We further deny that intelligent design is a scientific theory at all.

Although we focus on intelligent design and public science education, our concerns and corresponding aims are broader than this. We believe that the recent attempts to discredit evolutionary theory and to insinuate intelligent design into public school science curricula is no less than an assault on the dictates of public reason and dispassionate inquiry and their valued and well-earned place, not only in educational institutions, but in political culture and public policy more generally. While intelligent design may soon vanish from debates within state legislatures and local school boards across the country, the pernicious effects of the more general attack on the value of reason in public life will, we believe, linger.

In what follows we discuss our views about the scientific merits of this debate along with its religious, political, educational, and legal dimensions. Our reflections grow out of a series of informal meetings of scientists and scholars in the humanities and education during 2005-06 at the Poynter Center for the Study of Ethics and American Institutions at Indiana University. We do not presume to exhaust the relevant issues but to bring our competence to bear on what we perceive to be core issues in recent debates over the teaching of evolution. Readers interested in probing one or another facet of teaching evolution will be aided by the resources that we reference in the footnotes and in the Appendix to this document.

SCIENCE

The current debate about intelligent design and evolutionary theory isn't merely about which of these theories better explains and predicts the biological phenomena that fall within the scope of traditional evolutionary biology. It is also a debate about the nature of science (about which, more below). Although defenders of intelligent design theory do not explicitly argue for a wholly different conception of science and its methods—on the contrary, they try to cast their arguments from within science—the claims they make, both critical and programmatic, tend to be at odds with current understandings of science,

its methods and its supporting bodies of evidence. It is therefore not surprising that scientists and scientific societies have responded swiftly and in one voice, not only to reaffirm the truth of evolutionary theory and to denounce intelligent design theory, but to defend science itself.⁶

We approach the scientific assessment of intelligent design theory in two stages. First, in order to make clear the motivations of intelligent design theorists, we briefly survey the intellectual and political pedigree of current intelligent design positions. After this, in section 3, we offer some preliminary remarks about the nature of science, scientific inquiry and scientific evidence before assessing the critical and programmatic claims of intelligent design theorists in light of these remarks.

2. Intelligent Design's Intellectual and Political Pedigree

In many respects, intelligent design theory resembles an earlier 20th century antievolutionary doctrine known as creationism.⁷ “Creationism” is a term applicable to a variety of intellectual positions that can be placed along a continuum according to the degree to which they accept the Bible as literal truth or according to the degree to which their views attempt to be consistent with some scientific evidence.⁸ The organizing belief across this spectrum is “the doctrine that ascribes the origin of matter, species, etc. to acts of creation by God.”⁹ Some creationist positions, such as Young Earth Creationism,¹⁰ have long since been discredited scientifically and have few adherents today, largely because of evidence that demonstrates that the earth is far older than that assumed by these accounts. Other creationist positions have sought to accommodate “old earth” evidence, among other pieces of evidence from the physical sciences, but still maintain that God intervened in the world to create new and increasingly complex species—humans, in particular—sequentially in time. Thus, while such so-called Progressive Creationists accept some evidence from the physical sciences—the age of the earth, the Big Bang—they deny a central tenet of evolutionary theory, namely, that different species evolve from each other over time. Theistic evolutionists, by contrast, freely accept all the results from the physical and biological sciences, but claim that God is present and active throughout the entire cosmic process. On this view, divine creative activity, though not necessarily manifest in any observable way, is integral to or cohesive with the evolutionary process itself.

⁶ For a partial list of scientific societies that have published position statements in defense of evolutionary theory, its methods and evidence, see the Appendix.

⁷ See Ronald L. Numbers, *The Creationists* (Berkeley, Calif.: University of California Press, 1992); Michael Ruse, *The Evolution-Creation Struggle* (Cambridge, Mass.: Harvard University Press, 2005); Ruse, *The Evolution Wars* (New Brunswick, N.J.: Rutgers University Press, 2001); Eugenie C. Scott, *Evolution vs. Creationism: An Introduction* (Berkeley, Calif.: University of California Press, 2004).

⁸ Scott, *Evolution vs. Creationism*, chap. 3; and, Scott, “Antievolution and creationism in the United States.” *Annual Review of Anthropology* 26 (1997): 263-89.

⁹ “creationism,” in *Webster's New World Dictionary*, 3rd College edition.

¹⁰ Roughly the view that (1) the earth is no more than 6,000 to 10,000 years old, (2) there is no biological descent with modification, and (3) the Big Bang did not occur.

Although much could be written about these and other creationist positions, their permutations and variations, as well as their interrelations, this will not occupy us in this White Paper. Our focus here is on intelligent design theory, which differs from creationism in important respects. Contemporary intelligent design theorists owe less to biblical religion than to the argument from design and early modern Deism, especially the ideas of William Paley.¹¹ In his *Natural Theology*, Paley famously argued that upon discovering a watch on the ground and asking why it happened to be in that place, the “inference, we think, is inevitable, that the watch must have had a maker: that there must have existed, at some time, and at some place or other, an artificer or artificers who formed it for the purpose which we find it actually to answer; who comprehended its construction, and designed its use.”¹² Given the intricacies of the watch, and the way that its parts work together seamlessly to produce a functional whole, Paley claimed that it would be very surprising that such a watch were the product of a mindless chance process, and far less surprising that the watch had a watch-maker. As with the watch, so too, on analogy, with countless features of the living world; and, Paley concluded, biological entities in all their richness and variety must be the product of an intelligent designer, namely, God.¹³

Contemporary design theorists have modernized the argument from design and have distanced themselves from some of Paley’s theological content—most importantly, his conclusion from the design argument that an omnipotent and benevolent God exists. Proponents of intelligent design focus on the presence of design *simpliciter* in biological systems and on the entailment that an intelligent designer exists and is responsible for the witnessed design. This designer may or may not be the God of Christianity. In an open-minded, all-comers-are-welcome spirit, Michael J. Behe has claimed that candidates for the designer include: “the God of Christianity; an angel—fallen or not; Plato’s demiurge; some mystical new-age force; space aliens from Alpha Centauri; time travelers; or some utterly unknown intelligent being.”¹⁴ But whatever or whomever the designer happens to

¹¹ On arguments from design, see Elliott Sober, “The design argument,” in *The Blackwell Guide to the Philosophy of Religion*, ed. William E. Mann (Malden, Mass.: Blackwell Publishers, 2005), pp. 117-47; Michael Ruse, *Darwin and Design: Does Evolution Have a Purpose?* (Cambridge, Mass.: Harvard University Press, 2003). On Deism, see Charles Taylor, *Sources of the Self: The Making of the Modern Identity* (Cambridge, Mass.: Harvard University Press, 1989), chapters 15 and 16.

¹² William Paley, *Natural Theology; or, Evidences of the Existence and Attributes of the Deity*, 12th edition. (London, England: Printed for J. Faulder, 1809 [1802]). [Online] Available at: <http://www.hti.umich.edu/cgi/p/pd-modeng/pd-modeng-idx?type=header&id=PaleyNatur>. We are simplifying Paley’s argument here to reflect the way it is silently used in contemporary intelligent design arguments. For a more nuanced account of Paley’s work, set in its appropriate historical context, see Keith Thomson, *Before Darwin: Reconciling God and Nature* (New Haven, Conn.: Yale University Press, 2005).

¹³ Paley’s design argument is given a rigorous formulation in Elliott Sober, “The design argument,” in *The Blackwell Guide*, pp. 117-47.

¹⁴ Michael J. Behe, “The modern intelligent design hypothesis: Breaking rules,” in *God and Design: The Teleological Argument and Modern Science*, ed. Neil A. Manson (New York: Routledge, 2003), pp. 277-91, at 277.

be, the focus of intelligent design researchers is on generating empirical evidence which shows that “intelligent agency appears to be a good explanation for some biological features.”¹⁵ Moreover, sophisticated practitioners of intelligent design distance themselves from their more scientifically-disreputable forbears, such as the flood geology creation “scientists” of yore.¹⁶ Those who argue for the truth of intelligent design thus happily affirm certain aspects of contemporary biology, as well as of many other sciences, a move that appears to lend credence to their self-proclaimed status as scientists who are carving out an alternative scientific theory that explains biological origins, development and diversity.

Despite substantive differences between biblical creationism and intelligent design theory, proponents of the latter are very much the heirs of earlier, 20th century creationists when it comes to advancing their claims in the public realm. Such efforts include attempts by local school districts and state boards of education, often with backing from members of Congress, to include intelligent design in, or to exclude evolutionary theory from, the high school science curriculum; attempts by the same bodies to introduce “warning” stickers on high school biology textbooks claiming that evolution is “a theory, not a fact, regarding the origin of living things” and that evolutionary theory is not the consensus view among biologists; the establishment of privately-funded organizations and institutes that serve as clearinghouses for pro-creationist or intelligent design literature and which house and support creationist scholars; the placement of op-eds in newspapers that circulate in locales where these educational challenges occur; the publication of books and textbooks by ID proponents that attempt to popularize the idea of intelligent design and to cast doubt on evolutionary theory’s validity; and so on.

The Discovery Institute, a think-tank that sponsors programs in science, technology, religion, democracy, and environmental studies, published an anonymous document, “The Wedge Strategy,” in 1999 that lays out these political and cultural aims.¹⁷ The document identifies the Institute’s short- and long-range goals, chief among which is the overthrow of “scientific materialism and its cultural legacies.” Here we see the larger agenda to which intelligent design theory is addressing itself, namely, the idea that Darwinism debunks the idea that human beings were created in God’s image—an idea that serves as “one of the bedrock principles on which Western civilization was

¹⁵ Behe, “The modern intelligent design hypothesis,” p. 278. It is worth noting, of course, that many improbable factors can *appear* to be *good* explanations for a phenomenon, without there being any solid evidence *demonstrating* that the factor *is* the actual explanation of the phenomenon. Conspiracy theories spring immediately to mind.

¹⁶ See, for example, John C. Whitcomb and Henry M. Morris, *The Genesis Flood: The Biblical Record and Its Scientific Implications* (Phillipsburg, N.J.: Presbyterian and Reformed Publishing Company, 1961); Henry M. Morris, *Scientific Creationism* (Green Forest, Ark.: Master Books, 1974).

¹⁷ The document has been removed from the Discovery Institute’s website. It is now accessible at <http://www.antievolution.org/features/wedge.html>. For an in-depth discussion of the Wedge Strategy document and its aims, see Barbara Forrest and Paul R. Gross, *Creationism’s Trojan Horse: The Wedge of Intelligent Design* (New York: Oxford University Press, 2004), especially chaps. 1 and 2.

built.” According to the “Wedge Strategy,” thinkers such as Darwin, Marx, and Freud left us with a picture of humanity as biologically and socially determined, of morality as relative to environmental conditions, and of politics as the product of social engineers. In place of this materialist, relativist, determinist, and utopian legacy, the Discovery Institute aspires to sponsor research, political agitation, and cultural activities that re-open “the case for a broadly theistic understanding of nature.”

The “wedge” in the strategy aims to cut off materialism at its source. The document states: “If we view the predominant materialistic science as a giant tree, our strategy is intended to function as a ‘wedge’ that, while relatively small, can split the trunk when applied at its weakest points.” Through research and publication, dissemination of ideas through the mainstream media, and through “cultural confrontation and renewal”—including “potential legal action for teacher training”—the authors of the Wedge Strategy aim to build a base of support for intelligent design theory and to have it elevated to the dominant scientific perspective in the next 20 years.

