

UNCOMMON DISSENT: INTELLECTUALS WHO FIND DARWINISM UNCONVINCING

Edited by William A. Dembski

Motto: “The purpose of freedom is to create it for others,” Bernard Malamud, *The Fixer*

Dedication: To the memory of Michael Polanyi, for freeing inquiry from ideology

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Introduction

THE MYTHS OF DARWINISM

William A. Dembski

Immodest ideas have a way of gathering mythologies, and Darwinism is no exception. Darwinism's primary myth is the myth of invincibility. All of Darwinism's other myths follow in its train. Darwinism, its proponents assure us, has been overwhelmingly vindicated. Any resistance to it is futile and indicates bad faith or worse. Thus Richard Dawkins charges those who resist Darwin's grand evolutionary story with being "ignorant, stupid or insane (or wicked, but I'd rather not consider that)." Nor has Dawkins mitigated his position over time. Several years later he added: "I don't withdraw a word of my initial statement. But I do now think it may have been incomplete. There is perhaps a fifth category, which may belong under 'insane' but which can be more sympathetically characterized by a word like *tormented*, *bullied*, or *brainwashed*."

The myth of invincibility recurs in the writings of philosopher Daniel Dennett who, in *Darwin's Dangerous Idea*, describes Darwinism as a universal acid that eats away every idea it touches. Dennett is so smitten with Darwinian evolution that he regards it as the greatest idea ever conceived, far ahead of the ideas of Newton and Einstein. This awe of Darwinism has now worked its way into the popular culture. Thus, novelist Barbara Kingsolver will describe Darwin's idea of natural selection as "the greatest, simplest, most elegant logical construct ever to dawn across our curiosity about the workings of natural life. It is inarguable, and *it explains everything*."

Given such sentiments, it's not surprising that discipline after discipline is now being "Darwinized." Cosmology has its self-reproducing black holes governed by cosmological natural selection (see Lee Smolin's *The Life of the Cosmos*). Ethics and psychology have now become evolutionary ethics and evolutionary psychology (see Robert Wright's *The Moral Animal* and Steven Pinker's *How the Mind Works*). Even the professional schools are being overtaken, so that we now have books with titles like *Evolutionary Medicine* (medicine), *Managing the Human Animal* (business), *Economics as an Evolutionary Science* (economics), and *Evolutionary Jurisprudence* (law). And let's not forget religious studies, in which God genes (i.e., genes that cause us to believe in God irrespective of whether God exists) and the Darwinian roots of religious belief have become a growth industry (see, for instance, Pascal Boyer's *Religion Explained: The Evolutionary Origins of Religious Thought*).

Such enthusiasm for Darwinism might be endearing except that its proponents are deadly earnest. For instance, in *Darwin's Dangerous Idea* Daniel Dennett views religious believers who dissuade their children from believing Darwinian evolution as such a threat to the social order that they need to be caged in zoos or quarantined (both metaphors are his). Because of the myth of invincibility that now surrounds it, Darwinism has become monopolistic and imperialistic. Though often associated with "liberalism," Darwinism as practiced today knows nothing of the classical liberalism of John Stuart Mill. "Darwinian liberalism" tolerates no dissent and regards all criticism of Darwinism's fundamental tenets as false and reprehensible.

Yet according to Mill, “We can never be sure that the opinion we are endeavouring to stifle is a false opinion; and even if we were sure, stifling it would be an evil still.” Mill expanded:

First, if any opinion is compelled to silence, that opinion may, for aught we can certainly know, be true. To deny this is to assume our own infallibility. Secondly, though the silenced opinion be an error, it may, and very commonly does, contain a portion of truth; and since the general or prevailing opinion on any object is rarely or never the whole truth, it is only by the collision of adverse opinions that the remainder of the truth has any chance of being supplied. Thirdly, even if the received opinion be not only true, but the whole truth; unless it is suffered to be, and actually is, vigorously and earnestly contested, it will, by most of those who receive it, be held in the manner of a prejudice, with little comprehension or feeling of its rational grounds. And not only this, but, fourthly, the meaning of the doctrine itself will be in danger of being lost, or enfeebled, and deprived of its vital effect on the character and conduct: the dogma becoming a mere formal profession, inefficacious for good, but cumbering the ground, and preventing the growth of any real and heartfelt conviction, from reason or personal experience. [From *On Liberty*.]

Charles Darwin was Mill’s contemporary and fully accepted Mill’s classical liberalism. In the *Origin of Species*, Darwin wrote: “A fair result can be obtained only by fully stating and balancing the facts and arguments on both sides of each question.”

By contrast, many of Darwin’s contemporary disciples have turned stifling dissent into an art form. Because the myth of invincibility must be preserved at all costs, it is not acceptable to place doubts about Darwinism on the table for vigorous discussion. Rather, the doubts must be disqualified and repressed. To see this, consider the response by Darwinists to Senator Rick Santorum’s “Sense of the Senate” amendment to the Elementary and Secondary Education Act:

It is the sense of the Senate that (1) good science education should prepare students to distinguish the data or testable theories of science from philosophical or religious claims that are made in the name of science; and (2) where biological evolution is taught, the curriculum should help students to understand why this subject generates so much continuing controversy, and should prepare the students to be informed participants in public discussions regarding the subject.

An eminently reasonable amendment, no doubt. Indeed, the U.S. Senate voted overwhelmingly for it (91-8). Even Senator Ted Kennedy, rarely an ally of Santorum's, voted for it. What's more, by merely reflecting the "Sense of the Senate," this amendment was nonbinding. And yet, the American Association for the Advancement of Science, the National Center for Science Education, and the American Civil Liberties Union (to name but a few) were up in arms over this amendment. Why? Because evolution was singled out for special treatment and opened to critical scrutiny. Why, detractors of the amendment demanded, wasn't general relativity or the atomic theory of matter singled out for similar treatment?

