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The critique of intelligent design: Epicurus, Marx, Darwin, and Freud and the materialist defense of science

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Abstract A new version of the age-old controversy between religion and science has been launched by today's intelligent design movement. Although ostensibly concerned simply with combating Darwinism, this new creationism seeks to drive a "wedge" into the materialist view of the world, originating with the ancient Greek philosopher Epicurus and manifested in modern times by Darwin, Marx, and Freud. Intelligent design proponents thus can be seen as challenging not only natural and physical science but social science as well. In this article, we attempt to explain the long history of this controversy, stretching over millennia, and to defend science (especially social science) against the criticisms of intelligent design proponents – by defending science's materialist roots.

Introduction: Creationism versus science

"Christianity," Karl Marx once wrote, "cannot be reconciled with reason [as embodied in Enlightenment science] because 'secular' and 'spiritual' reason contradict each other" (Marx and Engels 1975, vol. 1: 190). At best there is a peace treaty between the two based on different spheres of influence, although the resumption of war is typically imminent.

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Today proponents of "intelligent design," the "creation science" of earlier decades in a new guise,[1] are reigniting this age-old war by attempting to elevate their doctrine to the level of science and to incorporate it as part of the science curriculum in public schools in the United States – to be given equal standing with evolutionary theory. This has been accompanied by attempts to wedge the divine foot in the door of the academy (see Johnson 1997: 92; Forrest and Gross 2004: 296, 300).

Supporters of intelligent design argue that many features of the natural world, particularly biological structures, are too complex to be explained by naturalistic causes and, thus, can only be explained as products of an intelligent designer – i.e., God.[2] Stephen C. Meyer, vice president of the Seattle-based Discovery Institute, and program director for its Center for Science and Culture (previously the Center for the Renewal of Science and Culture) – the main center for the propagation of intelligent design – claims that DNA is like a software program or "an advanced form of nanotechnology," and that such a complex "program" must have been written by a programmer. Given that DNA holds such detailed, complex information, Meyer argues, something with intelligence must have had "a role in the origin of DNA" – since it could not evolve by mere natural causes. Meyer concludes "that living organisms look designed because they really were designed" and therefore have a designer (Meyer 2005). Such intelligent design proponents center their attacks on Darwin and the theory of evolution, attempting to show that the intervention of an intelligent designer or deity is necessary to explain numerous natural phenomena – and thus evolutionary theory as a materialist explanation of biological development is wrong.

It may appear at first glance that intelligent design is simply concerned with the realm of natural–scientific explanation and does not touch directly on social theory. Its leading proponents, however, state otherwise. Phillip E. Johnson, often considered the father of the current intelligent design movement, is explicit that intelligent design "isn't really, and never has been, a debate about science.... It's about religion and philosophy" (quoted in Forrest and Gross 2004: 215). Indeed, a closer examination reveals that the argument from design aimed at evolutionary theory is conceived as part of a larger attack on materialism that traces the root of the problem not to Darwin himself but to the ancient Greek philosopher Epicurus (341–270 BCE). The refutation of Darwin is seen as necessary but not as the final or sufficient goal for such thinkers. Rather their criticisms embrace the entire materialist tradition extending from Epicurus in antiquity to Darwin, Marx, and Freud in modern times. According to William Dembski, senior fellow of the Discovery Institute's Center for Science and Culture and one of intelligent design's leading proponents, "all roads lead to Epicurus and the train of thought he set in motion" (Dembski 2002a: 10).

[1] For a critique of the earlier "creation science," see Kitcher (1983) and Eldredge (2000). In his most recent book, Kitcher (2007) presents a history of creationist explanations of the natural world. He notes how these explanations have repeatedly changed, each one being incompatible with the others.

[2] Today's intelligent design proponents sometimes pointedly refrain from referring to the Judaic–Christian God or other supernatural agents directly, preferring to allude more obliquely to a "designer." Yet, the fact that their arguments are thinly veiled defenses of a religious worldview, which derives its support from that quarter, is too clear to be ignored. Nor are they consistent in maintaining this veil in place, as many of the passages quoted in this article will attest. Consequently, in the following critique of intelligent design we frequently allude to the concept of a Supreme Deity. It should also be added that throughout our analysis, religion and science are treated in a largely Western context, since the concern is with the specifically Western debate over materialism and intelligent design, and the relation of this to science and religion in their Western contexts.

Similarly Benjamin Wiker, also a senior fellow of the Center for Science and Culture and its leading social philosopher, states: "Epicurean materialism was defined against every account of nature leading to an intelligent designer, and so it also always set itself against any religion which asserted that the universe was created and controlled by divine power" (Wiker 2002a: 24; see also Wiker and Witt 2006: 15–16: Pearcey 2004: 389–92). Understood in this way, Wiker (2002b) contends,

> Darwinism is part of a much larger theoretical and moral worldview, that of materialism ... that ... can be traced all the way back to the ancient Greek Epicurus.... As it turns out, our present moral state of affairs, morbid as it is, is the result of having accepted the entire materialist package, of which Darwinism was an essential part. This larger materialist package supports all kinds of things which are morally repugnant to Christians, not only ... Social Darwinism and eugenics, but also sexual libertinism, abortion, infanticide, euthanasia, cloning, and so on.... [W]e find out by reading Epicurus and Lucretius that materialism was designed to destroy all religion. When Christianity arose on the scene, not too long after Lucretius wrote his Epicurean materialist epic poem, it showed itself to be immediately antagonistic to Epicurean materialism. This fundamental antagonism can be traced historically over the next millennium and a half.[3]

Intelligent design proponents thus routinely present Darwin, Marx, and Freud as the modern representatives of a long tradition of materialism–humanism with its roots in Epicurus. Because of this, Epicurus, Darwin, Marx, and Freud are the four main targets of the intelligent design movement. Yet, for many of today's social theorists all of this is bound to be startling. Isn't intelligent design supposed to be simply an attack on Darwin and evolution? Why Epicurus? Why materialism? Why Marx and Freud? What challenges does this raise not only for science as a whole but social science in particular? To answer these questions, we contend, it is necessary to explore: (1) the larger social aims of the intelligent design movement as expressed in their "Wedge" strategy; (2) the historical evolution of materialist thought (and its critique of intelligent design) in Epicurus, Marx, Darwin, and Freud; and (3) the ways that the contemporary intelligent design movement seeks to overthrow science as presently constituted (including social science).

Although there are a number of histories of the creationist controversy, most of these, such as Ronald L. Numbers's (2006) *The Creationists: From Scientific Creationism to Intelligent Design*, begin with Darwin and neglect the much longer history of intelligent design and the role that the critique of it played in the development of materialism and science dating back to ancient times. Michael Ruse's *Darwin and Design* (2003) does address "Two Thousand Years of Design" in its opening chapter, but fails to highlight the

[3] In this article we follow intelligent design proponents themselves in applying the term "intelligent design" not simply to arguments regarding the natural and physical world, but also to the notion that the social and cultural world is intelligently designed. The main base of the intelligent design movement is the Center for Science and Culture of the Discover Institute. That Center has 12 senior fellows. The views of two of these who have played a leading role in the natural science side of the debate (Behe and Dembski) are addressed in this article. But we also address the views of two of the social–cultural intelligent design theorists who are senior fellows in the Center (Wiker and Witt – along with Pearcey, a fellow rather than senior fellow, but also important in this respect). In addition we allude to the arguments of the founder of the wedge strategy, Phillip E. Johnson, who is program advisor of the Center and a legal scholar. Intelligent design's ambitions thus extend to the social sciences and cultural realm as well.

fact that the materialist critique of design, out of which was to emerge the Western scientific view, is also more than two thousand years old (though Epicurus's early proto-evolutionary views and influence on the Enlightenment are acknowledged in passing [pp. 25–26]). In contrast, intelligent design proponents are far more disposed than their opponents to acknowledge the conflict over the millennia between materialism and design. Nevertheless, they do so strictly in their own terms, chiefly in relation to what Nancy Pearcey, a fellow of the Discovery Institute, calls "The Long War Between Materialism and Christianity," which she sees as beginning with the early Christian thinkers who developed their views by "forcefully attacking Epicurean materialism" (Pearcey 2004: 389–92; Wiker 2002a).

The truth is that each of the leading thinkers of modern social science, along with many of the great thinkers in natural science, had to return to the critique of design and teleology and thus to the materialist roots of science as a prerequisite to the development of their views. Yet, this long critique of design, which was so integral to the development of science, is little understood today, leaving those who wish to oppose the argument from design ill-equipped for the current struggle. Moreover, the relation of the materialism/design debate to the development of social science in particular is almost entirely overlooked outside the work of design proponents themselves (see Forrest and Gross 2004).

It is widely recognized that Darwin needed to challenge the prevailing religious worldview in order to establish a foundation for rational inquiry into the processes of the natural world, but it is much less well known that a similar challenge lay at the foundation of the social sciences. In particular, Marx's effort to found a science of society paralleled those of Darwin (and Epicurus before him) and led him to dismantle the religious dogma of his day so as to build a materialist philosophy which enabled social analyses that were free of irrationalism. Likewise, Freud found it necessary to challenge theistic premises in his efforts to create a science of the mind. Thus, rather than needing to develop a new defense of social science against the critiques of intelligent design creationists, the social sciences have such a defense already prepared by Marx and to a lesser extent one by Freud as well. Despite their importance and force, Marx's challenges to intelligent design are generally neglected. Further, most social scientists today are largely unaware both that intelligent design seeks to challenge the foundations of social science and that a materialist defense of social science against these critiques already exists. Thus, our main goal here is to resurrect this neglected defense and link it to the long line of materialist inquiry going back to Epicurus so as to highlight the deep connections between the natural and social sciences, while providing a bulwark against the forces of irrationalism that seek to undermine both.

Indeed, without an understanding of the long history of the materialist critique of intelligent design – of the kind we supply here – one cannot understand the challenge that the intelligent design movement poses not only to science in general but to social science in particular (as these are now constituted) or the nature of the necessary response. The goal of the intelligent design movement, we argue, extends well beyond the attempt to wedge a fundamentalist religious view into scientific discourse by introducing the notion of design. It also ultimately seeks to wedge religious and moral concepts of a teleological and foundationalist nature into the social sciences and humanities. The goal is to undermine the materialist–humanist notion that it is human beings (in their interaction with the natural environment) that are the sole designers of the human-historical world.

Despite its extremely dubious claims to science, today's new creationism in the form of intelligent design has had the effect of forcing natural scientists to mount a strong public-

intellectual defense of evolutionary theory and scientific analysis in general.[4] Likewise the intelligent design movement's attempt to overthrow modern social theory – as rooted in a materialist–humanist worldview – necessitates a strong public-intellectual defense of social science through an affirmation of its not inconsiderable debt to materialism from Epicurus to the present. Such a strong defense of science in general can be most effectively carried out, we contend, from the standpoint of the tradition of thought represented by Marx (supplemented by other materialist views, such as those derived from Darwin and Freud). This is due to historical materialism's long-standing, thoroughgoing critique of intelligent design and all forms of idealist thought, coupled with its dialectical (non-mechanistic, non-reductionist) emphasis on structure, agency, and historical contingency. Not the least of the ironies surrounding the intelligent design movement's attack on Epicurean materialism as the classical critique of intelligent design and the forerunner in this respect of Darwin, Marx, and Freud, is that Marx, who wrote his doctoral thesis on Epicurus, has long been recognized by Epicurean scholars as one of the most penetrating nineteenth-century analysts of Epicurean materialism (see Bailey 1928; Farrington 1967; Foster 2000; White 2003).