Yet there are some novel aspects of intelligent design political strategy as well. Just as contemporary believers in intelligent design depart in some of the details from their intellectual heirs, so too do they depart from their political heirs in matters of detail. For example, because the legal separation of church and state in the United States is a well-known part of the public political culture and has, moreover, been upheld in the courts in many science education challenges, antievolutionists replaced the overtly religious term “creationism” with the neologism, “creation science”—an attempt to make creationist claims seem “scientific” by linguistic fiat. “Creation science”—a term that died in 1982 with the ruling in *McLean v. Arkansas Board of Education*—has now been abandoned in favor of “intelligent design theory,” a term more euphonious to the modern ear, yet sufficiently telling for those who lament the disenchantment of their scientific world and seek its re-enchantment.¹⁸ Despite such differences, the aims of creationists and intelligent design theorists are of a piece: to influence public opinion in order to gain public support for changes to high school and university science curricula.

3. An Assessment of Intelligent Design Theory

If we are to assess intelligent design theory as a scientific theory, then some preliminaries about science and its methods are necessary.¹⁹ Science is many things, rather than one thing. It is, for example, characterized as a way of approaching the world and its

¹⁸ The contemporary intelligent design movement probably began with the publication of Charles Thaxton, Walter Bradley, and Roger Olson’s *The Mystery of Life’s Origin: Reassessing Current Theories* (New York: Philosophical Library, Inc., 1984) and Michael Denton’s *Evolution: A Theory in Crisis* (Bethesda, Md.: Adler & Adler, 1986). See also Dean Kenyon and Percival Davis, *Of Pandas and People*, 2nd edition (Richardson, Tex.: Foundation for Thought and Ethics, 1993 [1989]).

¹⁹ Our remarks here are brief and incomplete. For an accessible account of science and its many methods, see F. James Rutherford and Andrew Ahlgren, *Science for All Americans* (New York: Oxford University Press, 1991). This book is also available online at: <http://www.project2061.org/publications/sfaa/online/sfaatoc.htm>.

empirical phenomena, and it is supported by bodies of theoretical knowledge and empirical evidence. Scientists approach the natural world with the aims of *describing* and *explaining* its current and past phenomena and of *predicting* future phenomena. Explanations proffered by scientists must be consistent with the empirical evidence gathered; that is, explanations must be *testable*. Absent testability, such explanations are mere hunches.²⁰ One test of any phenomenon's explanation is never adequate to determine the explanation's truth; such explanations must be tested and re-tested using both the same and different kinds of scientific procedures. Absent such multiple testing, an explanation fails to yield *reliable* knowledge, i.e., knowledge that stands the test of time.²¹ Despite this, scientific knowledge is always in principle *tentative* or *provisional*; that is, science is not a fixed and static set of facts, dogmas or set of ideas.²² On the contrary, science is an often changing, ever-expanding and ongoing research program.

Corresponding to these features of science and scientific practices is a set of intellectual virtues and duties that are inherent in the structure of scientific inquiry: a duty to expand its explanatory armamentaria; a duty to gather evidence; a willingness to fairly assess and be responsive to evidence; a willingness to have one's results rigorously tested by one's peers; and a refusal borne by humility to assert anything more than what the evidence warrants and to be open to alternative explanations of phenomena. We find these virtues at risk, and these duties shirked, in the recent debates about evolution, intelligent design and scientific education, about which we will say more below.

Intelligent design advocates cast themselves as scientists who are pursuing an empirically-based research program that seeks to explain biological origins, development and diversity. We briefly outline both their critical and programmatic claims below.²³

3. A. Critical Claims: Arguments against Evolutionary Theory

Intelligent design proponents make different claims using a variety of methods, yet they are unified by their commitment to one point: evolutionary theory is an incomplete and,

²⁰ On testability, see Elliott Sober, "Testability," *Proceedings and Addresses of the American Philosophical Association* 73 (1999): 44-76.

²¹ We note here that some theists hold that, while scientific explanations are good so far as they go, they nonetheless are incomplete—i.e., they fail to be ultimate—because they leave out of their explanations the concept of divine action.

²² It is important not to overstate the tentativeness of scientific conclusions and explanations. "Tentative" in this context does not mean that scientists are undecided because sufficient evidence isn't yet in; it means that all available evidence, both theoretical and empirical, points to a particular truth, but that advances in theoretical sciences and in scientific methodology, along with new empirical findings, might yet yield a different truth sometime down the line. Moreover, the tentativeness of scientific knowledge applies not to all scientific propositions, but rather only to a subset of these propositions.

²³ See Michael J. Behe, *Darwin's Black Box* (New York: The Free Press, 1996); Phillip E. Johnson, *Darwin on Trial*, 2nd ed. (Downers Grove, Ill.: InterVarsity Press, 1993 [1991]); William A. Dembski, *The Design Inference* (New York: Cambridge University Press, 1998); Dembski, *No Free Lunch* (Lanham, Md.: Rowman & Littlefield, 2002); Dembski, *Intelligent Design: The Bridge between Science and Theology* (Downers Grove, Ill.: InterVarsity Press, 1999).

hence, unsatisfactory account of the origin, development and diversity of biological life. There are two claims—one weak, one strong—built into this formulation. The weak claim is that not all the possible evidence supporting the truth of evolutionary theory has been generated. As a consequence of this, gaps in our knowledge about the origin, development and diversity of extant and extinct species remain. The strong claim is that evolutionary theory cannot explain the origin, development and diversity of biological life because it is committed, a priori, to a naturalistic, or materialistic, metaphysic.

Few, if any, evolutionary biologists would disagree with the weak claim. Indeed, were all the evidence in and evolutionary biology considered a “complete” science, evolutionary biologists would be out of work and evolutionary biology would be studied in the history of science, not *as science*. Yet among some intelligent design advocates, this incomplete knowledge is cited as evidence of evolutionary theory’s falsity or as the basis for one’s extreme skepticism about its claims. One variously reads: (1) that natural selection operating on random mutations cannot explain a host of aspects of the living world such as irreducibly complex biological systems (e.g., the blood clotting cascade) or biological features (e.g., the bacterial flagellum); novel organs and morphological structures (e.g., wings, eyes, nervous systems); or novel body plans (or forms); (2) that the fossil record is woefully incomplete, thus demonstrating that Darwin’s idea of a tree of life, according to which all species are genealogically related to all others, is either wrong or a bald assumption. As Phillip Johnson writes: “The fossil record...is so unhelpful that the important steps in evolution must be assumed to have occurred within its ‘gaps’;”²⁴ (3) that scientists have found no evidence of the existence of a nitrogen-rich “prebiotic soup” from which life is supposed to have initially sprung; (4) that the genetic code across species is not universal, thus calling into question the claim that evolution proceeds via descent with modification; and so on.²⁵

These criticisms are based upon a faulty understanding of either evolutionary theory and its several mechanisms of action or the bodies of evidence in its support. What is more, the criticism regarding the incompleteness of the fossil record is uniformly and vastly overstated. That the fossil record is incomplete, for example, does not invalidate evolutionary theory: the theory’s truth does not hinge on a complete set of fossils that demonstrate every instance of modification and speciation over the course of many millennia. There are multiple lines of evidence that evolutionary scientists pursue, reinforce and draw upon, lines that extend beyond the boundaries of paleontology. Evolutionary science is not one science, but many. It is therefore both naïve and dishonest to draw the conclusion that evolutionary theory is a theory in crisis simply because there is incomplete knowledge within one of its branches.

²⁴ Phillip E. Johnson, “Evolution as dogma: The establishment of naturalism,” in *Intelligent Design Creationism and Its Critics*, ed. Robert T. Pennock (Cambridge, Mass.: MIT Press, 2001), pp. 59-76, at 65.

²⁵ See, for example, David K. DeWolf, Stephen C. Meyer, and Mark E. DeForrest, “Teaching the origins controversy: Science, or religion, or speech?” *Utah Law Review* 39 (2000): 39-110, at 50-55; Stephen C. Meyer, “The origin of biological information and the higher taxonomic categories,” *Proceedings of the Biological Society of Washington* 117 (2004): 213-39.

Moreover, 150 years of evidence in favor of evolutionary theory's truth is considerable. In addition to evidence from the fossil record, finding from molecular biology, the existence of developmental and structural remnants in extant species, the study of biogeography, direct small-scale observation, and from the demonstration of homologous similarities across species, all point to the soundness of evolutionary theory's account of the origin, development and diversity of biological life.²⁶

The strong antievolutionist claim, however, is the important one for intelligent design theorists. It is this: that evolutionary theory cannot explain the origin, development and diversity of biological life because it is committed, a priori, to a naturalistic, or materialistic, metaphysic. Here is Johnson's version of this point: "The theory in question is a theory of *naturalistic* evolution, which means that it absolutely rules out any miraculous or supernatural intervention at any point. Everything is conclusively presumed to have happened through purely material mechanisms that are in principle accessible to scientific investigation, whether they have yet been discovered or not."²⁷ Johnson again: "Naturalism assumes the entire realm of nature to be a closed system of material causes and effects, which cannot be influenced by anything from 'outside.' Naturalism does not explicitly deny the mere existence of God, but it does deny that a supernatural being could in any way influence natural events, such as evolution..."²⁸ William A. Dembski spells out the theological consequences of naturalism in a similar way: "For those who cannot discern God's action in the world, the world is a self-contained, self-sufficient, self-explanatory, self-ordering system. Consequently they view themselves as autonomous and the world as independent of God. This severing of the world from God is the essence of idolatry and is in the end always what keeps us from knowing God. Severing the world from God, or alternatively viewing the world as nature, is the essence of humanity's fall."²⁹ And as Johnson and Stephen Meyer have both argued, the evolutionary scientist's commitment to naturalism (or materialism) is no less an article of faith than is belief in God—it is dogma.³⁰

The precise contours of this challenge to the underpinnings of evolutionary theory need to be explained and its faults highlighted. First, there are two forms of naturalism that are run together by supporters of intelligent design: *metaphysical* (or ontological)

²⁶ See, for example, Jerry Coyne, "The faith that dare not speak its name," *The New Republic* (Aug. 22 & 29, 2005); Ernst Mayr, *What Evolution Is* (New York: Basic Books, 2001), chap. 2; Mark Ridley, *Evolution*, 3rd ed., (Malden, Mass.: Blackwell Publishers, 2004); Douglas J. Futuyma and Thomas R. Meagher, chairs; endorsed by the American Society of Naturalists, the Society for the Study of Evolution, the Society for Molecular Biology and Evolution, the Ecological Society of America, the Society of Systematic Biologists, the Genetics Society of America, the Animal Behavior Society, and the Paleontological Society. *Evolution, Science, and Society: Evolutionary Biology and the National Research Agenda*. [Online] 1998. Available at: <http://www.rci.rutgers.edu/~ecolevol/fulldoc.pdf>.

²⁷ Johnson, "Evolution as dogma," p. 61.

²⁸ Johnson, *Darwin on Trial*, pp. 116-17.

²⁹ Dembski, *Intelligent Design*, p. 99.

³⁰ Johnson, "Evolution as dogma," and Stephen C. Meyer, "Scientific tenets of faith," *Perspectives on Science and Christian Faith* 38 (1986): 40-42.[Online] Available at: <http://www.asa3.org/ASA/PSCF/1986/JASA3-86Meyer.html>.

naturalism and *methodological* naturalism. Ignoring this distinction lies at the heart of intelligent design theory's confusion. Metaphysical naturalism is a claim about which entities (and forces, processes, etc.) exist, and which do not. Since God is typically thought of as a supernatural (or non-natural) entity, a commitment to metaphysical naturalism entails a belief that the natural world is causally closed (i.e., only natural entities and processes are operative within the physical world) and, importantly, a denial either of God's existence or of God's agency in the physical world. So if a belief in the truth of evolutionary theory implies a denial of God's existence or worldly agency, then advocates of intelligent design will doggedly deny the truth of evolutionary theory. And because intelligent design theorists believe that a non-natural intelligence is causally responsible for the existence and variety of biological life, they claim that evolutionary theory is in principle incapable of offering a true explanation of such things.