The wedge strategy

Intelligent design proponents, as one of their leading critics, Eugenie Scott, Executive Director of the National Center for Science Education, has stated, are divided as to the nature of design activity itself, which could take such varied forms as "front-loading all outcomes at the big bang, episodic intervention of the progressive creationism form, or other, less well-articulated possibilities." Theistic evolution – the notion that God created the universe and has kept "his" hands off of the physical universe ever since allowing it to evolve via natural laws (except for the production of the human soul), as propounded by the Catholic Church and many mainline Protestant seminaries – however, is "ruled out" (Scott 2004: 128). Hence, intelligent design proponents are not simply believers in "creationism" in the ultimate sense, which holds to the notion that God created the universe (a view that is consistent with theistic evolution), but they also give numerous indications of believing in what is known as "special creationism," in which it is held that a supernatural entity created the world in essentially the same form in which it exists today. They therefore assert that it can be inductively demonstrated and inferred that an intelligent designer must have had an active hand in the ongoing formation of the world. Crucial to intelligent design, as legal scholar Phillip E. Johnson (2000), program advisor to the Discovery Institute's Center for Science and Culture, says, is the notion "that God has influenced the creation on a regular

[4]The demarcation problem within the philosophy and sociology of science has given rise to endless debates about the criteria distinguishing science from non-science. It is common among sociologists of science today to argue that there are no universal rules allowing for such a demarcation, which are determined rather by scientific consensus. To say that intelligent design is generally outside of and opposed to science, as we do here, is not, however, to address the difficult issue of the demarcation problem, *since intelligent design's objective is not to provide new scientific explanations.* Intelligent design proponents seek rather to make empirical arguments to establish the limits of empirical science. Thus they always point to phenomena for which they say science has no explanation and can have no explanation and treat that as final. Those who engage in science, in contrast, invariably seek to explore phenomena for which "science has no [adequate] explanation – yet" (Scott 2004: 252–53).

basis" (p. 93). This view is closely associated with the fundamentalist belief of young-earth creationism (those who believe that the earth is no older than what is suggested in the Bible) and with the views of earlier versions of "creation science," and it follows from the virulent rejection of Darwinian natural selection.

This new creationism, which is now fighting legal battles in the nation's schools, is instigating a renewed war between religion and science that is potentially more virulent than any that occurred in the twentieth century. Intelligent design proponents defy the scientific consensus and draw for their support on the vast popular appeal of creationist views. A Gallup Poll in November 2004 indicated that 45% of the population in the United States believes that human beings were created in their present form sometime in the last 10,000 years. Another 38% believes that human beings evolved with God's guidance. Only 13% believe that God had no part in the process (Pew Research 2005; Numbers 2006: 1). It is this widespread belief in creationist doctrines, along with ignorance of evolutionary theory, that has allowed intelligent design to constitute itself as a popular educational movement. However, this is not simply a movement of the multitude. US President George W. Bush has indicated support for teaching intelligent design in public schools (O'Leary 2004: 161) – a view in line with his frequent invocation of God's design and intelligence in support of the US war in Iraq.

Intelligent design proponents in attacking Darwinism see this as simply part of a larger struggle in which the ultimate target is materialism. They refer to their objectives in terms of a "Wedge strategy" aimed at pushing back materialism within all reaches of science and society. For Phillip Johnson, who originated the wedge strategy, "a log is a seeming solid object, but a wedge can eventually split it by penetrating a crack and gradually widening the split. In this case the ideology of scientific materialism is the apparently solid log" (Johnson 1997: 92; Forrest and Gross 2004: 22). One of his recent books is *The Wedge of Truth: Splitting the Foundations of Naturalism* (Johnson 2000). As stated in the now notorious 1999 *Wedge Strategy* document (more commonly known as the *Wedge Document*), an internal memo issued by the Center for the Renewal of Science and Culture,

> The proposition that human beings are created in the image of God is one of the bedrock principles on which Western civilization was built.... This cardinal idea came under wholesale attack by intellectuals drawing on the discoveries of modern science. Debunking the traditional conceptions of both God and man, thinkers such as Charles Darwin, Karl Marx, and Sigmund Freud portrayed humans not as moral and spiritual beings, but as animals or machines who inhabited a universe ruled by purely impersonal forces.... [M]aterialism spawned a virulent strain of utopianism. Thinking they could engineer the perfect society through the application of scientific knowledge, materialist reformers advocated coercive government programs that falsely promised to create heaven on earth. (Center for the Renewal of Science and Culture 1999; see also Forrest and Gross 2004: 30; Cole 2007)

The same basic statement attacking Darwin, Marx, and Freud, as an unholy trinity of modern materialism, is repeated throughout the documents associated with the Wedge strategy. One 1995 conference, sponsored by Johnson, was called "The Death of Materialism and the Renewal of Culture" (Forrest and Gross 2004: 19, 30–31). In his recent *Architects of the Culture of Death* (2004), coauthored with Donald De Marco, Wiker distinguishes between a "Culture of Life" represented by Christianity and a "Culture of Death" represented by the major secular thinkers. Separate chapters are devoted to attacking thinkers such as Karl Marx, Charles Darwin, Sigmund Freud, Auguste Comte,

Jean-Paul Sartre, Simone de Beauvoir, Wilhelm Reich, Margaret Mead, Margaret Sanger, and Jack Kevorkian for the "self-willed eclipse of the true sense of God and man, that defines the Culture of Death" (De Marco and Wiker 2004: 18). Recently Wiker and Jonathan Witt (also a senior fellow in the Discovery Institute's Center for Science and Culture) have extended this critique, arguing that the materialist view emanating from Epicurus eventually fed "the greater river of materialism/relativism/nihilism" that "since the Victorian era" has had as "its principal tributaries ... Freudianism, Marxism and, above these, Darwinism." Nihilism, the loss of meaning in the world, has in our day emerged, according to these authors, as the ultimate result of materialism and is evident in the views of Nietzsche and contemporary postmodernists such as Jacque Derrida (Wiker and Witt 2006: 15–16, 59–60. 150, 245–52).

The *Wedge Document* states that its goals include ensuring that design theory enters into the social sciences and humanities, namely "psychology, ethics, politics, theology and philosophy in the humanities" and that it comes to "permeate our religious, cultural, moral and political life." Also incorporated is a plan to alter contemporary views on "sexuality, abortion and belief in God" (Center for the Renewal of Science and Culture 1999). According to William Dembski, senior fellow of the Center for Science and Culture and one of intelligent design's leading proponents, "two animating principles drive intelligent design": the larger general cultural revolt against philosophical materialism and the argument against Darwinian evolutionary science in particular. The former is referred to as "cultural renewal," the latter as "scientific renewal." These two aspects of intelligent design, he writes, "need to work together, protecting and reinforcing each other" (Dembski 2004: 306–09).

All of this reflects the fact that the stated object of the intelligent design movement is not simply to undermine Darwinism in science but to insert a wedge that will lead to a shift in intellectual culture generally away from the prevailing materialism–humanism, affecting the social science and humanities disciplines as well. As Scott (2004: 124–25), explains, "The second focus of ID [intelligent design] is 'cultural renewal,' a term its proponents use to describe the movement's efforts to replace the alleged philosophical materialism of American society with a theistic (especially Christian) religious orientation." Thus the Center for the Renewal of Science and Culture has explicitly stated that its goals are "to show that science supports the concept of design and meaning in the universe – *and that that design points to a knowable moral order*" (quoted in Scott 2004: 125–26, emphasis added). The leading proponents of intelligent design, including Johnson, Dembski, Michael Behe, Jonathan Wells, Wiker, Witt, and Pearcey, frequently attack materialism as the counterpart to their advocacy of intelligent design, and they connect this to larger cultural and sociological issues. Hence, understanding the long history of the critique of intelligent design by materialist thinkers is crucial if we are to make sense of how this age–old struggle is recurring in our time and for a defense of materialist science.

Epicurus's swerve

The phrase "intelligent design" is not new but was introduced in the late nineteenth century in a discussion of the Epicurean critique of religious thought. Its oldest known use in its modern sense can be traced to the famous British physicist and materialist John Tyndall in his presidential address (often called the "Belfast Address") to the British Association for

the Advancement of Science in 1874.[5] Today Tyndall is best known as the scientist who through his experiments first discovered that carbon dioxide acted as a greenhouse gas retaining solar heat on earth (Weart 2003: 3–4). Marx was a close student of Tyndall's work and frequently attended his lectures (Foster 2000: 160–61, 207–10). In his Belfast Address Tyndall launched a defense of materialist science, speaking at length about the role of Epicurus and his follower the Roman poet Lucretius (ca 99–ca. 55 BCE) in opposing teleological conceptions of the universe.[6] In explaining how Lucretius's *De rerum natura* portrayed a universe based in atomism and governed by contingency and emergence, Tyndall (2000) stated:

> The mechanical shock of the atoms being in his [Lucretius's] view the all-sufficient cause of things, *he combats the notion that the constitution of nature has been in any way determined by intelligent design.* The inter-action of the atoms throughout infinite time rendered all manner of combinations possible.... 'If you will apprehend and keep in mind these things, nature, free at once, and rid of her haughty lords, is seen to do all things spontaneously of herself, without the meddling of the gods.' (p. 362, emphasis added)[7]

It is this materialist outlook, exemplified by ancient Epicureanism, suggesting that nature can be understood as evolving spontaneously into more complex, emergent combinations, developing in accordance with contingent occurrences and through natural selection, that most threatens creationist thinkers. Attached to this, in Epicurus's case, was a conception of social evolution and human freedom that rejected foundationalist ethics (that is, the gods as intelligent moral designers and the existence of moral principles independent of human social contracts under changing conditions). Together these propositions made Epicurus and his followers in subsequent centuries the great enemies of ancient teleology. For emerging Christianity no greater philosophical threat existed than Epicurean materialism.

Intelligent design arguments within Western civilization thus predate Christianity and can be traced back to the ancient Greeks and Romans, including Plato (ca. 427–347 BCE), Aristotle (384–322 BCE), the Stoics (in Hellenistic and Roman times), and Cicero (106–43 BCE), while their greatest ancient critic was Epicurus. Plato's Demiurge or Creator-God in the *Timaeus* designed the world on the model of "the perfect intelligible Living Creature." In *The Laws* Plato urged that those who were impious and attributed nature's coming into being to necessity and chance rather than design be treated as criminals and imprisoned or even put to death (Plato 1977: 42, 54, 96; Plato 1970: 415–20; Farrington 1967: 73). Balbus, the Stoic, expounded the design argument in Cicero's dialogue *The Nature of the Gods* (written in 45 BCE) – a work that centered on a critique of Epicurean materialism – as follows:

> When you follow from afar the course of a ship, upon the sea, you do not question that its movement is guided by a skilled intelligence. When you see a sundial or a water-

[5] See the timeline at http://www.researchintelligentdesign.org.

[6] Lucretius is one of our main sources of Epicurus's ideas, the bulk of whose writings have been lost. His epic poem is viewed by classical scholars as an attempt accurately to convey Epicurus's philosophy.

[7] Marx and Engels were familiar with Tyndall's Belfast Address and supported its main propositions, though they were critical of Tyndall for not being materialist enough. Tyndall's argument on Epicurus was heavily based on Frederick Lange's *The History of Materialism*, first published in German in 1865. Marx and Engels were closely acquainted with Lange and frequently corresponded with him (see Foster 2000: 207–210; Lange 1950: 93–125).

> clock, you see that it tells the time by design and not by chance. How then can you imagine that the universe as a whole is devoid of purpose and intelligence?... Our [Epicurean] opponents however profess to be in doubt whether the universe ... came into being by accident or by necessity or is the product of a divine intelligence.... The truth is that it [the universe] is controlled by a power and purpose which we can never imitate. When we see some example of a mechanism, such as a globe or a clock or some such device, do we doubt that it is the creation of a conscious intelligence? So when we see the movement of the heavenly bodies, the speed of their revolution, and the way in which they regularly run their annual course, so that all that depends on them is preserved and prospers, how can we doubt that these too are not only the works of reason but of a reason which is perfect and divine? (Cicero 1972: 159–63)

For Cicero the purpose of such arguments was to defeat ancient materialism, particularly Epicureanism, with its proto-evolutionary views and critique of intelligent design. As A.A. Long, one of the foremost scholars of Epicureanism and Hellenistic philosophy in general, has recently written in an essay entitled, "Evolution vs. Intelligent Design in Classical Antiquity," "the Epicureans even today are the unsung heroes of ancient science if you are looking for significant anticipations of a modern rationalistic outlook. They are unsung mainly because popular culture has preferred the theistic outlook of Plato with its Biblical affinity.... What aligns them with our science is the following set of methodologies and assumptions":

1. The starting point for understanding the world is rigorous empiricism.
2. We have reason to think that everything we experience is ultimately explicable by reference to physical facts and causes.
3. The building blocks of the world are uncreated and everlasting atomic particles incessantly in motion.
4. Science has no use for inherent purposiveness or mind in matter.
5. Apparent evidence for design in nature (e.g. the complexity of organisms and organs) is due not to an invisible guiding hand but to the determinate ways matter organizes itself according to strict causal laws.
6. Life and mind are not basic to the world, but emergent properties of particular types of atomic conglomerates. (Long 2006a; see also Long 2006b: 157–77)

Not only did Epicurus and his followers attempt to advance these propositions, but they did so not on the basis of faith but with empirical arguments, using a sophisticated method of scientific inference, given the limitations of the inductive methods of the day, that was to influence later scientific thought (see Asmis 1984). Epicurus's philosophy was concerned above all with escaping the double trap (the bonds of fate) represented by the gods and mechanistic determinism. Adherence to the notion of the gods as prime movers in the world meant, in Epicurus's view, ascribing to an anti-scientific philosophy in describing the world. In contrast, strict mechanistic determinism, while displacing the gods and allowing for a materialist science, denied human agency altogether.

Epicurus sought to escape both of these positions. Similar to modern scientists, he rejected explanations of the world based on final causes, particularly "divine causation." "Nothing ever by divine power comes from nothing" (Lucretius 1997: 7). His philosophical tradition thus rejected teleological positions, grounding the examination of the physical world in material (natural) explanations. Building on the earlier atomic theory of Democritus, Epicurus described the world in terms of physical processes rather than Aristotelian final

causes (teleology). In explaining the happenings of the world, Epicurus accepted the principle of multiple possible causes that only could be adjudicated by empirical investigation. He sought a general theory of causation, where a single correct explanation might not be possible given limitations in observing the exact phenomena (for instance, during his lifetime, solar and lunar eclipses). Instead, several alternative hypotheses were set up to account for any other conditions that might contribute to the relationship or event under investigation. It is from Epicurus that we get the phrase "awaits confirmation." In this, Epicurus "maintained his empirical principle that a scientific explanation must be consistent with, or not contradicted by, experience" and conform to a "general principle of determinism [material causation], without claiming to have knowledge of specific causes in all cases" (Strodach 1963: 45–50, 234–235; Epicurus 1994: 19–28, 34; Asmis 1984: 321–30).

But Epicurus resisted a mere mechanical materialism without giving way to idealism. He claimed that the world was composed of atoms that continued to fall through the void, yet swerved, almost imperceptibly, as they fell, creating the element of chance and indeterminacy. These actions took place within and through material conditions; the swerve was both facilitated and limited by them. Nonetheless, the existence of the swerve created added uncertainty to the course of life. Within a particular temporal context, at a specific point – as Lucretius explained – accidents happen (Lucretius 1997: 17, I. 475–85). These accidents are the result of complex interactions, and the implication of these collisions is not known. Thus Epicurus saw contingency, due to the swerve of atoms, as an escape from the confines of gods and determinism. In fact, contingency is at the heart of change at every level and in every stage of life, and, as a result, novelty becomes part of history and life (van Leeuwen 1972: 102–107).

Marx, who was arguably the greatest scholar of Epicureanism in the nineteenth century, understood Epicurus's attack on both mechanistic determinism and teleology as the basis of a doctrine of freedom that was extended into the social realm and human history. In Epicurus's Garden (as opposed to other ancient Athenian philosophical schools) women and slaves were admitted as equals (Rist 1972: 11). Hence, as Jean-Paul Sartre (1955), following Marx, put it in his essay on "Materialism and Revolution," "The first man who made a deliberate attempt to rid men of their fears and bonds, the first man who tried to abolish slavery within his domain, Epicurus, was a materialist" (p. 207).

Epicurus did not kill the gods. He simply separated them from the material world, banishing them, as Marx always insisted, to the pores – or *intermundia*, the spaces between the worlds – of the universe. Epicurus saw the need for "the plastic gods of Greek art" (Marx and Engels 1975, vol. 1: 51), but not gods as material actors. As Alfred Lord Tennyson (1809–1892) expressed it in his 1868 poem *Lucretius*, the gods of Epicurus haunt:

> The lucid interspace of world and world
> Where never creeps a cloud, or moves a wind,
> Nor ever falls the least white star of snow,
> Nor ever lowest roll of thunder moans,
> Nor sound of human sorrow mounts to mar
> Their sacred everlasting calm! (Tennyson 1987: 713)

The gods for Epicurus exist, but they have no relation to the material world.[8] It was this classic version of what Stephen Jay Gould (1999) has called NOMA or the notion of non-

[8]Epicurus claimed that the knowledge of the gods came through preconceptions (*prolepses*) provided in dreams. These preconceptions of the gods provided ideals for human action but did not otherwise affect the material world. Freud later removed the gods from dreams themselves, making them utterly material, himself earning the ire of today's intelligent design proponents.

overlapping magisteria of science and religion – removing the gods from all connection to the material world thus making it the magisterium of science – that most outraged Epicurus's critics for more than two thousand years (leading Dante in his *Inferno*, Canto X, to consign Epicurus and his followers to an eternity of torture in open coffins in the sixth circle of hell), and which more than anything else generated charges of "atheistic materialism" (Dante 1982: 96). At the same time, it helped to earn him the reputation as the "inventor of empiric Natural Science" amongst even idealist philosophers such as Hegel (1965: 297). Plato had attributed to the gods the role of creating and superintending the moving universe. Epicurus insisted that the gods had nothing to do with it: the universe was eternal and had never been created; it operated of itself and needed no superintendence (DeWitt 1954a: 275).

Epicurus's denial of any relation of the gods to the material world still generates the ire of intelligent design proponents. Thus Dembski (2002a) observes that for Epicurus "God or the gods might exist, but they took no interest in the world, played no role in human affairs and indeed could play no role in human affairs, since a material world operating according to mechanistic principles leaves no place for meaningful divine interaction" (pp. 10–11). Johnson (2000) argued in *The Wedge of Truth* that materialist views from Epicurus to Gould that allow for the existence of a god or gods as long as they are expelled from the material world can be viewed as an "imperialism ... founded on materialist premises ... [that gives] the realm of religion absolutely nothing in the end" (pp. 99–100). Wiker argues in his *Moral Darwinism* that both Epicurus and Gould attempt to make "any deity superfluous" by creating a two sphere approach and removing any divine relation to the material world. It means the elimination of "the Christian cosmos ... and the Christian moral world as well" (Wiker 2002a: 27, 314–15, 149; Johnson 1999).

Epicurus, as Marx stressed, even abandoned the traditional cult of the heavenly bodies as gods that was characteristic of Greek religion and philosophy (Marx and Engels 1975, vol. 1: 70–72). Moreover, since humans belonged to nature and were themselves material–sensuous entities, death amounted to dissolution of all material–sensuous connections. In fact, Epicurus sought to take the fear out of religion by denying the existence of the immortal soul, insisting that "death is nothing to me," since there is no longer any sensuous existence and no material reality other than sensuous existence. Marx, like David Hume, subscribed to Epicurus's view of death even on his own deathbed (Engels 1983: 28; Gay 1966, vol. 1: 356).

Epicurus placed the concepts of emergence and contingency at the center of his discussion of the material world, including the changing social world. "Nothing remains for ever what it was. Everything is on the move. Everything is transformed by nature and forced into new paths" (Lucretius 1994: 149–50). Life itself is recognized as an emergent consequence of organization; in fact, it embodies "action occurring as the *result of organization*," where "the increasingly complex organization of higher life-forms permits the appearance (the emergence) in them of new modes of life, new functions or behaviors, impossible in less organized forms" (Hall 1969: 19–20). Thus, the character and behaviors of an organized system, in its totality, cannot be reduced to the operations of its isolated parts.

He thus combined an emphasis on contingency and complexity in emergent organization that provided a powerful materialist alternative to teleological conceptions of the world. It is no wonder that today's intelligent design proponents continually evidence their dislike for Epicurus. Thus Dembski (2002b: 1) opens the first chapter of his *No Free Lunch* with complaints about the emphasis that Epicurean philosophy placed on the role of chance.

Ancient Epicurean materialism was also proto-evolutionary in orientation. It was open to many evolutionary ideas, which were necessary for a materialist perspective, but it lacked a

developed theory of the forces that led to evolutionary change. Epicurus taught that life had originally emerged from the earth by spontaneous generation through processes no longer possible – and not through divine creation. (This position was later developed in the twentieth century, beginning with the Oparin-Haldane hypothesis, into a materialist explanation for the emergence of living organisms from the inorganic world).[9]

Ancient materialist conceptions of evolution could be traced to Empedocles (ca. 493–433 BCE) and were carried over into the work of Epicurus and his followers. Empedocles presented species as originally taking all sorts of monstrous forms, and then through a process of selection all of these abnormalities were eliminated and species took their lasting, normal forms – what in modern scientific parlance could be described as a kind of "normalizing selection" (Barrow and Tipler 1986: 34). Although far from being a developed evolutionary perspective, this approach was proto-evolutionary in orientation, being strongly materialist and opposed to the notion of divine intervention. Those species that survived, and were able to perpetuate "the chain of offspring," according to Lucretius, were those that had developed special organs that served to protect them from their environment, "but those who were gifted with none of these natural assets ... were fair game and an easy prey for others, till nature brought their race to extinction" (Lucretius 1994: 150–51; Ruse 2003: 25–26). The same proto-evolutionary perspective was also evident in Epicurus's understanding of the development of human society from an age of stone and wood, to that of bronze, and then iron, which also incorporated discussions of the emergence of speech, the advance of mutual assistance, the introduction of fire, and other developments (Lucretius 1994: 152–66).