So there seems to be a stand off. Defenders of intelligent design theory think that evolutionary theorists exclude supernatural causes with no good reason, and evolutionary theorists think that intelligent design theory allows for the idea of supernatural causation with no good reason.³¹ This description of the state of play distorts the issues, however, because proponents of intelligent design lump together two different naturalistic theses. Evolutionary theory as a theory is not committed to *metaphysical* naturalism, even if some of its practitioners are. It is rather committed to *methodological* naturalism, and this is a very different thesis.³² The methodological naturalist uses methods that reliably and consistently yield good evidence and information about the physical world. As such, the methodological naturalist only investigates claims that can ultimately be verified or falsified by sensory observation (including the use of instruments that "extend" the human senses). He or she does not investigate claims about the non-material world whether in the realm of mathematics or theology, since such claims, by definition, cannot ultimately be verified or falsified by empirical investigation. Such scientists simply seek accounts of the material world in terms of these sensory observations using methods from the natural or empirical sciences.

Far from being adopted dogmatically and a priori, these methods and the results they yield are always subject to critical scrutiny, fine-tuning, and revision. Contrary to the claims of intelligent design proponents, evolutionary theorists need not—as scientists—rule out hypotheses that invoke supernatural (or non-natural) entities. But similar such hypotheses have been rejected over and over, by generation after generation of scientists, as being inadequately supported by the evidence. And so evolutionary

³¹ Some theists claim that divine action is as much a part of the natural world as are the typical causal processes that scientists investigate. As such, those who hold such views would object to our claim that the action of God is a supernatural action.

³² See, for example, Niall Shanks, *God, the Devil, and Darwin* (New York: Oxford University Press, 2004), chap. 4; and Robert T. Pennock, "Naturalism, evidence, and creationism," in *Intelligent Design Creationism and Its Critics*, ed. Pennock, pp. 77-97. We are well aware that much more could be written about naturalism in its many forms. On this, see Michael C. Rea, *World Without Design: The Ontological Consequences of Naturalism* (New York: Clarendon Press, 2002), especially chap. 3; William Lane Craig and J.P. Moreland, eds., *Naturalism: A Critical Analysis* (New York: Routledge, 2000).

scientists are rightly skeptical of explanatory frameworks that involve the supernatural (or the non-natural), not because of some a priori philosophical prejudice, but rather because their methods have been so successful for so long in so many different contexts in generating knowledge about the physical world, and because they have produced no evidential support for the operation of the supernatural (or the non-natural) within nature.

The strong antievolutionist claim proffered by defenders of intelligent design theory is premised upon a conflation of naturalistic theses and should thus be rejected. In those instances where advocates of intelligent design claim that evolutionary theory is unable to explain features of the natural world, evolutionary scientists see a phenomenon that is yet to be fully explained; where defenders of intelligent design see dogmatic assumptions about mechanisms operative in the natural world, evolutionary scientists see mechanisms the explanation of which their empirically-backed methods have provided.

3. B. Programmatic Claims: Arguments in Favor of Intelligent Design

The most general contention made by intelligent design theorists is that life and its genesis, variety and features are best understood as having arisen from the workings of an intelligence of some sort. We call this the *intelligent design hypothesis*. The evidence marshaled in favor of this hypothesis is drawn from a variety of disciplines, including biochemistry, cosmology and mathematics. We present and evaluate some of these programmatic claims below.

In a book and series of articles, Michael J. Behe has argued in favor of the intelligent design hypothesis based upon a feature of biological, cellular and biochemical systems he calls “irreducible complexity.” Behe discerns a weakness in evolutionary biology based upon Darwin’s own words: “If it could be demonstrated that any complex organ existed which could not possibly have been formed by numerous, successive, slight modifications, my theory would absolutely break down.”³³ Behe thus asks: “What sort of organ or system seems unlikely to be formed by ‘numerous, successive, slight modifications’?”³⁴ His answer is: one that exhibits irreducible complexity. When something exhibits irreducible complexity, Behe argues, the principal mechanism of evolutionary change, natural selection, is incapable of explaining how irreducible complexity emerged. Here’s why: Many biochemical systems, such as the blood-clotting cascade or the bacterial flagellum, require multiple and tightly matched constituent parts in order to function. In many such systems, the removal of just one constituent part results in a loss of functionality. It is impossible, he claims, for evolution—or any natural process—to produce such multiple-part, functional systems via gradual, step-by-step selective pressure because the final functional product is too far downstream for it to be favored by natural selection, and any precursor product is by definition non-functional, hence, not the kind of entity on which natural selection works. But such irreducibly

³³ Charles Darwin, *The Origin of Species*, edited with an introduction and notes by Gillian Beer (New York: Oxford University Press, 1996 [1859]), p. 154.

³⁴ Michael J. Behe, “Answering scientific criticisms of intelligent design,” in Michael J. Behe, William A. Dembski, and Stephen C. Meyer, *Science and Evidence for Design in the Universe* (Ft. Collins, Colo.: Ignatius Press, 2000), pp. 133-49, at 133-34.

complex systems do exist, and given that they do, Behe reasons, the best explanation of their existence is that they were designed by an intelligent designer.

Behe makes two claims. The first is a factual one, that certain systems are irreducibly complex; the second is that for selective pressure to be exerted on an irreducibly complex system (because its function confers a survival benefit to the organism), all the parts out of which the fully functional system is constructed have to be present at the beginning of its evolutionary history. Otherwise, Behe argues, there is no Darwinian explanation for the existence of the irreducibly complex system. If these claims are true, then Behe believes that the only explanation for the existence of such systems is the action of an intelligent designer.

Regarding the bacterial flagellum—dubbed by Kenneth Miller as the “poster child” of the intelligent design movement—both claims are false.³⁵ (A flagellum is a tail-like structure that, through its high-rpm movement, is used for locomotion.) First, a subset of the proteins in the flagellum make up the bacteria’s type III secretory system (TTSS), a fully functional subunit of the flagellum, albeit one with a different function than that of the flagellum. The presence of the TTSS proteins within the structure of the flagellum means that the flagellum is not irreducibly complex. So it seems that Behe’s factual claim about the bacterial flagellum is false. Second, on the evolutionary path to the flagellum, it is reasonable to believe that the TTSS was selected for its survival advantage, after which time further structures were added to this system which later resulted in the flagellum, an entity with a different function. In other words, all the parts out of which the flagellum is constructed do not have to be there from the beginning; rather, a flagellum can be constructed, via stepwise evolutionary mechanisms, by adding later parts to an earlier precursor. Parts that are added later can improve the entity’s functionality, and further downstream, the function of the entity can change altogether, thus making these later additions, not merely helpful, but necessary. Such entities—even those that are, unlike the flagellum, described in intelligent design theory as irreducibly complex—can thus be explained from within evolutionary biology. So the second part of Behe’s argument is also false.

Behe’s other examples of irreducible complexity and the problems such examples supposedly raise for evolutionary theory fare no better.³⁶ So although Behe has received

³⁵ Kenneth R. Miller, “The flagellum unspun: The collapse of ‘irreducible complexity,’” in *Debating Design: From Darwin to DNA*, ed. William A. Dembski and Michael Ruse (New York: Cambridge University Press, 2004), pp. 81-97.

³⁶ See H. Allen Orr, “Darwin v. intelligent design (again).” *Boston Review* (Dec.1996/Jan.1997). [Online] Available at: <http://bostonreview.net/BR21.6/orr.html>; Kenneth R. Miller, *Finding Darwin’s God* (New York: Harper Collins, 1999). Shanks, in his *God, the Devil, and Darwin*, and in a paper co-authored with Karl Joplin (Niall Shanks and Karl H. Joplin, “Redundant complexity: A critical analysis of intelligent design in biochemistry,” *Philosophy of Science* 66 (1999): 268-82), argues that many biochemical pathways exhibit redundant complexity, which means that one component of the system can be removed without loss of functionality, *pace* Behe. Finally, see the exchange between Michael J. Behe and David W. Snoke, “Simulating Evolution by Gene Duplication of Protein Features that Require Multiple Amino Acid Residues,” *Protein Science* 13 (2004): 2651–64; Michael Lynch, “Simple Evolutionary Pathways to

much attention in this debate, it is important to note that he has not gathered evidence to support his preferred explanation of irreducibly complex systems, nor has he demonstrated any phenomena that are inconsistent with the explanations or prediction of evolutionary biology. In light of this, one can rightly be skeptical of his many claims.³⁷

Another, more formal, attempt to defend the intelligent design hypothesis is that of William Dembski, who articulates and defends a design inference that makes use of what he calls the complexity-specification criterion.³⁸ Dembski's most general contention is that science is wrong to have removed the concept of design from its explanatory framework and that it should be reinstated. Doing this, however, requires that design is given a rigorous and scientific formulation that enables scientists to infer design from patterns of data. Dembski claims to have done just that. (The formal apparatus that Dembski invokes is considerably involved and ranges over probability, computational complexity and information theories. These details will not be discussed here.)

Dembski claims that there are three possible modes of explanation: necessity, chance, and design. While the sciences limit themselves to the study of necessity (i.e., laws) and chance, Dembski focuses on design. He writes: "When intelligent agents act, they leave behind a characteristic trademark or signature—what I define as *specified complexity*. The complexity-specification criterion detects design by identifying this trademark of designed objects."³⁹ The trademark, in turn, is an independently given pattern to which the designed object corresponds. How does the complexity-specification criterion do this? When faced with an event, object or structure, we need to explain it by reference either to necessity, chance or design. In order to do this, we need to ask three questions: Is it contingent? Is it complex? Is it specified? The complexity-specification criterion can thus be represented as a flowchart with three decision nodes corresponding to these three questions. He calls this flowchart the explanatory filter.

So, faced with an object, Dembski asks that we first determine whether it is contingent. If it is not, then its explanation is that of necessity, that is, it is required by physical law and could not have been otherwise. If, on the other hand, it is contingent, then we move to Dembski's second question, namely, whether it is complex. If it is not complex, then its explanation is that of chance because simple objects can arise by

Complex Proteins," *Protein Science* 14 (2005): 2217-25; Michael J. Behe and David W. Snoke, "A Response to Michael Lynch," *Protein Science* 14 (2005): 2226-27.

³⁷ For a recent demonstration of the stepwise evolution of a tightly integrated system of parts, see Jamie T. Bridgham, Sean M. Carroll, Joseph W. Thornton, "Evolution of Hormone-Receptor Complexity by Molecular Exploitation," *Science* 312 (2006): 97-101.

³⁸ See, variously, Dembski, *No Free Lunch*; Dembski, "The Third Mode of Explanation: Detecting Evidence of Intelligent Design in the Sciences," in Behe, Dembski, and Meyer, *Science and Evidence for Design in the Universe*, pp. 17-51; Dembski, "The Logical Underpinnings of Intelligent Design," in *Debating Design*, eds. Dembski and Ruse, pp. 311-30; Dembski, "In Defense of Intelligent Design," in *The Oxford Handbook of Religion and Science*, Philip Clayton and Zachary Simpson, eds., (New York: Oxford University Press, forthcoming). This essay is also available online at: http://www.designinference.com/documents/2005.06.Defense_of_ID.pdf.

³⁹ Dembski, "The third mode of explanation," in *Science and Evidence for Design in the Universe*, p. 23.

chance. If it is complex, we move to Dembski's final question, whether it displays specification, i.e., whether it has features that can be characterized independently of the process that brought those features about. If it is not specified, then its explanation is again that of chance. If it is specified, however, then one can rightly infer that its existence is due to design. Or so Dembski claims.