Epicurean morality further undermined the agency of the gods by denying foundationalist morality rooted in Platonic ideals, as in the case of justice. In a view that was greatly to influence Marx, Epicurus wrote: "If objective circumstances ... change and the same things which had been just turn out to be no longer useful, then those things were just as long as they were useful for the mutual associations of fellow citizens; but later, when they were not useful, they were no longer just" (Epicurus 1994: 36). In other words, with changes in objective conditions, the standards of justice themselves change – thus, morality was historically shaped and determined by human social practice. Epicurus's morality was at all times rooted in the concept of social contract – a notion he introduced (Marx and Engels 1975, vol. 5: 141–42).

As Marx stated in *The German Ideology*, "Lucretius praised Epicurus as the hero who was the first to overthrow the gods and trample religion underfoot; for this reason among all church fathers, from Plutarch to Luther, Epicurus has always had the reputation of being the atheist philosopher *par excellence*, and was always called a swine; for which reason, too, Clement of Alexandria says that when Paul takes up arms against philosophy he has in mind Epicurean philosophy alone" (Marx and Engels 1975, vol. 5: 141–42; DeWitt 1954b). Marx himself depicted Epicurus as "the greatest representative of the Greek Enlightenment," liberating humans from a teleological world by breaking "the bonds of fate," while providing them with the means to comprehend a universe in transformation (Marx and Engels 1975, vol. 1: 49–53, 73). He noted that Epicurus's materialist philosophy carried over into the Enlightenment of the seventeenth and eighteenth centuries, providing it with

[9] For the history and development of scientific views on the origin of life, attempting to explain life's emergence, see Bernal (1967), Hazen (2005), which *Science*, quoted on the back of the book, describes "as a solid rebuttal" to "proponents of intelligent design," and Lazcano (2007). It is no accident that intelligent design proponents have attacked the Haldane-Oparin theory, and later scientific approaches it helped inspire, simply dismissing it as derived from Epicurus, Darwin, Engels, and Marx. See Wiker and Witt (2006: 199–219).

its humanism and its strength (Marx and Engels 1975, vol. 5: 141–142). "Philosophy, as long as a drop of blood shall pulse in its world-subduing and absolutely free heart," Marx wrote, "will never grow tired of answering its adversaries with the cry of Epicurus: 'Not the man who denies the gods worshipped by the multitude, but he who affirms of the gods what the multitude believes about them, is truly impious'" (Marx and Engels 1975, vol. 1: 30; Epicurus 1994: 29).

In the debates regarding natural science versus religion in his lifetime, Marx identified with the struggles and dilemmas that Epicurus confronted. Hence, van Leeuwen (1972), a theologian, points out, "In a sense, Epicurus acts as Marx's double. Every time the name Epicurus is mentioned, we are to think of Marx reflecting his own problems in the mirror of Greek philosophy" (p. 74).

Enlightenment materialism and natural theology

With the scientific revolution and the emergence of Enlightenment philosophy, rational thinkers called into question the old worldviews of God's position in the world, specifically young-earth creationism. In the seventeenth century, Bacon, Hobbes, and Gassendi all promoted materialist approaches to science. Bacon (1905), who incorporated Epicurean views into his philosophy, was vehemently opposed to teleology and declared that any argument with respect to nature rooted in final causes was "barren, and like a virgin consecrated to God produces nothing" (p. 473). Hobbes, according to Marx, "systematized Bacon," giving greater force to his materialism. Hobbes's friend Gassendi systematized Epicurus's materialism for the new scientific age. Even Descartes, while creating a dualistic worldview, systematically excluded God from his physics, where mechanical principles held absolute sway. In the social sciences, figures such as Hobbes, Vico, and Rousseau were to draw on Epicurus's notion of the social contract and his view of the historical development of human society (Marx and Engels 1975, vol. 4: 125–26).

Leading British scientists, beginning with Boyle and Newton, tried to bridge the two worlds, incorporating final causes into their arguments, and attempting to make them consistent with the new mechanical philosophy. Boyle wrote a work entitled *Disquisition About the Final Causes of Natural Things*, arguing that "Epicurus and most of his followers ... banish the consideration of the ends of things [final causes] because the world being, according to them, made by chance, no ends of anything can be supposed or intended" (Boyle 1744, vol. 4: 515).

Unwilling to relinquish the earthly realm to science, and seeking to tame science and make it conform to religious views, many theists retreated from a reliance on divine revelation (increasingly undermined by science) to the distinct tradition of natural theology, which sought to find throughout nature innumerable examples of intelligent design pointing to God's continual intervention in the world. Hence, arguments for the existence of God from the evidence of nature were published in large numbers. In Britain John Ray, Samuel Clarke, William Paley, Thomas Robert Malthus, and Thomas Chalmers were among those from the seventeenth to the nineteenth centuries who produced influential books designed to push back the advance of materialism by smuggling teleological principles into interpretations of the natural world.

In the seventeenth century Reverend John Ray was one of the earliest parson naturalists in England and one of the most popular. In his 1691 book, *The Wisdom of God Manifested in the Works of Creation*, Ray begins with a critique of Epicurus and an attack on the notion of contingency. He viewed what he called "the Atheistik Hypothesis of Epicurus and

Democritus" as denying God's wisdom as revealed by creation (Ray 1699: 35–39, 41, 49). His studies of nature were conducted to reveal the marvels of the natural world and how rationally it was organized in accordance with a plan. The design of nature, which would become evident with observation, would make known the providence of God. A vital spirit introduced by God in animals and plants guided their development. This was taken as proof of the active role that God played in nature, as well as an indication of God's wisdom in constructing such a complex, perfect world. Everywhere in nature, Ray affirmed the hand of God at work: The air existed so animals could breathe and plants grew because God granted them a "Vegetative Soul." Making an analogy to a clock to support his position, Ray stated that a clock shows evidence of a designer, and the organization of nature, more perfect in its design than a clock, indicated that the work of a supreme designer was at hand (Ray 1699: 53, 81, 116, 257, 425). The natural theology that Ray presented dominated studies of natural history for nearly two centuries and served as a barrier to the development of evolutionary theory (Greene 1959: 1–10).

A century later, the Archdeacon William Paley, the most influential advocate of natural theology of the late eighteenth and early nineteenth centuries, extended the argument from design of Ray. In his natural theology, Paley connected the natural and social world. Natural theology was not just an argument about nature; it was an argument regarding the moral universe, which included the economy and the state. In his 1802 book, *Natural Theology – or Evidence of the Existence and Attributes of the Deity Collected from the Appearances of Nature*, Paley argued that proof of God was manifested in the works of his creation. Following the lead of Ray, Paley used a watch analogy – replacing the clock as the high technology of his day – as an argument for design. A watch has a particular ingenuity and its mechanisms work together to tell time as a result of a watchmaker. Thus, he contended, if we can see the contrived design in a watch, the intricate organization and perfection of the operations of nature – such as the marvels of the human eye – should be taken as even more obvious evidence of the work of a grand designer, given how even more wonderful they are than the works of humans. For Paley: "The marks of *design* are too strong to be got over. Design must have had a designer. That designer must have been a person. That person is God" (Paley 1803: 473). Ironically, despite his use of a watch as proof of design, Paley failed to incorporate a sense of time into his conception of nature, which remained essentially static and non-evolutionary in character, excluding emergence. His argument for design focused on what he saw as the irreducible complexity of the natural world, which he thought incapable of materialist explanation.

Paley's more developed natural theology and utilitarianism were foreshadowed in his 1785 book, *Principles of Moral and Political Philosophy*. Here Paley defended existing social hierarchies and property relations. The world was designed in a particular way for beneficial purposes, thus people were not to question who owned the land. Such property rights were to be understood as the "appointment of heaven" for the good of all. God as the "Supreme Proprietor" had consented to the separation of properties only when provision was made for the most elemental needs of the poor (Paley 1867: 36–38, 44, 99–103, 278). God's plan was just and right. While this earlier work included an argument to take care of the poor, Paley's *Natural Theology*, was to overturn these concerns. Malthus's influence surfaced in Paley's later book, as he concluded that part of God's design was for every nation to "*breed up* to a certain point of distress" (Paley 1803: 539–42).

This same teleological view of "the high purpose of creation" evident in both nature and society was present in Malthus's 1798 book, *Essay on the Principle of Population*. In this work of political economy and natural theology, Malthus, then a 32-year-old English curate, explained that "we should reason from nature up to nature's God" given that nature was a

reflection of the maker's design. He explained "that population should increase faster than food," in accordance with "the gracious designs of Providence, as determined by God." Hardship helped awaken the "Christian virtues" within society. Heads of households who chose to marry without the means to support a family were meant to suffer because they violated "the laws of nature, which are the laws of God," and as a result they were doomed "to starve for disobeying their repeated admonitions." The individual "had no claim of right on society for the smallest portion of food, beyond that which his labour would fairly purchase." Society had no obligation to help those in need, because this would go against the "express commands of God" (Malthus 1970: 201–12; Malthus 1989, vol. 2: 140–41, 101–05). The Supreme Being had provided checks – vice and misery – to keep population in a state of equilibrium with the means of subsistence. For Malthus, the problem was the natural geometric rate of growth of human population relative to the natural arithmetic rate of growth of subsistence. Yet, God in his infinite wisdom had designed the world so as to maintain an equilibrium of population – through poverty and its attendant misery – and ultimately, if all else failed, through the dreaded scourge of famine. Malthus's natural theology thus helped justify class domination and the impoverishment of large sections of the populace (see Foster 2000: 86–102).

Although employed over most of his career by the East India College (a training ground for East India Company officials) Malthus remained a cleric and delivered sermons throughout his life. The recent publication of four of his sermons has shown that he propounded views based on biblical revelation as well as natural theology. He suggested that those who sinned against God could expect "terror" in the hereafter (as well as on earth) and that those who used their reason and attended to God's works in nature could expect to gain insights, though limited, into his "final causes" (Malthus 2004: 1–24).