The main challenge that Dembski faces in his invocation and use of specified complexity is that it is question-begging. In other words, he reads design into biological phenomena by assuming that they match up with an independently given pattern. But, as H. Allen Orr has written, organisms do not strive to match an independently given pattern, whatever that pattern may be.⁴⁰ They are not, strictly speaking, striving for anything. To say as much implies that the arrow of evolution points in a particular, independently given direction. Organisms simply do what they do in order to survive to reproductive age and produce more offspring than their competitors. An acknowledgment of this fact, however, need not commit one to the existence of a grand design to which organisms are committed. This is precisely the thing that Dembski must demonstrate. But instead of demonstrating this, it serves as a silent and assumed premise in his argument, and thereby demonstrates his incomplete understanding of evolutionary science.

It is ironic that for all the talk of complexity among intelligent design theorists, all of their critical and programmatic claims are based on an understanding of evolutionary theory that makes it seem overly simple. Many advocates of intelligent design wrongly oversimplify and reduce evolution to natural selection. But while natural selection is the only known mechanism for adaptive change, other evolutionary changes occur along many other non-adaptive pathways, like random drift, for example. Similarly, in the hands of many intelligent design theorists, Behe in particular, science itself becomes a very simple endeavor. When faced with a phenomenon that is yet to be explained by evolutionary scientists, instead of calling for and pursuing more research in order to explain the phenomenon, advocates of design infer the workings of an intelligent designer. Widespread adoption of this strategy by scientists would make science far easier, but far less successful, than it is.

The argumentative strategy of intelligent design theorists is similarly simple. Through an artificially restrictive process of elimination, they infer that the best explanation is non-naturalistic, one involving the workings of an intelligence. Such an approach to science is inadequate because, unlike all other sciences, it involves no substantive methodological principle on which one may base a research program. Instead, intelligent design theorists make this kind of claim: "A, B, C and D (design) are the only available explanations for a particular phenomenon. We believe that A, B, and C are false (or inadequate), and so can be eliminated. Therefore, the correct explanation is D." This is the last-person-standing approach to science and, absent independent empirical evidence of D's truth—evidence that needs to be more than the mere falsity of A, B, and C—it is fallacious. The landscape would be significantly different if advocates of intelligent design were able to marshal independently justified evidence in favor of

⁴⁰ Orr, "Intelligent Design vs. Darwinism," *Boston Review*.

explanation D. But, the efforts of Dembski notwithstanding, no such evidence has yet appeared.⁴¹

EDUCATION

4. Educating for Citizenship

Writing in 1960, the paleontologist, George Gaylord Simpson, noted, not without alarm, the following:

Suppose that the most fundamental and general principle of a science had been known for over a century and had long since become a main basis for understanding and research by scientists in that field. You would surely assume that the principle would be taken as a matter of course by everyone with even a nodding acquaintance with the science. It would obviously be taught everywhere as basic to the science at any level of education. If you think that about biology, however, you are wrong. Evolution is such a principle in biology.⁴²

“This,” Simpson continued, “is a problem, and a very serious one, for our educational system and for the whole dream of developing the enlightened citizenry on which the ideal of democracy depends.” We concur.

Debates surrounding intelligent design implicate fundamental questions about the role and proper methods of education. We focus on this issue on the premise that the education of children and young adults is important, not only for them individually, but for society more generally. A society decides which cognitive virtues are important for its citizens to possess, and through its public educational institutions, chooses what needs to be taught and how it is to be taught to best encourage these virtues in its next generation. Through its educational institutions, society reproduces what’s best about itself and, if it is sufficiently forward-looking, what its citizens need in order to handle the challenges ahead.⁴³

Education has a variety of aims, some of which benefit the person receiving the education, some of which benefit society.⁴⁴ First, it fosters and facilitates autonomy. Through their interaction with those in their school and passage through its curricula, children and young adults are introduced to different ways of life and learn to reflect

⁴¹ See *Intelligent Design Creationism and Its Critics*, ed. Pennock,; Pennock, *Tower of Babel: The Evidence against the New Creationism* (Cambridge, Mass.: MIT Press, 1999); Forrest and Gross, *Creationism’s Trojan Horse; Why Intelligent Design Fails*, eds. Matt Young and Taner Edis (New Brunswick, N.J.: Rutgers University Press, 2004); *Debating Design*, eds. Dembski and Ruse; and Shanks, *God, the Devil, and Darwin*.

⁴² G. G. Simpson, “One Hundred Years without Darwin Are Enough.” *Teachers College Record* 60 (1961): 617-26, at 617. Simpson’s essay is also included in *Evolution*, ed. Mark Ridley (New York: Oxford University Press, 1997), pp. 369-78.

⁴³ For an early discussion of these themes, see The Committee on the Objectives of a General Education in a Free Society (The Harvard Committee), *General Education in a Free Society* (Cambridge, Mass.: Harvard University Press, 1945).

⁴⁴ In this paragraph, we follow Harry Brighouse, *On Education* (New York: Routledge, 2006).

rationally on the pressing matters with which they are confronted. Through exposure to schools, its people and its teachings, children can learn to navigate the factual and moral worlds they inhabit and to do so as reflective, self-governing agents. Second, education prepares the student for participation in the economy. By this we mean not that schools narrowly tailor their curricula to the demands of the work force, but rather that education gives one the general skills that are necessary to enter and thrive within the work force. This educational aim recognizes that individuals gain income, status and identity from work, and that it fosters an important sense of self-reliance. Third, education promotes human flourishing, however one defines one's goods in life. Indeed, it is the importance of living a fulfilling life across all of its dimensions that grounds the prior educational aims of autonomy-facilitation and the preparation for economic life.

The above-mentioned educational aims all serve the interests of those receiving an education. We want to discuss a further educational aim, one which certainly benefits those who receive the education, but whose principal benefit accrues to society. This is education for citizenship. Consider the so-called civic virtues, those dispositions among citizens that are necessary to engage in cooperative self-rule as a democratic people. On this view, citizens must maintain a reasoned commitment to the important principles that form the bedrock of their society, such as a commitment to the rule of law, to religious freedom, and to democratic participation. They must accept and defend the more general values that justify a society's principles, such as equality, liberty, the promotion of the common good and, importantly, truth. To do so requires that individuals possess certain habits of mind, like civility, toleration, and a commitment to reasoned dialogue. These are some of the civic virtues for a democratic polity, and while there is debate about which virtues are required for citizenship, there is broad agreement that a society's public educational institutions are places where such dispositions should be nurtured and honed.⁴⁵

We have two points to make in this context. First, we believe that the important role of science education has been overlooked in accounts of the civic virtues and of citizenship. It is not that one needs to be a trained scientist in order to be an effective and engaged citizen. It is rather that in order to participate as a citizen in matters of the public good, one must be accountable to evidence and be further committed to engage in dispassionate assessments of evidence. One must be open to criticism and correction in light of ideas and beliefs that are warranted by reliable evidence. One must respect the limits of what reliable evidence allows one to claim. These are habits that all citizens in a democracy should possess, and we believe that the link between the trait we call "accountability to evidence" and education is given its most explicit treatment in science curricula.⁴⁶ By this we do not mean to suggest that the non-sciences are non-evidential disciplines or that they lack criteria of good reasoning. It is rather that, at least in high school and undergraduate science curricula, students are taught that claims about the world need to be tested and assessed; evidence must be gathered; and the final arbiter of

⁴⁵ See Eamonn Callan, *Creating Citizens* (New York: Oxford University Press, 1997); Amy Gutmann, *Democratic Education* (Princeton, N.J.: Princeton University Press, 1987).

⁴⁶ Noretta Koertge, ed., *Scientific Values and Civic Virtues* (New York: Oxford University Press, 2005).

the truth of any scientific claim is, as it were, the physical world. The disposition to be responsive and responsible to evidence is at the heart of science education, and it clearly involves a set of habits that have implications well beyond the science classroom.

Second, and more expansively, one overarching tenet that we believe informs the proper direction of science education is the idea of “public reason.” A commitment to public reason is a key educational goal if one is concerned about educating individuals for citizenship. “Public reason” as we are using it here is a doctrine about terms on which dialogue should occur. It says that the reasons we offer in dialogue with others should make a good faith effort at being “public”—that is, at being intelligible across a range of traditions, beliefs, and practices, and open to criticism and revision based on information that meets the same test of good faith intelligibility.

The idea of public reason has been developed by John Rawls in an argument about the proper place of religious beliefs in what he calls the “public political forum,”⁴⁷ chiefly the three branches of government. We need not explore the specifics of Rawls’s argument here as it relates to democratic theory.⁴⁸ Instead we want to draw more generally from core ideas in Rawls’s account to consider limits on extra-scientific speech in science education. Our view is that there are justifiable limits placed on such speech. By “extra-scientific speech” we mean speech—religious and non-religious—that may draw on a student’s or professor’s personal faith or heritage, but that fails to adhere to the basic tenets of methodological naturalism.

Consider the actual case of students who reject basic and well-supported scientific claims because such claims do not cohere with their religious teachings or upbringing. Such students enter their science classrooms unwilling to have their faith-based ideas subjected to scientific scrutiny. In our view, such students not only make science education difficult if not impossible, they undermine some fundamental virtues and duties of public reason as we understand it. They introduce personal and extra-scientific ideas in order to arbitrate scientific inquiry and reason-giving.

But public reason puts limits on that kind of arbitration. Public reason means that there are justifiable constraints placed on us when we express our ideas. We’re constrained from invoking ideas that don’t speak to others on terms that they can understand and evaluate on shareable terms. What exactly those limits are, or exactly

⁴⁷ John Rawls, “The Idea of Public Reason Revisited,” in his *Collected Papers*, ed. Samuel Freeman (Cambridge, Mass.: Harvard University Press, 1999), pp. 573-615, at 576. For discussions, see Charles Larmore, “Public Reason,” in *The Cambridge Companion to Rawls*, ed. Samuel Freeman (New York: Cambridge University Press, 2003), pp. 368-93; Robert P. George and Christopher Wolfe, eds., *Natural Law and Public Reason*, (Washington, D.C.: Georgetown University Press, 2000); Eric A. MacGilvray, *Reconstructing Public Reason* (Cambridge, Mass.: Harvard University Press, 2004).

⁴⁸ For a discussion, see Steven M. DeLue, “Public Reason and Democracy: The Place of Science in Maintaining Civic Friendship,” in *Scientific Values and Civic Virtues*, ed., Koertge. DeLue explores other debates in science and public policy, e.g., the public funding of stem cell research, that go beyond our concerns in this White Paper.

where to draw them, is not a question that we need to answer here. It's the very idea of limits or line-drawing that we want to defend. Our view is that line-drawing is justified by the idea of public reason—that the canons for studying science should be informed by traditions of scholarship that are intelligible on the terms we've just provided: they make a good faith effort at being intelligible across a range of different traditions, beliefs, and practices, and they are open to criticism and revision based on ideas that meet the same canons of intelligibility. Persons who disregard the attempt to address others on terms that they can understand commit a form of disrespect.

Public reason thus creates a space that bars extra-scientific speech (as we have defined it) as a mode of reason-giving in science classes. Our view is that such limits are neither arbitrary nor ideological—they are justified for moral reasons, which we will develop below. We will state the core point here: Public reason is about the good of providing public justification in arguments addressed to others. As Rawls writes, public reason “proceeds from premises we accept and think others could reasonably accept to conclusions we think they could also reasonably accept.”⁴⁹

As “reasonable” as this doctrine might seem, it is not without its doubters. One of the positions that opposes itself to public reason might be called the “integrity complaint.” This complaint holds that abiding by public reason puts a gag order on personal beliefs. On this view, a student or professor must act contrary to her own deeply held convictions by presenting claims or speaking in a language that he or she doesn't believe. Having to refrain from expressing one's deeply held commitments seems inauthentic, and leaves the professor or student divided into two halves: a “believing” half and a “scientific” half. Having to follow public canons of academic scholarship thus appears to involve a good measure of insincerity and, in the final analysis, a kind of hypocrisy. So the complaint focuses on the lack of wholeness or integrity that public reason seems to require.

Several factors might be seen as aiding and abetting these and related concerns about speech, faith, and public reason in the classroom.

One factor is what William F. May calls the rise of “the twentieth century positivist university.”⁵⁰ In the positivist university, May writes, “values express only subjective, emotive preferences. They do not inhere in things; we read them into things. Spongy and slippery, they do not deserve a place at the lectern.”⁵¹ Here the culprit is the “fact-value” distinction and, with that distinction, the privileging of disinterested, scientific methods of inquiry along with the denigration of non-empirical phenomena as “mere opinions” or “subjective feelings.” In the positivist university, May observes, “teachers can transmit factual knowledge, which eventually yields power, but they cannot pose questions about its responsible uses.”⁵² Public reason seems to foster this quest for

⁴⁹ Rawls, “The Idea of Public Reason Revisited,” p. 594.

⁵⁰ William F. May, *Beleaguered Rulers: The Public Obligation of the Professional* (Louisville, Ky.: Westminster John Knox Press, 2001), pp. 247-53.

⁵¹ May, *Beleaguered Rulers*, pp. 247-48.

⁵² May, *Beleaguered Rulers*, p. 248.

disinterested and instrumental knowledge while avoiding the hard questions about the ultimate meaning and ends of a good human life.

Another factor aiding this disquiet is the so-called hegemony of liberalism and its quest for “neutrality” regarding issues that typically generate controversy and division. The idea of being “neutral” has several specific problems of its own.

- One problem is that “neutrality” has been shown to be a questionable aspiration; there is no “view from nowhere,” no epistemologically pure or untainted perspective, so the argument goes. Thus, for epistemological reasons, the idea of placing limits on speech in the name of public ideals seems unsound.
- A second problem is that having to put limits on extra-scientific speech is often linked to the desire to avoid controversy. This means restricting our speech with an eye to pragmatic necessities—that of conflict-avoidance. But that requirement seems to presume in advance a fact that has yet to be established. For example, many people co-exist peacefully in ecumenical contexts wherein open expressions of religious beliefs—and religious disagreements—are possible, and no acrimonious conflicts ensue. Restraint for pragmatic reasons seems alarmist or at least exaggerated.
- Another problem with liberalism is that it seems to rely on a picture of persons as free, independent, and “unencumbered”⁵³—standing outside of tradition, community, or history. Such a view, the complaint goes, is metaphysically and morally untrue. We are situated in time and place; our lives are embedded in social locations.

In addition to the perils of positivism and liberalism is a third problem, namely, the problem of secularism and its anti-religious ideology. Here the argument is that putting limits on religious speech is not to behave “neutrally” but to endorse a clear ideological regime—one that is hostile to religion and that would aim for a “naked public square.”⁵⁴ For a religious believer, having to put limits on extra-scientific speech is to play by the enemy’s rules, and that seems unfair. Here the argument is that public reason is not neutral but puts the religious believer at a disadvantage when discussing important or contested ideas.

A final, related factor is the “rationalism” of academic inquiry, which presumably suppresses intuitive, affective, or experiential sources of insight and wisdom. The basic idea is that reason is anemic or unfeeling; it crowds out other sources of real human knowledge, especially religious sources.

So the integrity complaint provides several reasons to question putting limits on extra-scientific speech—especially when such speech draws from religious beliefs. Not

⁵³ The phrase is notably used in Michael J. Sandel, *Liberalism and the Limits of Justice* (Cambridge, Mass.: Cambridge University Press, 1982 [2nd ed. 1998]), and in his article, “The Procedural Republic and the Unencumbered Self,” *Political Theory* 12 (1984): 81-96.

⁵⁴ See Richard John Neuhaus, *The Naked Public Square: Religion and Democracy in America* (Grand Rapids, Mich.: Wm. B. Eerdmans, 1984).

infrequently this complaint comes with the feeling that barring extra-scientific speech, especially when it derives from religious or cultural heritages, signals a form of disrespect. In our view, this claim confuses the meaning of respect with the issue of to whom respect is owed.

Indeed, we are not persuaded by those who voice the integrity complaint, however reasonable its supporting claims might seem. We fail to be persuaded because we believe that serious caricatures lie behind the four factors we just cited. But rather than explore those here, we want to focus on a deeper, underlying confusion that fuels the integrity complaint. That confusion turns on the moral aspirations that animate the idea of public reason and the duties that attach to those aspirations. *Those aspirations, we want to repeat, are moral ones.* They go beyond the obviously important goal of teaching science within the rigors of methodological naturalism. *The integrity complaint overlooks the fact that teaching and learning involve civility and respect.* Such goods may require students and professors to “bracket” or put aside their own personal convictions or worldviews.

When we enter the classroom we often overlook that fact that we are part of, or members of, an institution—and with that membership comes certain expectations and demands. Our institution is that of higher learning. Contrary to the picture of public reason as possibly involving “unencumbered selves,” professors and students are encumbered by protocols and obligations that tie them to the public good. Having extra-scientific beliefs restricted is only one piece of this larger task of “boundary drawing” that structures instructors’ relationships with students and students’ relationships with each other. It is a way of organizing and restricting professional and other forms of power.

Placing limits on extra-scientific speech thus widens the space of intellectual inquiry and exploration. Abiding by public reason means that students need not worry about whether their scientific ideas contravene someone else’s deeply held convictions. Public reason protects the freedom of everyone to pursue ideas that some might find religiously off-putting, offensive, or unorthodox. If freedom is the concern, in other words, that value is protected—not violated—by the canons of public reason.

A related moral aspiration is tied to the good of reciprocity. This good is realized when what we say in the classroom we consider reasonable others to accept, as free and equal persons, and not as dominated or manipulated. We speak to others on the same terms according to which we want to be addressed. Addressing others in this way is guided by the Golden Rule. In abiding by public reason, we are doing unto others as we would expect them to do unto us. We expect them to offer reasons in a way that is respectful. And to meet that test they must speak to others out of a good faith effort to render their ideas public. Seen from another angle, the idea of public reason implicates the value of equality. Abiding by public reason means adhering to protocols from which neither I nor my interlocutors can excuse ourselves. It applies to everyone, as equals.

Approaching the issue of science education in light of public reason shifts the focus away from the concerns about students' and professors' integrity. It focuses instead on the idea of respecting the people in the classroom according to the principle of equal liberty. This means that the requirement of public reason cuts in several directions—in relationships between students and professors, and among students in relation to each other. When offering ideas in scientific (or other) inquiry, students may not simply proclaim their religious views as if they were true or deserving of respect by virtue of being sincere or deeply held. They must make a good faith effort to render their views intelligible and public in ways that we have described.

So the idea of teaching within the constraints imposed by public reason may very well seem to “disrespect” those who wish to introduce extra-scientific beliefs into science classes. But that appearance is deceiving. The limits imposed by public reason are justified by the values of respect and reciprocity. On that basis, we should see science education, constrained by public reason, in ethical terms—as expressing a moral aspiration. It means that we should study science as we should any discipline—in ways that respect the dignity and equality of all the participants organized as they are in role-bound relationships.

Stated with an eye to the controversy surrounding science education, our point in this section is this: the idea of public reason and its corresponding norms of respect and reciprocity support the teaching of evolutionary theory in science classrooms. That theory makes no appeal to extra-scientific ideas in support of its claims. The idea of public reason also makes clear that excluding intelligent design theory from science education is neither unfair nor ideological in some pejorative sense. Intelligent design theory includes extra-scientific claims – claims that by their very nature are unavailable for scientific testing. Including evolutionary theory and excluding intelligent design theory from science education are thus appropriate stances – respectful stances – to take if one accepts public reason's limits on ideas and inquiry in scientific education. But teaching intelligent design in science education, alas, has been encouraged by political leaders, including President Bush. We take up that point in the following section.

5. “Teach the Controversy”

In response to questions about the teaching of intelligent design alongside that of evolutionary theory, in August 2005 President Bush said, “I felt like both sides ought to be properly taught...so people can understand what the debate is about.”⁵⁵ His comments surprised no one given that they are consistent with his No Child Left Behind Act, which encourages schools to teach the controversy surrounding biological evolution.⁵⁶ Nor indeed was this the first invocation of the “teach the controversy” rhetoric by a publicly elected official. In 2002, members of the Ohio State Board of Education rallied together under this banner and successfully changed the state's science education standards to

⁵⁵ Elisabeth Bumiller, “Bush remarks roil debate on teaching of evolution,” *New York Times* (Aug. 3, 2005).

⁵⁶ U.S. Congress. No Child Left Behind Act of 2001, Pub. L. No. 107-110, 107th Congress, Jan. 8, 2002. [Online] Available at: <http://www.ed.gov/policy/elsec/leg/esea02/107-110.pdf>.

mandate that biology teachers “critically analyze” evolutionary theory in their classrooms.⁵⁷

This rhetoric has also been picked up by prominent proponents of intelligent design. As Stephen C. Meyer has written: “When two groups of experts disagree about a controversial subject that intersects the public school curriculum students should learn about both perspectives. In such cases teachers should not teach as true only one competing view. . . . Instead, teachers should describe competing views to students and explain the arguments for and against these views as made by their chief proponents. Educators call this ‘teaching the controversy.’”⁵⁸ And together with colleagues David K. DeWolf and Mark E. DeForrest, Meyer has written that “public schools teach the controversy over biological origins in a way that faithfully reflects the debate that is actually happening among scientists.”⁵⁹

On its face, the idea that teachers should expose high school and university students to controversial issues seems reasonable. Teachers frequently lament the fact that their students lack critical analytical skills that are needed for success in school and beyond in the local and global economies. Would not early exposure to controversies and to the critical methods needed to resolve such controversies be a good thing? Moreover, a mandate to teach the controversy over biological evolution seems animated by a laudable egalitarianism: Is it not fair to open the curriculum to diverse materials so that all sides of a debate are allotted equal time? Surely, one might claim, doing so is best, not only for proponents of non-evolutionary accounts of biological origins, development and diversity, who would see their hard work rewarded by its inclusion in the curriculum, but for students, who would be exposed to the issues in their fullness. Thus equipped with all the information, students could decide for themselves which account of biological origins best withstood critical scrutiny.

But describing the “teach the controversy” slogan in this way distorts what is at issue. Whatever semblance of legitimacy the “teach the controversy” slogan might possess rests on an equivocation about the word *controversy*. If one restricts one’s reading to the popular press, one might reasonably conclude that there is a controversy raging in the United States about evolution, intelligent design, and science curricula. And there is: Evolution, intelligent design and the contents of science curricula are indeed matters of much controversy and have been for some time. *But these are cultural, political or social controversies that do not correspond to a genuine scientific controversy over biological origins, development and diversity and evolutionary theory’s ability to explain these phenomena.* Were the antievolutionist slogan specified to say,

⁵⁷ However, no mandate to teach antievolutionary thought—including young or old earth creationism, or intelligent design—made it into the Ohio education law.

⁵⁸ Stephen C. Meyer, “Teach the controversy,” *Cincinnati Enquirer* (Mar. 30, 2002). Available at: http://www.arn.org/docs/meyer/sm_teachthecontroversy.htm.

⁵⁹ David K. DeWolf, Stephen C. Meyer, Mark E. DeForrest, *Intelligent Design in Public School Science Curricula: A Legal Guidebook*. [Online] 1999. Available at: <http://www.arn.org/docs/dewolf/guidebook.htm>.