The Scottish divine, Reverend Thomas Chalmers, was an early follower and close associate of Malthus. Chalmers was an influential preacher and ecclesiastical reformer within the Established Church of Scotland and a leader of the schism that resulted in the creation of the Free Church of Scotland in 1843. The latter was to become the most organized group of evangelicals in Britain. Rather than relying simply on natural theology in its relation to the material world, the Free Church united this with arguments based on revelation and biblical readings, creating what historians have called a "theology of nature" (Secord 2000: 276–77). This dual approach was evident in Chalmers's own work. He was the author of *On the Power, Wisdom and Goodness of God as Manifested in the Adaptation of External Nature to the Moral and Intellectual Constitution of Man* (1834), the first of the *Bridgewater Treatises* (later to be ridiculed by Darwin and his supporters as the "bilgewater treatises" [Gould 2002b: 117]) – a series of eight treatises aimed at combating materialism funded by a bequest from Francis Henry Egerton, the eighth Earl of Bridgewater, who died in 1829. The *Bridgewater Treatises* constituted the greatest systematic attempt in the nineteenth century to create a natural theology that would dominate over all areas of intellectual endeavor. Yet, Chalmers did not confine his activities to natural–theological arguments for design, but also wrote of biblical revelation.

In its New College, the Free Church armed its ministers for combat against materialist and evolutionary theories. As the New College's principal and professor of divinity, Chalmers defended the argument from design against materialists and evolutionary scientists. He fused political economy with natural theology, in an elaborate presentation of how God's hand was evident in the workings of both nature and the economy. For Chalmers "the interposal of a God" and divine miracles were necessary whenever a new genera or species was to come into being. (quoted in Secord 2000: 279).

Chalmers began his *Bridgewater Treatise* by attacking atheists and materialists who tend to:

> reason exclusively on the laws of matter, and to overlook its dispositions. Could all the beauties and benefits of the astronomical system be referred to the single law of gravitation, it would greatly reduce the argument for a designing cause.... If we but say of matter that it is furnished with such powers as make it subservient to many useful results, we keep back the strongest and most unassailable part of the argument for a God. It is greatly more pertinent and convincing to say of matter, that it is distributed into such parts as to ensure a right direction and a beneficial application for its powers. It is not so much in the establishment of certain laws for matter, that we discern the aims or the purposes of intelligence, as in certain dispositions of matter, that put it in the way of being usefully operated upon by the laws. (Chalmers 1834, vol. 1: 17–21)

For Chalmers both nature and scripture equally led to God. "Give me the truly inductive spirit to which modern science stands indebted," Chalmers wrote, and it "... would infallibly lead ... to the firmer establishment of a Bible Christianity in the mind of every inquirer" (quoted in Secord 2000: 273).

Intelligent design ran deeper than the laws of matter. The world of trade and the market, Chalmers argued, was "one of the animate machines of society" and the mark of the "intellect that devised and gave it birth." The Smithian invisible hand by which self-interest promoted the general good through the market was, he insisted, the mark of a "higher agent." The free market was a "natural disposition" – emanating from God, while the same supreme Deity had instilled in humanity a strong "possessory feeling." Hence, humanity intervened on behalf of the poor, as in the Poor Laws, in vain arrogance, defying the will of God. "Capital ever suits itself, in the way that is best possible, to the circumstances of the country – so as to leave uncalled for, any economic regulation by the wisdom of man; and that precisely because of a previous moral and mental regulation by the wisdom of God." Indeed, if there was any proof of "the hand of a righteous Deity" it was to be found in the "mechanism of trade" (Chalmers 1834, vol. 1: 22, 252; vol. 2: 2, 7, 34–35; Chalmers 1853, vol. 2: 338).

The critique of heaven and the critique of earth

As the examples of Paley, Malthus, and Chalmers suggest, debate over natural theology was not limited just to nature. It had to do with the organization of the entire material world, including the social world. Radical opposition to the teleological view came to the fore via the work of many materialist thinkers, but Darwin, Marx, and Freud are certainly among the most noteworthy in this great struggle. In terms of social science, it is in understanding the development of historical materialism, in particular, that we can most readily appreciate how both nature and society were freed from the bonds of fate, as contingency and complexity came to be viewed as part of an emerging reality, defined in terms of itself. Marx helped introduce a radical extension of the magisterium of science, which he saw as encompassing the social and historical realm. For Marx "all history is nothing but a continuous transformation of human nature," which therefore needed no divine guidance (Marx and Engels 1975, vol. 6: 192). For this reason Marx stands next to Darwin and Freud as a modern target for intelligent design proponents – who trace the intellectual sins of all three ultimately to Epicurus.

Charles Darwin acknowledged that Paley's natural theology and Malthus's population theory were among the most important influences on his own intellectual development.

Through his research and investigation of nature, Darwin had to overcome the confining logic of natural theology. In the early 1840s, both Darwin and Marx each explicitly referred to and adopted Bacon's view that any concept of nature rooted in final causes was "barren" and empty of reason, yielding no insight in regards to the physical world. Thus Darwin and Marx each separately but within a few years of each other took their stand with materialism against teleology (Bacon 1905: 473; Darwin 1987: 637; Marx and Engels 1975, vol. 1: 201).

Materialism in the nineteenth century derived from the rejection within science of both the argument from design and all religious–idealistic theories that relied on teleological arguments. As Engels expressed it:

> "Did god create the world or has the world been in existence eternally?" The answers which the philosophers gave to this question split them into two great camps. Those who asserted the primacy of spirit to nature and, therefore, in the last instance, assumed world creation in some form or other – (and among philosophers, Hegel, for example, this creation often becomes still more intricate and impossible than in Christianity) – comprised the camp of idealism. The others, who regarded nature as primary, belong to the various schools of materialism. These two expressions, idealism and materialism, primarily signify nothing more than this; and here also they are not used in any other sense. (Engels 1941: 17, 21)[10]

The formation of these "two great camps" dividing materialists and idealists, and increasingly science and religion, had enormous repercussions for the way in which the world was viewed up through the time of Darwin and Marx – and still reverberates with us today. The dominance of teleological arguments in the treatment of nature, and the class and religious bases of this, help to explain why twenty years passed between Darwin reaching his conclusion regarding evolution and his actual publication of his views (Gould 1992: 21–27; Eiseley 1958; Ruse 1999: 184–88). In *The Origin of Species*, first published in 1859, Darwin (1968) presents a strictly materialist argument of evolution by natural selection. In this, he overthrew Paley's natural theology. Darwin wrote: "the old argument of design in nature, as given by Paley, which formerly seemed to me so conclusive, fails, now that the law of natural selection has been discovered" (Darwin 1958: 87). Materialism triumphed over teleological views of nature by recognizing that the very issues raised by natural theologians in support of their position were better understood when examined through a non-theistic, naturalistic lens. Darwin's *The Descent of Man*, first published in 1871, united humans and other creatures via evolution by common descent, recognizing that the same materialistic forces influenced the historical development of all life (Darwin 1981).

Intelligent design proponents are correct in seeing the materialist tradition from Epicurus to Darwin and Marx as the antithesis of their views – since materialism arose out of a critique of heaven that turned into a critique of earth. In Marx's *Contribution to the Critique of Hegel's Philosophy of Right*, he explained: "*The task of history* ... once the *world beyond the truth* has disappeared, is to establish the *truth of this world*. The immediate *task of philosophy*, which is at the service of history, once the *saintly form* of human self-alienation has been unmasked, is to unmask self-alienation in its *unholy forms*. Thus the criticism of heaven turns into the criticism of the earth, the *criticism of religion* into the *criticism of right* and the *criticism of theology* into the *criticism of politics*" (Marx and Engels 1971: 42).

[10]For more detailed definitions of materialism consistent with Engels's view, the analysis employed in this article, and with the various materialist thinkers treated here see Bhaskar (1983) and Foster (2000: 2–9).

For Marx, the publication of Darwin's *Origin of Species* laid the "basis in natural history for our view" in that it dealt "'teleology' in natural science ... a mortal blow" (Marx and Engels 1975, vol. 40: 551; vol. 41: 232, 246–47). Marx's critique of religion was geared at all times to the needs of a humanist, materialist, and scientific understanding of the world. The critique of religious alienation led to the critique of human worldly alienation by means of two dialectical movements: (1) a critique derived from Epicurus and Ludwig Feuerbach (1972) of religion as the alienation of the human world, and thus an inversion of human freedom – a critique that also extended from theology to idealist philosophy (as in the case of Hegel); and (2) a critique of purely contemplative materialism/humanism as empty abstractions (mere atheism or secular humanism), insofar as they were not simply presuppositions for a critique of the earth (i.e., material-historical reality). Marx thus seized upon the active side of the idealist dialectic, to create a materialism that was no longer contemplative, but practical and historical. It was this view that was central to his 1845 *Theses on Feuerbach*, which ended with "the philosophers have only *interpreted* the world, in various ways; the point is to *change* it" (Marx 1974: 423; Foster 2000: 68–78, 11–14; Hook 1994: 220–307).

The nature of Marx's critique of religion meant that atheism itself, so long as it remained in Feuerbach's contemplative realm, was insufficient and devoid of essential meaning, other than as a first step in the development of a humanist philosophy. Atheism, which was the denial of an illusory deity for the Young Hegelians, was, he insisted, "for the most part an abstraction." It was "a *negation of God*, through which negation it asserts the *existence of man*." It thus constituted mere "theoretical humanism." Thomas Dean (1975) is correct when he writes in his *Post-Theistic Thinking* that,

> Agreeing with the Aristotelian and Hegelian observation that contraries belong to the same genus, Marx views atheism as nothing more than an ideological contrary to religion. Hence it does not lead to a radical break with a religious way of thinking. Atheism looks more like a "last stage of theism, a negative recognition of God" than the theoretical foundation for a positive, this-worldly philosophy of man. It gives rise inevitably to the desire to supplant the God thus denied by a correspondingly elevated or deified concept of man....It is only by a second act of transcendence, by transcending the mediation of humanism via atheism, "which is, however, a necessary presupposition," that the possibility opens up of a "positive humanism, humanism emerging positively from itself." The basis of Marx's atheism and of his secular metaphysics is not therefore a set of philosophical arguments or speculative disproofs of the existence of God. That would be an ideological foundation as theological in character as theology itself. It is, rather, an independently formulated humanism that stands in immediate or unmediated fashion on its own feet. (p. 69)

Marx forged a practical atheism on the ground through his scientific commitment to a historical materialist approach for understanding material reality in all of its dimensions. The practical negation of God and the affirmation of humanity and science demanded an active movement for revolutionary social change, the real appropriation of the world (Marx 1974: 349, 357, 395). In this, materialist explanations served as the basis for understanding and explaining the happenings of an emerging physical world and the gods were effectively banished (Epicurean-like) to the pores of the universe, making them empty abstractions.

Marx's harshest criticisms were directed at those who rationalized brutality in the name of religion. Plutarch (ca. 46–121), who was the senior of two priests of Apollo at the Oracle

of Delphi, was a strong critic of Epicurus, on the grounds that the latter had removed the necessary fear of the gods. Marx scorned Plutarch, who, in his biography of Marius (157–86 BCE), a Roman general and politician, had provided "an appalling historical example" of how a religious morality rooted in fear of all-powerful deities violated humanism:

> After describing the terrible downfall of the Cimbri, he relates that the number of corpses was so great that the Massilians were able to manure their orchards with them. Then it rained and that year was the best for wine and fruit. Now, what kind of reflections occur to our noble historian in connection with the tragical ruin of those people? Plutarch considers it a moral act of God, that he allowed a whole, great, noble people to perish and rot away in order to provide the philistines of Massilia with a bumper fruit harvest. Thus even the transformation of a people into a heap of manure offers a desirable occasion for a happy reveling in [religious] morality! (Marx and Engels 1975, vol. 1: 84)

Religion itself, though a form of alienation and therefore an obstacle to human progress, was not to be condemned absolutely in the humanist view since: "*Religious* suffering is at one and the same time the *expression* of real suffering and a protest against real suffering. Religion is the sign of the oppressed creature, the heart of a heartless world and the soul of soulless conditions. It is the *opium* of the people" (Marx 1974: 244). While a form of estrangement to be transcended by materialism, it was nonetheless an expression of social distress and real suffering and a form of consolation – albeit in alienated human terms.