“teach the cultural (or social) controversy,” few would balk at such a suggestion, provided that certain reasonable constraints were in place (e.g., that educators refrain from presenting intelligent design as a legitimate scientific theory). Phrased in this way, the controversy and its place, if any, in the curriculum would be immediately identifiable as extra-scientific. But once the slogan takes the form of the expression, “teach the scientific controversy,” then its status as a red-herring is plain: *There is no scientific controversy between evolutionary theory and intelligent design.*

This response is informed by a more general set of reflections regarding the “teach the controversy” slogan, reflections recently published by Eugenie C. Scott and Glenn Branch. Those authors propose five criteria, all of which must be satisfied before a controversy is appropriate to teach in a high school science class. The criteria are:

- (1) The controversy ought to be of interest to students;
- (2) The controversy ought to be primarily scientific, rather than primarily moral, social, or religious;
- (3) The resources for each side of the controversy ought to be comparable in availability;
- (4) The resources for each side of the controversy ought to be comparable in quality; and,
- (5) The controversy ought to be understandable by the students.⁶⁰

According to Scott and Branch, the controversy over intelligent design satisfies criteria (1) and (3), but fails to satisfy criteria (2), (4) and (5). We believe that they are, in broad outline, correct—both regarding the merits of their criteria and about whether the evolution-intelligent design controversy satisfies them.

Let us assume, following Scott and Branch, that criteria (1) and (3) are satisfied (although about (3) one does well to note that intelligent design resources do *not* exist in the scientific literature). How does this controversy fail to satisfy the other three criteria? We have already discussed criterion (2) and have nothing further to add. With regard to criterion (4), the quality of the intelligent design literature is highly variable and generally very poor. The critical claims of intelligent design proponents, to the effect that evolutionary theory is a theory in crisis, mere dogma, or insufficiently supported by extant evidence, are without scientific merit and widely rejected by the scientific community.

On criterion (5), the evolution-intelligent design controversy fares no better. Although the basic elements of evolutionary theory are relatively easy to understand, the claims made by defenders of intelligent design range over and invoke so many disparate areas—astronomy, biochemistry, cosmology, biology, chemistry, mathematics—that an easily understandable, unified core of scientific tenets associated with intelligent design explanations of biological origins is scarcely discernible. It is difficult to imagine that

⁶⁰ Eugenie C. Scott and Glenn Branch, “Evolution: What’s Wrong with ‘Teaching the Controversy’,” *Trends in Ecology and Evolution* 18 (2003): 499-502.

high school science students could digest the hodge-podge of intelligent design claims, regardless of the skills of the teacher.

There are two additional reasons why the “teach the controversy” argument fails. First, if intelligent design is deemed an acceptable alternative to evolutionary theory in science class in the name of educational fairness, then so too should be the countless other accounts of the same phenomena found in the world’s religions.⁶¹ If fairness is what is at issue, in other words, doors should be wide open to a variety of alternative accounts from, say, Native American traditions, Chinese and South Asian religions, indigenous African religions, Zoroastrianism, and the like. But this is an absurd conclusion and speaks to the falsity of the fairness claim. What is and is not covered in science class has little to do with fairness of exposure; it is, rather, about bodies of evidence that have been generated and that have withstood scrutiny using methods appropriate to the discipline in question.

Second, it is not obvious that a deep engagement with and understanding of scientific controversies is an appropriate educational goal for high school, or indeed for undergraduate college science classes. One of the entailments of the “teach the controversy” slogan is that students should be provided with enough information for them to determine which side of the debate carries the day. It is not obvious that a standard science class has either the time or the resources to provide such information.

We are aware of the fact that there are few disciplines where controversies about both core and fringe issues do not exist.⁶² We believe that science teachers should be free to mention that a controversy exists about certain aspects of the science that he or she is teaching; and we believe that teachers should be free to briefly discuss such controversies as interesting in-class asides. Indeed, discussing historical examples of scientific controversy during science class may well animate the subject matter and show how such controversies were eventually resolved. But when there is an extant and genuine controversy in the scientific community, it is unrealistic to believe that high school and undergraduate university students could be provided with sufficient information, and could develop the necessary analytical skills, to resolve the controversy for themselves. In making this judgment, we presume a robust but reasonable sense of “deciding for oneself,” namely, that decisions are made by proffering the right kinds of discipline-specific reasons in light of all available evidence.

Put differently, if expert practitioners of a science are themselves currently locked in debate about aspects of their science, how could one believe that students—whose exposure to the given science, even at the end of their undergraduate education, is brief,

⁶¹ Brian J. Alters and Sandra M. Alters, *Defending Evolution in the Classroom* (Sudbury, Mass.: Jones and Bartlett Publishers, 2001), p. 156.

⁶² See, for example, H. Tristram Engelhardt, Jr. and Arthur L. Caplan, eds., *Scientific Controversies: Case Studies in the Resolution and Closure of Disputes in Science and Technology* (New York: Cambridge University Press, 1987); Peter Machamer, Marcello Pera, and Aristides Baltas, eds., *Scientific Controversies: Philosophical and Historical Perspectives* (New York: Oxford University Press, 2000).

and whose knowledge of the science is fragmented and incomplete—could decide the controversy for themselves during their high school or undergraduate careers? In the hands of intelligent design proponents, the claim that the controversy should be taught so that students can decide for themselves is premised on an anemic view of what is required for true decisionmaking.

In making these claims about the goals of science education, we are presuming for the sake of argument that a legitimate scientific controversy exists regarding the merits of intelligent design as a viable alternative to evolutionary theory. As we have noted above, however, we do not believe that such a scientific controversy actually exists. In our view, those advocating to “teach the controversy” misunderstand what a scientific controversy is and fail to appreciate how any scientific controversy might be realistically taught in high school and undergraduate science classes.

RELIGION

6. Science and Religion

We’ve argued that intelligent design theory is an intellectual heir of 17th century design theory and a political heir of earlier 20th century creationism. We’ve also argued that it is religiously motivated and that its proponents seek to establish religious, rather than scientific, conclusions. To the extent that this is true, the controversy raises broad questions about the relationship between science and religion, both in terms of their substantive content and as social practices.

Our aim here is not to provide a comprehensive discussion of how religion and science interact.⁶³ What we wish to identify are theological liabilities to intelligent design theory—untoward implications of the theory that religious adherents do well to note. To clarify this point, we identify four relationships between religion and science and concentrate on the third and fourth, since they seem especially pertinent to the kind of theological claims that intelligent design theorists make. Following Ian Barbour, let us consider four ways of tracking the relationship between religion and science: conflict, independence, dialogue, and integration.⁶⁴

Conflict: On this view, scientific claims are incompatible with religious claims. Scientists and religious adherents embrace this position for different reasons. Atheistic scientists claim that all religious beliefs are undermined by evolutionary theory. Religious adherents who adopt a literalist account of the creation narrative in Genesis

⁶³ For this, see Holmes Rolston III, *Science and Religion: A Critical Survey* (Philadelphia, Penn.: Temple University Press, 1987); John C. Polkinghorne, *Science & Theology: An Introduction* (Minneapolis, Minn.: Fortress Press, 1998); John F. Haught, *Science & Religion: From Conflict to Conversation* (Mahwah, N.J.: Paulist Press, 1995); Alister E. McGrath, *Science & Religion: An Introduction* (Malden, Mass.: Blackwell Publishers, 1998); Arthur R. Peacocke, *Theology for a Scientific Age* (Norwich, England: SCM-Canterbury Press, 1993).

⁶⁴ Ian Barbour, *When Science Meets Religion: Enemies, Partners or Strangers?* (San Francisco, Calif.: Harper, 2000).

believe that biblical revelation conflicts with evolutionary theory. Both groups hold that religious beliefs and scientific theories cannot be held simultaneously.

Independence: This account holds that science and religion occupy two quite different domains and can co-exist peaceably because they provide answers to different sorts of questions. Science deals with matters of fact and tests its claims empirically. Religion addresses matters of value which are qualitative and not subject to empirical verification or falsification. No conflict need arise between science and religion so long as each form of thought is compartmentalized. On this account, science and religion are “two non-overlapping magisteria,” in a phrase made famous by Stephen Jay Gould.⁶⁵

Dialogue: This account notes that formal and perhaps substantive similarities exist between scientific and religious claims. On this view, we do well to explore how similar presuppositions, methods, and concepts inform both domains of thought. For example, both approaches are challenged by the problem of describing non-observable phenomena; both draw on received paradigms of thought to shape inquiry; and both reckon with questions regarding the order and intelligibility of the universe. These areas invite dialogue between science and theology.

Integration: This approach looks at how science informs theology and works to revise theological claims given our understanding of nature’s history and its dynamic processes. Traditional variants of this position, as we have noted, are found in design theories of creation. More recent variants look to science as either placing constraints on religious claims or as providing a framework for thinking about process metaphysics. Theologians such as James Gustafson argue that scientific facts put limits on what can be credibly believed by religious adherents about humanity’s place in the cosmos and the overall direction of natural history.⁶⁶ Process theologians go further to embrace a naturalistic metaphysic in which scientific and religious claims are coordinated into one overall framework.⁶⁷

Proponents of intelligent design have succeeded in getting attention from the public in part because they have cleverly taken advantage of a common sentiment among Americans that there ought to be some kind of middle ground between evolution and belief in God. That is to say, they seek to exploit features of the third and fourth approaches enumerated by Barbour. While polls show an alarmingly high level of support for the idea that God created life in its present form with no recourse to evolutionary processes, there is also considerable support for the idea that life has

⁶⁵ Stephen Jay Gould, *Rocks of Ages* (New York: Ballantine, 1999).

⁶⁶ James M. Gustafson, *Ethics from a Theocentric Perspective*, 2 vols. (Chicago: University of Chicago Press, 1981, 1984).

⁶⁷ In addition to Ian Barbour’s *When Science Meets Religion*, see David Ray Griffin, *The Reenchantment of Science: Postmodern Proposals* (Albany, N.Y.: State University of New York Press, 1988); John B. Cobb, Jr., *The Process Perspective: Frequently Asked Questions About Process Theology* (Atlanta, Ga.: Chalice Press, 2003).

evolved over time with some guidance from a supreme being.⁶⁸ Support for the latter notion—the core idea of “theistic evolution”—is not necessarily support for intelligent design, and in fact may be in sharp contrast to it. But intelligent design proponents are able to muddy the waters of theistic evolution, much to their own advantage. To those who have not examined it closely, intelligent design appears to offer something reasonable, a compromise between a stance of atheism and one of anti-science. The fact that some scientists, most notably Richard Dawkins, have equated Darwinism with atheism leads some theistic evolutionists to search for such a compromise—a form of dialogue if not integration—and intelligent design is happy to take them in even if under false pretenses.

Yet there are crucial differences between theistic evolution and intelligent design, and we do well to note them. The key difference hinges on a proper understanding of methodological naturalism. As we noted above, methodological naturalism is not committed to a particular worldview. Thus, it is not to be equated with the *bête noire* of intelligent design theory, namely, metaphysical naturalism. Methodological naturalism does not imply an ontological or metaphysical stance, atheistic or otherwise. Rather it signals adherence to scientific method as a tried and true approach to investigating how the world works. As such, it does not preclude religious belief but neither does it attempt to give evidential grounds for it. Many people who claim to believe that evolution occurs, but with some guidance from God, may very well hold to a form of methodological naturalism: they do not want to jettison scientific methods and evidence; they see the value and benefits of science in their lives, but they also do not want to be told that scientific investigation forces them to give up faith. Nor do they necessarily want science to claim competence in theological questions or to weigh in directly on discussions of the nature of God. After all, if science can provide evidence for theism, it can also undermine theism as new evidence is discovered and previous conclusions become suspect.

On the face of it, intelligent design theory sounds like theistic evolution because it involves some “mix” of natural selection and belief in a supreme being. So long as this mix is not closely scrutinized, middle grounders may find intelligent design theory appealing. Intelligent design is not theistic evolution precisely because it does attempt to provide scientific evidence for a designer; theistic evolution, in contrast, interprets evolution theistically but does not seek scientific evidence to support claims about the existence of God. More to the point, intelligent design theory “scientifically” affirms theism in a way that many believers would probably find offensive if they were aware of just what the theory claims, or fails to claim, about God. The God of intelligent design is akin to what can be called a “God-of-the-Gaps.” That is, intelligent design reasons from

⁶⁸ Gallup News Service. “American Beliefs: Evolution vs. Bible’s Explanation of Human Origins: Education, church attendance, partisanship related to beliefs.” Mar. 8, 2006; *ibid.* “Almost Half of Americans Believe Humans Did Not Evolve: Religion is major predictor of attitudes toward human origin.” June 5, 2006; and, *ibid.* “Third of Americans Say Evidence Has Supported Darwin’s Evolution Theory: Almost half of Americans believe God created humans 10,000 years ago.” Nov. 19, 2004. These polls are available online at: <http://www.galluppoll.com/>.

gaps in our knowledge about nature to gaps in nature itself, positing “God” as the term for our ignorance. It is not simply that we don’t know all there is to know about evolution, intelligent design argues, but that evolution as a process is limited to certain phenomena. The activity of “God” is invoked to explain phenomena that science cannot fully explain at present. By extension, God is absent in those processes that are scientifically accounted for.

The theological liabilities of such a position should be apparent. The main problem is that the gaps in our knowledge may be closed at any time by scientific information, thus further marginalizing God. This liability becomes even more apparent when we remember that science is not a closed and fixed doctrine but an ongoing *activity* that adds to knowledge in incremental and sometimes revolutionary ways. As scientific explanations increase, the “space” for supernatural explanations correspondingly diminishes. Even some evangelical Christians would rather subscribe to a theistic evolution that embraces natural selection fully but does not pronounce on matters of faith, than an intelligent design theory that leaves room only for deism and erodes God’s immanence in creation.⁶⁹

To concerns such as these, intelligent design, in some of its forms, has a ready response: God will never be explained away as the gaps are closed because there are some gaps that simply cannot be closed. Some phenomena in nature could not have come to exist naturalistically—namely those that show irreducible complexity. So what intelligent design is saying is not that certain phenomena are as yet unexplained but that they are inexplicable. Having pronounced them inexplicable, there is no burden on intelligent design to explain them either, no need to offer a positive account of the origin of biological complexity in lieu of the supposedly failed Darwinian account. But until it offers an alternative account—other than appealing to direct, divine agency—intelligent design remains outside the realm of science. As it currently stands, it is intelligent design, and not Darwinian science, that is committed to an ontological stance—one of mysticism. That is to say, its final appeal is to a reality that is ineffable. In this sense, intelligent design theory represents not a middle ground, but a point at the opposite end of the spectrum from the extreme atheistic naturalism or “scientism” professed by the likes of Richard Dawkins. Intelligent design theory only avoids fully embracing a God-of-the-Gaps by further positing a God who remains opaque to human reason and whose actions in the world are defined, in circular fashion, as those we cannot comprehend. For those seeking a middle ground between evolution and faith, the God of intelligent design does not seem to offer much to believe in.

We should now see that intelligent design theory and its forbear, Deism, share less in common than one might initially think. William Paley, whom we mentioned earlier, developed a Deistic argument with an eye to the grandeur of the universe. For deists, to say that the divine design is visibly evident is to make a statement about the

⁶⁹ Keith B. Miller, ed., *Perspectives on an Evolving Creation* (Grand Rapids, Mich.: Wm. B. Eerdmans Publishing Co., 2003).

harmony, beneficence, and beauty of the natural world.⁷⁰ Intelligent design theory, in contrast, makes no mention of nature's observable regularity and harmony on which an intelligent designer is premised. It rather posits a God who is opaque in light of "evidence" that is itself unintelligible according to canons of scientific observation and inquiry.⁷¹

LAW AND PUBLIC POLICY

7. Legal and Public Policy Debates about the Teaching of Evolution

Antievolutionists, old and new, have a political and public policy agenda, namely, to change educational curricula to include alternatives or challenges to evolutionary theory in high school and university science classrooms. By some measure, these educational policy challenges to evolutionary theory have been successful: antievolution advocates have successfully included their attempted reforms in proposed state legislation and school board measures, and challenges to established policy have been litigated in federal courts. To some, this development might suggest that these challenges have merit and that events in the public policy arena track (or are prompted by) events in science. If antievolution measures have an audience, especially among elected officials and the courts, one might infer that evolutionary theory is in shambles, or that intelligent design is a validated scientific theory, and that educators and law-makers are conscientiously responding to this scientific state of affairs with the educational best interests of their constituents at heart.

But this isn't so. Far from being a success, antievolution measures that have made their way into law-making bodies stand as a prime example of interest groups perverting the political and legislative process without due regard for the interests of those who would be forced to bear the consequences of such measures. Moreover, as long as antievolution forces continue to press their cases into U.S. courtrooms, those in the general public who have no science background will likely believe that intelligent design is a legitimate theory whose defenders are righteously engaged in a worthy cause. Whatever one might call this, "success" hardly seems appropriate.

What, then, are the legal issues that are raised when creationist advocates get their day in court? The recently decided case in Dover, Pennsylvania, *Kitzmiller et al. v. Dover Area School District*, highlights many legal issues in what was the first case in which defenders of intelligent design theory argued their case in a federal court. *Kitzmiller* also amply demonstrates that the questions raised by such antievolutionist challenges are settled matters of law.⁷²

⁷⁰ Paley, *Natural Theology*. Paley writes: "It is a happy world after all. The air, the earth, the water, teem with delighted existence. In a spring noon, or a summer evening, on whichever side I turn my eyes, myriads of happy beings crowd upon my view."

⁷¹ We are grateful to Noretta Koertge for noting this contrast.

⁷² Anne Marie Lofaso, *The Constitutional Debate over Teaching Intelligent Design as Science in Public Schools* (A White Paper released by the American Constitution Society). [Online] Dec., 2005. Available at: http://www.acslaw.org/pdf/Intelligent_Design_White_Paper.pdf.

In October, 2004 the Dover Area School Board of Directors passed the following resolution: “Students will be made aware of gaps/problems in Darwin’s theory and of other theories of evolution including, but not limited to, intelligent design. Note: Origins of Life is not taught.” One month later, the Dover Area School District (DASD), issued a press release indicating that teachers would be required to read a statement to their ninth grade biology classes at Dover High School. The statement read, in part:

Because Darwin’s Theory is a theory, it continues to be tested as new evidence is discovered. The Theory is not a fact. Gaps in the Theory exist for which there is no evidence. A theory is defined as a well-tested explanation that unifies a broad range of observations.

Intelligent Design is an explanation of the origin of life that differs from Darwin’s view. The reference book, Of Pandas and People, is available for students to see if they would like to explore this view in an effort to gain an understanding of what Intelligent Design actually involves. As is true with any theory, students are encouraged to keep an open mind.

Shortly thereafter, in December 2004, concerned parents, with help from the American Civil Liberties Union, Americans United for the Separation of Church and State, and the Pennsylvania law firm of Pepper Hamilton, launched a lawsuit against the DASD, the focus of which was the questionable constitutional validity of the DASD’s resolution and press release. In particular, the plaintiffs alleged that the DASD’s policy violated the Establishment Clause of the First Amendment of the U.S. Constitution and that it also violated the Constitution of the Commonwealth of Pennsylvania. The trial opened on Sept. 26, 2005 and Judge John E. Jones, III issued his judgment on Dec. 20, 2005. Judge Jones ruled in favor of the plaintiffs.⁷³

The Establishment Clause of the First Amendment provides that “Congress shall make no law respecting an establishment of religion.”⁷⁴ Courts interpret this clause to mean that neither federal nor state governments may make judgments about the value or disvalue, the truth or falsity, of religions or religious beliefs or practices. As Michael J. Perry explains, “government may not take any action based on the view that the preferred religion or religions are, as religions, better along one or another dimension of value than one or more other religions or than no religion at all.”⁷⁵ Phrased in this way, one can see

⁷³ *Kitzmiller, et al. v. Dover Area School District*. Full text of the opinion available at: <http://f11.findlaw.com/news.findlaw.com/hdocs/docs/educate/ktzmllrdrv122005opn.pdf>.

⁷⁴ See Erwin Chemerinsky, *Constitutional Law: Principles and Policies*, 3rd ed. (New York: Aspen Publishers, 2006).

⁷⁵ Michael J. Perry, *Religion in Politics* (New York: Oxford University Press, 1997), p. 15. For further discussions of these issues see Perry, *Love and Power: The Role of Religion and Morality in American Politics* (New York: Oxford University Press, 1991); Perry, *Under God? Religious Faith and Liberal Democracy* (New York: Cambridge University Press, 2003); Kent Greenawalt, *Does God Belong in Public Schools?* (Princeton, N.J.: Princeton University Press, 2005); Francis

that the Establishment Clause is an antidiscrimination provision. It says: if the government somehow favors one religion over another (or over no religion at all), then those who fall within the favored religion are “insiders,” and those who fall outside of the favored religion are “outsiders” or are not full members of the political community. To the extent that this is so, such “outsiders” are discriminated against. Typical Establishment Clause conflicts that have played themselves out in courts include mandatory prayers in public schools, the display of religious symbols by agencies of the government, government aid to religiously-affiliated schools, and, as in *Kitzmiller*, the teaching of intelligent design in public schools.

Framed as an Establishment Clause case, the question before the Dover court was whether the mandated inclusion of intelligent design in high school biology classes constituted an endorsement of religion. Before answering the “endorsement test,” Judge Jones first provided an account of the intelligent design movement to highlight the historical and cultural context of the case over which he was presiding. Of note was the Court’s examination of several drafts of the pro-intelligent design textbook under consideration, *Of Pandas and People*. The court compared drafts of the book that were written before and after the 1987 U.S. Supreme Court decision, *Edwards v. Aguillard* (482 U.S. 578), a decision stating that the Constitution forbids the teaching of creationism as science on First Amendment grounds. Judge Jones concluded that “three astonishing points” emerge as one compares various drafts of *Of Pandas and People*: “(1) the definition for creation science in early drafts is identical to the definition of intelligent design; (2) cognates of the word *creation* (creationism and creationist), which appeared approximately 150 times were deliberately and systematically replaced with the phrase *intelligent design*; and (3) the changes occurred shortly after the Supreme Court held that creation science is religious and cannot be taught in public school science classes in *Edwards*.”⁷⁶ In short, Judge Jones found that the authors of *Of Pandas and People* had simply done a search-and-replace to remove offending terms. The new edition differed not at all in substance from its earlier, and overtly creationist, editions. This finding, among others, led Judge Jones to conclude that an objective observer would know that intelligent design theory, as well as mandated teaching about “gaps” and “problems” in evolutionary theory, are religious strategies that evolved from earlier forms of creationism.

To answer the endorsement test, Judge Jones asked the following questions: First, would an objective student view the disclaimer as an official endorsement of religion? He answered “yes.” Second, would an objective Dover citizen perceive the conduct of the DASD to be an endorsement of religion? He answered “yes.” Finally, is intelligent design science? He answered that a reasonable and objective observer would conclude that intelligent design “is an interesting theological argument, but that it is not science.”⁷⁷ The conclusion of the Court was that the conduct of the DASD conveyed a strong message of

J. Beckwith, *Law, Darwinism, and Public Education* (Lanham, Md.: Rowman & Littlefield, 2003); Noah Feldman, *Divided by God* (New York: Farrar, Strauss and Giroux, 2005).