However, natural theologians who sought to find in the world itself the proof of God's intelligence, by denying all accidents, and using this to rationalize worldly suffering, were for Marx true enemies of science and humanity. Like Epicurus, Marx denied that supernatural forces had anything to do with human morality and society, along with the rest of worldly existence. Morality was to be judged not in either foundationalist or relativist terms, but in terms of radical historicism, where moral conditions evolve with the material needs of human communities (West 1991) – a view that can be traced to Epicurus. There was no ultimate, divine moral order for society. Marx attacked all notions of "*mystical tendency*, the *providential aim* ... providence," insisting instead that human beings were "the actors and authors of their own history" (Marx and Engels 1975, vol. 6: 170, 173).

Challenging religious morality and its effects on the development of political economy, Marx noted in *Capital* that "most of the population theorists are Protestant clerics ... Parson Wallace, Parson Townsend, Parson Malthus and his pupil, the arch-Parson Thomas Chalmers, to say nothing of the lesser reverend scribblers in this line.... With the entry of 'the principle of population' [into political economy], the hour of the Protestant parsons struck" (Marx 1976: 76677, 800). For Marx and Engels the main objection to such thinkers is that they had departed from the principles of science by allowing the arguments of natural theology and religious morality to intrude into the science of political economy, as part of a defense of the ruling-class order. "The Malthusian theory," the young Engels wrote in 1844, was "the economic expression of the religious dogma of the contradiction of spirit and nature and the resulting corruption of both" (Marx and Engels 1975, vol. 3: 439).

Marx defended the scientific character of Adam Smith's thought against the criticisms of Chalmers who considered Smith to have rejected the Christian view through his close connection to David Hume (who was influenced by Epicurus's materialism) and in his concept of unproductive labor, which Chalmers viewed as an attack on God's clergy. In his political economic writings, Marx argued, Chalmers allowed religion to intrude into

science. "The parsonic element is ... in evidence not only theoretically but also practically, since this member of the Established Church defends it 'economically' with its 'loaves and fishes' and the whole complex of institutions with which this Church stands or falls" (Marx 1971, part 1: 299–300; part 3: 56–57).

Marx's admiration for Darwin's evolutionary theory is well-known. He was reported as speaking of nothing else for months after the publication of *The Origin of Species* (Liebknecht n.d.: 106). His only criticism of Darwin was that by drawing on Malthus for inspiration in his theory of natural selection he had inadvertently given credence within the social realm to the Malthusian doctrine, which had espoused Christian morality, natural theology, and bourgeois justifications of the division of class and property. Hence, Marx and Engels, while supporting Darwin, sought at all times to separate Darwinian theory from Malthusianism or social Darwinism, while adhering to a materialist/humanist science, seeking to further human freedom.

Freud's critique of intelligent design

Along with Darwin and Marx, Freud is the third member of the unholy trinity continually referred to by intelligent design proponents as personifying a godless materialism, emanating from ancient Epicurean roots. Intelligent design's wedge theorist, Phillip Johnson, refers to Freud along with Darwin and Marx as the "three giants of materialism" and continually attacks not only Darwinism but Marxism and Freudianism as well (Johnson 2001: 449). For De Marco and Wiker (2004) Freud is one of the chief modern "architects of the Culture of Death." "Freud, in effect," they write, "reduced the world of man and all his distinctly human operations to mere fodder for scientific materialism.... Freud entered into a 'Satanic pact' and ... psychoanalysis was its result. Soon after the pact ... Freud wrote *The Interpretation of Dreams* ... which he always regarded as his masterpiece" (pp. 15, 209, 218). It is of course natural that Freud would be accused by intelligent design proponents of having built an analysis of human development around sexual pleasure and that this would give rise to accusations that Freud (like Darwin) had contributed to the destruction of the divine meaning of life (Wiker and Witt 2006: 86, 190). But the antagonism of intelligent design proponents toward Freud goes much deeper than this, and can be seen as a response to his well-known materialism and atheism and his critique of religion as "an illusion."

In his influential work, *Freud and the Problem of God*, German Catholic theologian Hans Küng described at length the roots of Freud's materialism, which grew out of a German tradition of scientific materialism that, in opposition to German idealism, revived the materialist systems of the ancient Greek atomists Democritus, Epicurus, and Lucretius (Küng 1990: 3). "Epicurus' [psychological] theory," Erich Fromm (1976) observed, "resembles Freud's in many ways." (p. 4). Epicurus's treatment of human freedom and morality was rooted in a conception of human psychology in terms of pain and pleasure that had *ataraxia*, i.e., equanimity, imperturbability, and intrepidity (self-sufficient satisfaction arising from philosophical contemplation), as its main object (Marx and Engels 1975, vol. 5: 141; Zeller 1962: 474–75).

Like Marx, Freud's materialism descended from Feuerbach. As Küng (1990) wrote, "the grandfather of Marxist atheism and of Freudian atheism is Ludwig Feuerbach, who was first a theologican, then a Hegelian, and finally an atheistic philosopher" (p. 3). The young Freud indicated that "among all the philosophers, I worship and admire this man

[Feuerbach] the most" (Gay 1987: 53).[11] Feuerbach declared that the natural sciences "had long before dissolved the Christian world view in nitric acid" with the chemical discoveries of German scientists (Küng 1990: 3). In his later, scientific–materialist phase, Feuerbach gave credence to the materialist philosophical implications of the work of such nineteenth-century scientists as Jakob Moleschott, Carl Vogt, and Ludwig Büchner (all of whom were criticized by Marx and Engels as mechanistic materialists). One of Freud's youthful "idols," associated with the same tradition, was the physicist, mathematician, and biologist Hermann Helmholtz, a co-discoverer of the conservation of energy. Freud himself became an exponent of the mechanistic physiology propounded by Helmholtz, Émil du Bois-Reymond, Ernst Brücke, and others. In all of his work, Freud thus approached psychological phenomenon as materially based in the interaction of physiological and psychological principles (Küng 1990: 3–19).

In the last decade of his life Freud was primarily concerned with the critique of religion, beginning in 1927 with his *The Future of an Illusion*. He argued that science could not halt in the face of creationism and must challenge its fundamental postulates. In this respect, he stated, "the Americans who instituted the 'monkey trial' at Dayton [the famous 1925 Scopes trial in Tennessee in which creationism was challenged by evolutionary science] have alone shown themselves to be consistent" (Freud 1989: 49).

In *The Future of an Illusion* Freud advanced a specialized psychoanalytic critique of religion in which he saw it as an infantile illusion – a psychological illusion arising in childhood (and in the childhood of the species according to the now defunct theory of recapitulation [see Gould 2002a: 147–58]). Freud, however, claimed only to have added a "psychological foundation" to the wider critique of religion provided by his "great predecessors" such as Feuerbach (Küng 1990: 75). Much of his critique of religion was thus a product of the general materialist thrust rather than his own specialized psychoanalytic theory.[12] It is Freud's more general analysis that bears most directly on the critique of intelligent design.

Freud argued, particularly in his *New Introductory Lectures on Psychoanalysis* of 1933, that the *Weltanschauung* of religion was being replaced by the *Weltanschauung* of science associated with the "humanization of nature" (Freud 1965: 139–60; Freud 1989: 27). Religion was more "grandiose" than science in that the former "leaves no question unanswered." It fulfilled "three functions" for human beings. "It gives them information about the origin and coming into existence of the universe, it assures them of its protection and of ultimate happiness in the ups and downs of life and it directs their thoughts and actions by precepts which it lays down with its whole authority." Due to the grandiose way in which it fulfills these three functions "religion alone is to be taken seriously as an enemy" of science, while science is hard-pressed to fulfill the same needs (Freud 1965: 139–42). But religion's great strength and also its weakness is that it is "insusceptible of proof" encouraging "intellectual atrophy" (Freud 1989: 40, 61). The scientific *Weltanschauung*, in contrast, is a way of employing the intellect that by its nature awaits, indeed demands, confirmation, and thus progresses in stages. It tentatively – but with even firmer

[11] Johnson (2000: 21–22) notes that Feuerbach's projection theory of God had a direct influence on both Marx and Freud and uses this to disparage all three.

[12] For an interesting account of Freud's specific psychoanalytic critique of religion and an attempt to extend this along Freudian–Marxist lines see Fromm (1963).

logic and intolerance of non-scientific claims – establishes a "dictatorship in the mental life of man" (Freud 1965: 151).

Nevertheless, the struggle between religion and science persists, since the supporters of religion claim that there is a realm of supreme knowledge (divine intelligent design) that mere science can never attain. As Freud summarized these attacks on science:

> The supporters of the religious *Weltanschauung* act upon the ancient dictum: the best defense is attack. 'What,' they ask, 'is this science which presumes to disparage our religion [?].... Can it tell us how the universe came about and what fate lies before it? Can it even draw us a coherent picture of the universe, or show us where we are to look for the unexplained phenomena of life or how the forces of the mind are able to act on inert matter? ... It gives us fragments of alleged discovery, which it cannot bring into harmony with one another; it collects observations of uniformities in the course of events which it dignifies with the name of laws and submits to its risky interpretations. And consider the small degree of certainty which it attaches to its findings! Everything it teaches is only provisionally true: what is praised to-day as the highest wisdom will be rejected to-morrow and replaced by something else, though once more only tentatively. The latest error is then described as the truth. And for this truth we are to sacrifice our highest good!' (Freud 1965: 152)

Freud's analysis suggests therefore that the attack of religion on science in the name of intelligent design is nothing but the defense of religion against the inroads of science, claiming on ostensibly empirical grounds that science is forever incapable of grasping the "irreducible complexity" or the "meaning-fullness" (Wiker and Witt 2006: 15, 152) of the world. The reason offered by the religious *Weltanschauung* is that divine knowledge is insusceptible to science. Freud's response was that science was young and its necessary "dictatorship in the mental life of man" will progress, uncovering further secrets of the material world by materialist means. The tentative and uneven but inexorable progress of science was only just beginning. As evidence of scientific materialism's youth, Freud pointed out that he himself "was already alive when Darwin published his book on the origin of species," while the time that had transpired since ancient Greek materialism was only "a small fraction of the length of time which anthropologists require for the evolution of man from an ape-like ancestral form, and which certainly comprises more than a hundred thousand years" (Freud 1965: 152–53). Science as opposed to religion, Freud argued, "is no illusion. But an illusion it would be to suppose that what science cannot give us we can get elsewhere" (Freud 1989: 71).