⁷⁶ *Kitzmiller*, p. 32.

⁷⁷ *Kitzmiller*, p. 89.

endorsement of religion and, as such, was a violation of the Establishment Clause of the First Amendment.

Further legal questions were at issue in *Kitzmiller*. The Court was required to ask a separate question, one which is similar to that embodied in the endorsement test. It was this: would the mandated inclusion of intelligent design in science class strike the reasonable, objective observer as having both the purpose and effect of endorsing a religion? The “purpose” and “effect” questions—known as the *Lemon* test—are established principles of law that derive from the U.S. Supreme Court’s decision in *Lemon v. Kurtzman* (403 U.S. 602, 1971).⁷⁸ According to *Lemon*, a government-sponsored message violates the Establishment Clause of the First Amendment if (1) it does not have a secular purpose; or (2) its principal or primary effect advances or inhibits religion; or (3) it creates an excessive entanglement of the government with religion.⁷⁹ To violate the Establishment Clause, only one of the three prongs of the *Lemon* test needs to be satisfied; prong 3, “excessive entanglement,” was not at issue in *Kitzmiller*. Judge Jones concluded that the intelligent design policy of the DASD satisfied both the purpose and effect prongs of the *Lemon* test, and as such, the intelligent design policy constituted an attempt by the DASD to promote religion in the classroom. With regard to the purpose prong, Judge Jones concluded: “Any asserted secular purposes of the Board are a sham and are merely secondary to a religious objective,” and that the defendant’s “previously referenced flagrant and insulting falsehoods to the Court provide sufficient and compelling evidence for us to deduce that any allegedly secular purposes that have been offered in support of the ID Policy are equally insincere.”⁸⁰

The *Kitzmiller* decision was a resounding defeat for the advocates of intelligent design. It was hardly surprising, however. The legal debates between advocates of creationism and evolutionary theory were carried out in a series of landmark cases in the twentieth century, starting with the famous, but jurisprudentially unimportant, Scopes “monkey trial” of 1925. At issue in this trial was the constitutionality of the Butler Act, which made it illegal for anyone to teach evolutionary theory in a state-funded educational institution. John Scopes, a teacher who defied the Butler Act, lost his case in 1925, but his case ended up before the Tennessee Supreme Court on appeal in 1927 and was overturned on a technicality. The Butler Act remained on the books in Tennessee until 1967, but was never legally invoked in its remaining 40 years.⁸¹

Far more legally important were three later cases, two of which made it to the Supreme Court. In *Epperson v. Arkansas*, an Arkansas antievolution bill was struck

⁷⁸ The question of whether a government’s actions convey a message of endorsement (or disapproval) of religion is referred to as the “endorsement test.” The purpose and effect tests articulated in *Lemon* are separate tests. However, in practice, the effect test is thought to be the way in which courts decide the endorsement test; in other words, while the endorsement and effect tests are separate, they converge in practice.

⁷⁹ *Kitzmiller*, p. 90.

⁸⁰ *Kitzmiller*, p. 132.

⁸¹ *Scopes v. State of Tennessee* (1927) 154 Tenn. 105, 289 S.W. 363.

down by the Supreme Court in 1968 for its violation of the Establishment Clause.⁸² In 1982, the judge in *McLean v. Arkansas Board of Education*, struck down Act 590, entitled “Balanced Treatment for Creation-Science and Evolution-Science Act,” on First Amendment grounds.⁸³ And in 1987’s *Edwards v. Aguillard*, the U.S. Supreme Court ruled that Louisiana’s “Creationism Act,” which required the teaching of creationism in public elementary and secondary schools *if* evolutionary theory was taught, was also unconstitutional on First Amendment grounds.⁸⁴ Given these precedents, it would have been shocking if *Kitzmiller* had been decided other than it was.

The *Kitzmiller* case also had some foreseeable effects. For example, shortly after testimony concluded in November, 2005, but before the final decision was handed down, Dover residents voted out all eight member of the Dover Area School Board who had proposed the pro-ID educational reforms. Sensing the weakness of the case, many prominent defenders of intelligent design distanced themselves from the case even before its conclusion. Dembski and two other expert witnesses from the Discovery Institute pulled out shortly before being deposed in the case. After the ruling, many intelligent design advocates attacked Judge Jones—a Republican appointed by George W. Bush to the bench—for his activism. As John G. West, a Senior Fellow from the Discovery Institute, put it: “This is an activist judge who has delusions of grandeur.”⁸⁵ And the case cost the Dover Area School Board—i.e., taxpayers—over one million dollars in legal fees, less than half of what it would have cost had the plaintiff’s lawyers not agreed to take the case *pro bono* and charge only for its actual expenses.

CONCLUSION

Were cases like *Kitzmiller* oddities on the political and legal landscape, science educators and parents concerned about the quality of their children’s public school science education would have comparatively little to worry about. Were it so, one could view such events as the workings of local groups of well-placed, but misguided, individuals trying to push their views into the educational policy arena. Sadly, however, this is not how things are in the contemporary United States. On the contrary, *Kitzmiller* is an example of a far more general phenomenon, namely, a systematic attempt by certain powerful segments of the population to interfere with science, scientific practice, and science education for political reasons. As Chris Mooney writes, science is politicized when there is “any attempt to inappropriately undermine, alter, or otherwise interfere with the scientific process, or scientific conclusions, for political or ideological reasons.”⁸⁶ Before offering some concluding recommendations, we want to note briefly how science is being politicized on a number of fronts today.

⁸² (1968) 393 U.S. 97.

⁸³ (1982) 529 F. Supp. 1255.

⁸⁴ (1987) 482 U.S. 578.

⁸⁵ Discovery Institute Staff, “Dover Intelligent Design Decision Criticized as a Futile Attempt to Censor Science Education,” Dec. 20, 2005. Available at: <http://www.discovery.org/scripts/viewDB/index.php?command=view&id=3107&program=News&callingPage=discoMainPage>.

⁸⁶ Chris C. Mooney, *The Republican War on Science* (New York: Basic Books, 2005), p. 17.

The current Bush administration has been accused of serious political meddling in science. So pervasive is this thought to be that in 2004 the Union of Concerned Scientists (UCS) produced two reports detailing the administration's interference with science.⁸⁷ The UCS documents a host of strategies used by government agencies to interfere with or distort science in order to bring it in line with the administration's policy agendas. These strategies include: suppressing or censoring scientific research; distorting or misrepresenting scientific evidence; controlling the scientific process in government agencies; subjecting potential scientific appointees to political litmus tests; appointing non-scientists in senior science advisory positions; appointing under-qualified scientists to important government positions; exerting pressure on government scientists about what they are allowed to say to the media; showing favoritism within government agencies to research funded by industry that has pro-administration conclusions; etc. And these tactics have been felt at a number of government agencies, including the National Aeronautics and Space Administration, the Department of Agriculture, the Fish and Wildlife Service, the National Institutes of Health, the Environmental Protection Agency, the Food and Drug Administration, and the National Oceanic and Atmospheric Administration, among others.

The broadly anti-science outlook of the Bush administration has not gone unnoticed.⁸⁸ Two bills have been introduced into the Senate that attempt to bring the White House's approach to science in line with that of the scientific community, and there has been a recent call to launch a Congressional investigation into the administration's interference with science.⁸⁹ While these bills and the Congressional investigation may not get very far, the spirit which animates these efforts is laudable. They represent attempts to drive a wedge between scientific norms and practice and government in order to ensure that the autonomy of science is protected.

These developments provide the broader cultural and political backdrop against which antievolutionary efforts and arguments have been developing in recent years. Our summary view is that such attempts to discredit evolutionary theory and to introduce intelligent design theory into science curricula raise issues that are not only educational, but also theological, ethical, and political. We hope to have indicated why intelligent design theory lacks any defensible scientific rationale. Intelligent design theorists have

⁸⁷ Union of Concerned Scientists, *Scientific Integrity in Policymaking: An Investigation into the Bush Administration's Misuse of Science*. [Online] March 2004; and Union of Concerned Scientists, *Scientific Integrity in Policy Making: Further Investigation of the Bush Administration's Misuse of Science*. [Online] July 2004. Both documents available at: http://www.ucsusa.org/scientific_integrity/interference/reports-scientific-integrity-in-policy-making.html.

⁸⁸ United States House of Representatives, Committee on Government Reform—Minority Staff Special Investigations Division, *Politics and Science in the Bush Administration*. [Online] August 2003. Available at: http://www.democrats.reform.house.gov/features/politics_and_science/pdfs/pdf_politics_and_science_rep.pdf.

⁸⁹ Daniel Smith, "Political Science," *New York Times Magazine* (Sept. 4, 2005).

not made a convincing case that evolutionary theory is a theory in crisis, one that has failed to stand the test of time. Nor have they gathered empirical evidence in direct support of their theorizing. We also hope to have shown what theological, ethical, and civic issues are at stake in efforts to provide intelligent design theory a place in science education. For religious believers, intelligent design theory suggests an account of God as filling “gaps” of knowledge that may later be filled by scientific discoveries, thereby diminishing God’s connection with what believers consider God’s handiwork. For educators, allowing extra-scientific or faith-based ideas to parade as scientific claims entails a disregard for the moral terms that ought to shape inquiry and the exchange of ideas between free and equal persons. And for policy makers, providing a place for intelligent design theory in science education jeopardizes the wall between church and state and ignores the fundamental difference between science as a method and more comprehensive, metaphysical worldviews. Moreover, it also jeopardizes the already inadequate science education system in the United States.⁹⁰

In light of these conclusions, we make the following recommendations:

To science educators: Be clear about difference between *methodological naturalism* and *metaphysical naturalism*. Moreover, be clear about the habits of mind and the methods of inquiry that scientific research involves. This means getting beyond science education as requiring the memorization of data and equations as if science were a fixed and unchanging deposit of information. Impart, instead, an understanding of science as a research activity that adds to and revises knowledge in incremental and sometimes revolutionary ways. Impress upon your students a sense of the intellectual virtues as we have described them in this White paper: being accountable to evidence and committed to engage in dispassionate assessments of evidence; being open to criticism and correction in light of ideas and beliefs that are warranted by reliable evidence; honoring the limits of what reliable evidence allows one to claim; and respecting persons in the kinds of reasons we offer in inquiry and dialogue.

To education policy makers: Understand that intelligent design theory might be suitable to teach as a cultural or political phenomenon, but not as science. Caving in to political or parental pressure to include intelligent design theory in science instruction is to reduce education to the exercise of parental rights and authority, at the expense of a child’s basic interest in proper science education.

To public policy makers: Note that efforts by intelligent design theorists to conceal their theological claims and religious motivations have failed in the public policy forum. Note as well that efforts by proponents of intelligent design theory extend well beyond the classroom, to museums, and national park bookstores. Such literature seeks to advance

⁹⁰ On this, see: Paul R. Gross, et al., *The State of State Science Standards* (Washington, D.C.: Thomas B. Fordham Institute, 2005). [Online] Available at: <http://www.edexcellence.net/doc/Science%20Standards.FinalFinal.pdf>.

creationist or explanations from intelligent design theory for natural history.⁹¹ Such works do not belong in science sections of our public parks and museums.⁹²

To citizens more generally: Note that virtues in science education have broader implications, and note how efforts to undermine evolutionary theory stand within a wider pattern of “faith-based” policy making regarding the physical and biological sciences that have direct implications for public and personal health.

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⁹¹ See, for example, Tom Vail, *Grand Canyon: A Different View* (Green Forest, Ark.: Master Books, 2003).

⁹² On this, see the Spring 2006 issue of *Museums & Social Issues*.

APPENDIX⁹³

I. Position Statements

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⁹³ The authors wish to thank Glenda Murray and Melissa Seymour for helping with the editorial and other work in producing this appendix.

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