The defense of natural science: Contingent evolution versus irreducible complexity

The same attacks on science by religion, described by Freud, can be seen today emanating from those who seek to use rational, empirical arguments to demonstrate: (1) the natural limits of reason and science; (2) the importance of the notion of intelligent design as alone providing the basis for a rational understanding of the universe; and (3) the necessity of a religious *Weltanschauung*. Moreover, insofar as many scientific conceptualizations are rooted in contingency, evolution, and emergence – as materialists since Epicurus have argued – intelligent design proponents insist such views are based on "mere chance," and are incapable of comprehending a complex, organized, irreducibly holistic world arising from divine intelligence.

As Marx ironically observed, following Hegel, while traditional theological depictions of God see the world in the form of innumerable supernatural accidents or miracles, natural theology, in contrast, rejects accident in favor of a pervasive intelligence, which is then taken as evidence of God (Marx and Engels 1975, vol. 1: 103). Proponents of natural theology and intelligent design throughout history have thus decried the role of chance and contingency in materialist thought, arguing that it is insufficient, even when combined with a process of natural selection, to explain the organization of life and human beings.

Michael Behe (1996), a biochemist and senior fellow of the Discovery Institute's Center for Science and Culture, claims that evidence of intelligent design is to be found in the smart-machine-like design of living systems – as manifested in cells, which are characterized as being irreducibly complex. Intelligent design proponents, such as Behe, marvel at the information contained within DNA, noting how it operates like a computer, processing information, maintaining the needs and operations of living systems. They contend that too much information is contained in DNA for it to have developed by blind forces, or chance. Furthermore, like a machine that is being built, an intelligent designer is necessary to make the proper tuning.

Referring to cells and DNA this view takes the same general form as the classic argument from design: assuming the complexity of life is beyond materialist explanation, while at the same time pretending to engage in scientific investigation/inference. Nevertheless, it insists as always on the rigid separation of species and the notion that no intermediaries are possible, hence no evolution (Behe 1996). Each organism is perfectly designed to fill a particular niche in the economy of nature. In the process, it asserts that if we comprehend how truly awesome, unique, and complex the world is, intelligent design is the only possible explanation for it.

In his latest book, *The Edge of Evolution*, Behe (2007) has shifted his argument to focus more on the random nature of mutation that provides the raw material upon which natural selection operates. He argues that random mutation simply does not provide sufficient variation to allow for dramatic evolutionary change, although it may allow for minor modifications of organisms. In this unsupported contention, he contradicts the scientific consensus, based on the research of a long line of mathematical geneticists (many of whom, such as J.B.S. Haldane and Richard Lewontin, were influenced by the Marxist tradition), that has clearly established that in fact the rate of naturally occurring mutation exceeds what is necessary for natural selection to produce the full range of organisms we observe. Unwilling to acknowledge this contrary evidence, Behe asserts that an intelligent designer must have intervened in the evolutionary process to produce the myriad forms we see. One of the key points that Behe fails to appreciate properly, although surely he is aware of it, is that natural selection, not random mutation, is the creative force in Darwinian evolution. Although mutation in many ways may be regarded as random, natural selection is anything but random; it serves to preserve genetic mutations systematically that enhance the reproductive success of their host organisms.

Dembski (1998), in particular, attempts to argue that the improbability of certain chance results makes the "design inference" more likely. These arguments, however, are based on the confusion of pure chance (like the rolling of a dice) with contingency based on evolutionary pathways and interactions. By presenting evolutionary theory in a mechanical, reductionist form, and alleging that its explanations of organic evolution depend on the action of pure chance, intelligent design proponents misconceive science (or take its weakest argument as straw persons) and make their arguments for design seem more plausible.

Within this context, Marx's dialectics of nature and society continues to serve as a powerful base for a critique of intelligent design. It includes a commitment to a materialist conception of natural and social history – and thus to the interaction of necessity and contingency. From this tradition, which has influenced noted scientists, such as J.B.S. Haldane, J.D. Bernal, Hyman Levy, and Lancelot Hogben in the 1930s and 1940s, and Stephen Jay Gould, Richard Lewontin, Richard Levins, amongst numerous others, in recent years, we can gain insights into the dynamic development and interaction of society and nature (see Clark and York 2005: 326–32). Stephen Jay Gould noted that it was from the social sciences and humanities that he came to learn the importance of contingency (Gould 2003: 138). "The more we learn about complex systems," writes Gould (2003), "the less we can sustain a belief that classical reductionism might work, and the more we must suspect that emergence and contingency will enter in ever more important ways as we mount the scale of complexity in nature's material reality" (p. 231). While this statement is a critique of hyper-reductionism within science, it also serves as a reminder that the future is contingent and open.

The contingent character of evolution was for Gould evidence that it is history (whether natural or social) that is the real designer, the real force behind how the world is organized. Teleology is inherently flawed, while mechanistic materialism, its dialectical opposite, is reductionistic and determinisitic and therefore frequently misleading. As Gould (1980) notes: "Our textbooks like to illustrate evolution with examples of optimal design – nearly perfect mimicry of a dead leaf by a butterfly or of a poisonous species by a palatable relative. But ideal design is a lousy argument for evolution, for it mimics the postulated action of an omnipotent creator. Odd arrangements and funny solutions are the proof of evolution – paths that a sensible God would never tread but that a natural process, constrained by history, follows perforce" (pp. 20–21).

A key feature of the Marxist view of history is that change is not typically smooth and continuous, but rather, often occurs very rapidly following periods of stasis (temporary periods, of indeterminate length, of counterbalancing opposing forces leading to relative stability). The discovery of "deep time" by geologists and of organic evolution by naturalists undermined the eternal stasis perspective. But the notion of slow, glacier-like continuous change was a key facet of the thinking of Victorian scholars, reflected in Charles Lyell's uniformitarianism and Darwin's gradualism (see Clark and York 2005). Naturally, neither view, rapid change or gradual change, is absolutely correct; the complexity of human and natural history has ensured that both types of change occur. (It goes without saying that the rate of change is not binary, either necessarily rapid or gradual, but this dichotomy is heuristically useful.) Furthermore, the rate of change of any particular phenomenon is a factual question, and it cannot be determined without empirical evidence.

The unification of Darwinian and Marxian materialist views of historical change in the natural world is exemplified in Eldredge and Gould's (1972; Gould and Eldredge, 1977) argument that the evolutionary history of organisms is best characterized as "punctuated equilibria," long periods of stasis, punctuated with (geologically) brief periods of rapid change. This is based in part on a literal interpretation of the fossil record, which generally shows fossils of a species remaining quite similar over extended stretches of time, to be suddenly (in the geological sense) replaced by a substantially different, although apparently related, type. Their argument is in no way a rejection of Darwinism in general, only a challenge to Darwin's strong preference for gradualism. They invoke no special mechanisms for change. Rather, they argue that speciation typically happens when a subset of a species becomes isolated. In a small isolated population, mutations can spread

rapidly throughout the gene pool of the population, and the rate of change can be further accelerated if the population faces different selection pressures than the parent species. In large populations that are geographically widespread, although connected through breeding, mutations spread slowly, and any mutations that are favorable to organisms in one part of the range are not necessarily retained, since they may not be favorable to organisms in another part of the range. For these reasons, Eldredge and Gould propose that widespread species will generally change little over most stretches of time, but may change rapidly around the point of speciation, when a subpopulation becomes isolated. Since intelligent design proponents regularly argue that the gaps in the fossil record are evidence of intelligent design – suggesting divine intervention (a position known as "gap creationism") – no interpretation of evolutionary theory is conceived by them as more directly antagonistic toward their views than the theory of punctuated equilibrium, associated with Gould and Eldredge (Johnson 1991: 61–62).

Gould (2002b) points out, significantly, that organisms are not mere putty to be sculpted over the course of their phylogeny (evolutionary history) by external environmental forces, but, rather, their structural integrity constrains and channels the variation on which natural selection operates. In this, Gould is challenging the notion that phenotypic variation is isotropic, effectively random in all directions. He notes that the structural nature of the development of an organism throughout its life course (ontogeny) limits the types of phenotypic variation that is possible, because changes at one stage of the developmental process have consequences for later stages. Therefore, many characteristics of an organism cannot simply be modified without having substantial ripple effects throughout the whole organism. The inherited patterns of development, therefore, do not readily allow for all types of modification. Hence, the evolutionary process is a dialectical interaction between the internal (inherited structural constraints) and the external (environmental selection pressure), just as the ontogeny (development over the life course) of individual organisms is a dialectical interaction between their genes and the environment (Lewontin 2000).

The structural nature of development has consequences for patterns of change. To illustrate this point, Gould (1993) makes use of a metaphor, Galton's polyhedron. As always Gould draws upon the arguments of various historic figures involved in the evolutionary debate to build his own. Francis Galton, who was Darwin's cousin (Erasmus Darwin was grandfather to both), and is regarded as the father of eugenics, was deeply impressed by his cousin's work on evolution, but he disagreed with Darwin's assumptions about the nature of variation. He developed a metaphor to challenge aspects of Darwin's conception of natural selection and the nature of change. Adopting Galton's conceptual insight, Gould explains that in the idealized Darwinian formulation species are metaphorical spheres that roll freely on any phylogenic course the external world pushes them along – i.e., their structure offers no resistance to pressure from the external environment, and, thus, they move readily wherever environmental forces direct them via natural selection. Alternatively, in the metaphor of Galton's polyhedron, species are polyhedrons, multi-sided solid objects that have flat faces (such as dice), whose structure prevents them from rolling freely when only slightly perturbed and limits the paths they can follow after receiving a sufficient push from the external world. They can switch the facet on which they rest, but they cannot simply rest in any given position. In contrast with a sphere, which may roll smoothly with a light tap, the polyhedron will resist minor perturbations, but, given sufficient force, will switch facets abruptly. Thus, species cannot perfectly track changing environments because of the structural interconnections they develop over the course of their phylogeny that limit and, potentially, direct the type of

change that is possible. Note that this metaphor also points to another concept common in the historical materialist tradition: change does not necessarily happen smoothly, but, rather, can happen rapidly, preceded and followed by periods of relative stability, shaped by opposing forces (Gould 1993: 384–385). The polyhedron contains both structural constraints and the potentiality for new states. Hence, it has an affinity with the theory of punctuated equilibrium.

The key insight of Darwin was, of course, that structural constraint, rather than being God-given and immutable, is the product of evolutionary history. Gould (2002b) emphasizes the importance of both recognizing the reality of structural constraint and also the fact that structures have historical origins. This perspective helps unite the insights from both sides of the age-old debate between functionalist biologists, such as Darwin, Cuvier, and Lamarck, and formalist (structuralist) biologists, such as Geoffroy St. Hilaire, Richard Owen, and Goethe. Whereas the functionalists emphasized that features of organisms existed for utilitarian reasons (e.g., they were adaptations to their environments), formalists emphasized the structural unity of type common across similar organisms. Formalists typically denied the possibility of evolution because they believed that only superficial change was possible, not fundamental change of underlying structures. Thus, intelligent design advocates are often drawing on the arguments of prominent eighteenth- and nineteenth-century formalists in making their argument for the impossibility of evolutionary change in the structural features of organisms (see, for example, the explicit support of formalism and the views of Owen and Geoffroy St. Hilarie in Wiker and Witt [2006: 229]). However, their arguments were undermined by Darwin and subsequent evolutionists, who recognized that structures had evolved, although after their emergence they may indeed constrain the evolutionary pathways available to organisms (as the metaphorical polyhedron comes to rest on a particular side). Thus, as Gould notes, Darwin fundamentally reoriented the functionalist–formalist debate, by adding a new dimension to the functional (active adaptation) and formal (rules of structure) dichotomy: history (contingencies of phylogeny) (Gould 2002b: 251–260). Intelligent design supporters have, obviously, missed the innovation, and continue to expound views that have long been superseded.

From the above discussion, we can see that evolution is not an unfolding process with predictable outcomes, but a contingent, wandering pathway through a material world of constraints and possibilities. Levins and Lewontin (1985) contend that the larger, physical world in which an organism is situated is filled with its own contingent history and structural conditions – i.e., caught up in its own historical processes (pp. 286–288). Interactions are part of the fabric of life, because objects throughout the physical world are interconnected. Multiple pathways or channels exist, in relation to the structural integrity of organisms, for evolutionary processes – in fact, they are part of what created life and makes its continuance possible. Even when the external conditions are fixed, multiple pathways exist, as organisms interact with opposing forces while obtaining the needed materials for survival. What survives is not necessarily due to inherent superiority, but has much to do with chance given the multitude of influences that shape the world.

The dialectical interchange between the environment and the organism is a central tenet of the coevolutionary position presented by Levins and Lewontin. Both the environment and organism are integrated levels, "partly autonomous and reciprocally interacting," in both directions (Levins and Lewontin 1985: 288). Change is the rule of life. Organic processes are historically contingent, defying rigid universal explanations. Thus, both the parameters of change and the nature of transformation are subject to change given the ongoing development of life (p. 277). In such a materialist–dialectical view the notion of "intelligent design" is superfluous, necessarily empty of all genuine scientific content.

God as superfluous

The pragmatist American philosopher Charles Peirce (who counted Epicurus among his major influences) once noted, "To the mind of a physicist there ought to be a strong presumption against every mystical theory; and therefore it seems to me that those scientific men who have sought to make out that science was not hostile to theology have not been so clear-sighted as their opponents." For Peirce the only religion easily tolerated by science was that which propounded a Deity in the form of an abstract "Supreme Ideal," such that it was "repugnant to its real existence." In other words, such a deity would have to be superfluous to any analysis of the material world, which must be conducted on a purely "mechanical" basis. For Peirce the turning of the entire magisterium of nature over to materialism did not by that token eliminate the possibility of a religious morality or a belief in God (Peirce 1957: 105–25). But he argued like Epicurus and Marx that God (or the gods) had no connection to the magisterium of science, which encompassed all of worldly reality.[13]

Indeed, both the social and natural world remained within the magisterium of science. As noted earlier, Epicurus insisted on the materiality of the soul, which perishes with the body. He argued that the world came into being by spontaneous generation, and consigned the gods to the *intermundia*, with no relation to the material world. His anti-teleological, anti-reductionist materialism served as the basis for knowing and understanding the world. He provided a proto-evolutionary theory of species development, and saw human beings as evolving over the course of their history. It is to him that we owe the anti-foundationalist notion that language and morality are to be seen as products of changing circumstances and human community. The Epicureans, Marx wrote, argued that "the world must be *disillusioned*, and especially freed from fear of gods, for the world is my *friend*" (Marx and Engels 1975, vol. 5: 141–42; Foster 2000: 51–62). The gods were rendered superfluous, and humanity was freed from the bonds of fate to confront the physical world and their morality.

All of this helps us understand the extremely virulent attacks on Epicurus's notion of the gods and on all subsequent materialist restrictions of religion's magisterium, as represented by the unholy trinity of Darwin, Marx, and Freud. Johnson (2000) attacks Spinoza's God, Einstein's God, and Hawking's God as mere abstractions, since the material world has been given over entirely to materialism (pp. 91–92). For Johnson, Gould's NOMA is nothing more than a "power play" that "bars religion from claiming that there is a supernatural creator (much less one who was incarnated in Jesus), a divinely infused soul, a life after physical death or a source of divine revelation such as inspired Scripture. This is 'separate but equal' [of the magisteria] of the *apartheid* variety." God is left with "no cognitive status" (Johnson 2000: 99–101). "Accommodation" with scientific materialists, Johnson (1997) declares, "doesn't work" since "religion is acceptable to materialists only as long as it stays in the realm of the imagination and makes no independent claims about objective realty" (pp. 86–87). Likewise, Wiker (2002a) claims that the materialist approach, such as that of Gould's NOMA, which gives to religion's magisterium the "morality of morals" but insists that the "anthropology of morals" belongs to science, is a Trojan Horse since materialists from Epicurus to the present (including Marx, Darwin, and Freud) have sought to reduce all morality to the anthropology of morals, discounting foundationalism and hence God's intelligent design of the moral world. As he puts it, "'factual conclusions' about nature entail, of necessity, *that these conclusions be applied to human nature*, and

[13] Pearcey (2004: 235–36; 389) attacks Peirce, from an intelligent design standpoint, both for the influence of Epicurus on his thought and his role as a "Darwinian of the mind."

that means materialist science cannot and will not honor the terms of this false peace" (Wiker 2002a: 314–15, emphasis added). Indeed, as Wiker notes,

> when modernity adopted Epicurean materialism as its scientific foundation and reality filter, it simply reinstated the ancient belief in the amorality of nature. The intrinsic purposefulness of nature, which was the foundation of moral claims according to the Christian natural law argument, was given the *coup de grâce* by Darwin.... Whatever a particular materialist may happen to desire morally, it is simply an incontrovertible fact that, with the increasing secularization of the West, the repugnance toward abortion, infanticide, eugenics, euthanasia and sexual libertinism, which had its theoretical and historical origin in Christianity (stretching back through Judaism), has given way to acceptance. The cause for this moral reversal is secularization, and as we have seen, the cause of secularization has been the rise of Epicurean materialism as culminating in moral Darwinism. (pp. 296–97)

Materialists from Epicurus to the present are said to drain God's *logos* from the world. Cartesian rationalism, Wiker and Witt (2006) argue, tried to "retain theism," but ended up giving supremacy to the "human 'I'" of his "*cogito ergo sum.*" The result was Descartes's belief that "he was able to transfer truth and certainty from nature to human beings" (pp. 247–248). This pointed the way, Wiker and Witt propose, towards nihilism and cultural degeneration as witnessed in the works of Nietzsche and Sartre's *Nausea*, "suffocating [culture] in the materialist darkness, where all meanings are mere human fabrications" (pp. 108–109). The ultimate personification in our time of such materialism–nihilism, according to Wiker and Witt, is Jacques Derrida. Derrida, they contend, advanced "a view of language that is pure *misère*, unmitigated nihilistic darkness, a language of unmeaning fit for a meaningless world. In this, Derrida has inadvertently done us an invaluable service ... for he has traced out the implications for meaning in a world without God: by removing the Author, the materialists created a meaningless drama" (p. 249).

At the root of this whole tragedy, we are told, is the materialist emphasis on chance going back to Epicurus and later adopted by Darwin. "To remove God and enthrone chance," Wiker and Witt (2006) suggest, "removes the reality of both good and evil," i.e., God's *logos* (p. 251). "Epicureanism provided the prototype of the meaningless universe – godless, governed by chance, purposeless. Nihilism is its heir" (Wiker and Witt 2006: 16–17; Johnson 1997: 90; Pearcey 2006). The postmodernist deconstruction of secular reason is now viewed by intelligent design proponents as a new opportunity to bring the *logos* of God back to a world from which it was banished: now refashioned as the source of irreducible meaning, the social counterpart of Behe's irreducible complexity.

Conclusion: Materialist defense of science (natural and social)

Social scientists, together with natural scientists, tend to reject arguments that suggest the world is predetermined, teleological, or governed by miracles and divine intervention. The resurgence of intelligent design is an attempt by theistic ideologies to reclaim a hold in the material world, from which they were largely excluded following the Enlightenment. Intelligent design is thus first and foremost an attack on materialism–humanism and on any theory of historical emergence in the natural and social world. It is a threat that attempts to bind both the natural and social world within its reactionary confines. "The term *wedge*," according to Dembski (2006), "has come to denote an intellectual and cultural movement," a definite "strategy for unseating materialism and evolution" (p. 100). Like the natural

theologians and idealists of centuries past, its claim for evidence of design is by way of nature (or *logos*), not revelation. Its end goal, however, is the same as that of fundamentalist biblical revelation. Counter to Marx's critique of heaven as the basis for a critique of earth, intelligent design offers a teleology of earth (natural and social) as the basis for a teleology of heaven.

The battle is one over nature, science, history, and knowledge of the world. To make space for materialist explanations of society as well as nature, Marx engaged in a critique of heaven and earth. Inspired by Epicurus, he emphasized contingency in the natural world, which served as a prerequisite for freedom in the social world. This is why the battle over the natural world is so important. Human society is not abstracted from nature within Marx's theory. Marx, like Darwin and Freud, saw the relationship as one of coevolution. Because of this consistent materialism, Marx's historical materialism in particular remains a crucial social foundation from which to engage in a critique of intelligent design. It resolutely brings a non-mechanistic, non-reductionist materialist dialectic to the analysis of both nature and society. As Lewontin (1997), building on both Darwin and Marx (if not Freud as well), has written of this materialist–scientific viewpoint:

> We take the side of science *in spite* of the patent absurdity of some of its constructs, *in spite* of its failure to fulfill many of its extravagant promises of health and life, *in spite* of the tolerance of the scientific community for unsubstantiated just-so stories, because we have a prior commitment, a commitment to materialism. It is not that the methods and institutions of science somehow compel us to accept a material explanation of the phenomenal world, but, on the contrary, that we are forced by our *a priori* adherence to material causes to create an apparatus of investigation and a set of concepts that produce material explanations. No matter how counter-intuitive, no matter how mystifying to the uninitiated. Moreover, that materialism is absolute, for we cannot allow a Divine foot in the door. (p. 31)

In Marx's view (as in that of Darwin and Freud), it was crucial to combat all attempts to wedge the "Divine foot" in the natural and physical world. But the same applied as well to the social-historical world, which is equally part of the magisterium of materialism–humanism. The first principle of all true science was the overcoming of religious alienation, helping dispel illusion and enhancing human knowledge of the material world. As Lucretius (1997) wrote: "Things come into being without the aid of gods" (p. 8). Likewise for Marx all human history, including the development of human nature, the formation of new needs, etc., is made by human beings – through social praxis – as self-mediating beings of nature, who exist "without the aid of gods" (see Mészáros 1971: 162–89). If there is evidence of design in human history, it is because it has a designer – humanity itself, as a result of the unending, historically contingent struggle for development and freedom. We can know human history, as Vico said, because we have made it – if not always under conditions of our choosing (Marx 1976: 493).

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