Such comparisons of evolutionary theory with well-established theories of physics and chemistry display wishful thinking. The reason such theories were not singled out for critical scrutiny is, of course, because they are well-established and evolutionary theory is not. This book will detail the weaknesses of Darwinian evolutionary theory, going even further, arguing that the preponderance of evidence goes against Darwinism. Nevertheless, it's actually quite easy to see that Darwinism is not in the same league as the hard sciences. For instance, Darwinists will often compare their theory favorably to Einsteinian physics, claiming that Darwinism is just as well established as general relativity. Yet how many physicists, to argue for the truth of Einsteinian physics, will claim that general relativity is as well established as Darwin's theory? Zero.

Once Darwinism becomes a target for critical scrutiny, its proponents prefer to change the target. Thus, when David Berlinski criticized Darwinism in his December 2002 article in *Commentary* (titled "Has Darwin Met His Match?"), biologist Paul Gross

took him to task for making “Darwinism” the topic of controversy. According to Gross, only “those who do not know much evolutionary biology” refer to something called “Darwinism.” Evolutionary biology, we are assured, is far richer than the caricature of it called Darwinism.

Despite such protestations, Darwinism is the right target. It is no accident that in debates over biological evolution Darwin’s name keeps coming up. Nor are repeated references to Darwin and Darwinism simply out of respect for the history of the subject, as though evolutionary biology needed constantly to be reminded of its founder. Darwin looms larger than life in the study of biological origins because his theory constitutes the very core of evolutionary biology. Indeed, nothing in evolutionary biology makes sense apart from Darwinism.

To see this, we need to understand Darwinism’s role in evolutionary biology. Darwinism is really two claims. The less crucial claim is that all organisms trace their lineage back to a universal common ancestor. Thus you, the fly buzzing around your head, and the bacteria perched on the fly all share the same great-great-great grandparent. Alternatively, any two organisms are n -th cousins k -times removed where n and k depend on the two organisms in question. This claim is referred to as “common descent.” Although evolutionary biology is committed to common descent, that is not its central claim.

The central claim of evolutionary biology, rather, is that an unguided physical process can account for the emergence of all biological complexity and diversity. Filling in the details of that process remains a matter for debate among evolutionary biologists. Yet it is an in-house debate, and one essentially about details. In broad strokes, however,

any unguided physical process capable of producing biological complexity must have three components: (1) hereditary transmission, (2) incidental change, and (3) natural selection.

Think of it this way: We start with some organism. It incurs some change. The change is incidental in the sense that it doesn't anticipate future changes that subsequent generations of organisms may experience (neo-Darwinism, for instance, treats such changes as random mutations or errors in genetic material). What's more, incidental change is heritable and therefore can be transmitted to the next generation. Whether it actually is transmitted to the next generation and then preferentially preserved in subsequent generations, however, depends on whether the change is in some sense beneficial to the organism. If so, then natural selection will be likely to preserve organisms exhibiting that change.

This picture is perfectly general. As already noted, it can accommodate neo-Darwinism. It can also accommodate Lamarckian evolution, whose incidental changes occur as organisms, simply by putting to use existing structures, enhance or modify the functionalities of those structures. It can accommodate Lynn Margulis's idea of symbiogenetic evolution, whose incidental changes occur as different types of organisms come together to form a new, hybrid organism. Other forms of incidental change that it can accommodate include genetic drift, lateral gene transfer, and the action of regulatory genes in development.

Evolutionary biologists debate the precise role and extent of hereditary transmission and incidental change. The debate can even be quite sharp at times. But evolutionary biology leaves unchallenged Darwinism's holy of holies—natural selection.

Darwin himself was unclear about the mechanisms of hereditary transmission and incidental change. But whatever form they took, Darwin was convinced that natural selection was the key to harnessing them. The same is true for contemporary evolutionary biologists. That's why to this day we hear repeated references to Darwin's theory of natural selection but not to Darwin's theory of variation or Darwin's theory of inheritance.

Apart from design or teleology, what can coordinate the incidental changes that hereditary transmission passes from one generation to the next? To perform such coordination, evolution requires a designer substitute. Darwin's claim to fame was to propose natural selection as a designer substitute. But natural selection is no substitute for intelligent coordination. All natural selection does is narrow the variability of incidental change by weeding out the less fit. What's more, it acts on the spur of the moment, based solely on what the environment at present deems fit, and thus without any foresight of future possibilities. And yet this blind process, when coupled with another blind process (incidental change), is supposed to produce designs that exceed the capacities of any designers in our experience.

Leaving aside small-scale evolutionary changes like insects developing insecticide resistance (which no one disputes anyway), where is the evidence that natural selection can accomplish the intricacies of bioengineering that are manifest throughout the living world (like producing insects in the first place)? Where is the evidence that the sorts of incidental changes required for large-scale evolution ever occur? The evidence simply isn't there. Robert Koons (chapter 1) helps us appreciate what's at stake by imagining what would happen to the germ theory of disease if scientists never found any

microorganisms or viruses that produced diseases. That's the problem with Darwinism. In place of detailed, testable accounts of how a complex biological system could realistically have emerged, Darwinism offers handwaving just-so stories for how such systems might have emerged in some idealized conceptual space far removed from biological reality.

Why, then, does Darwinism continue to garner such a huge following, especially among the intellectual elites? Two reasons: (1) It provides a materialistic creation story that dispenses with any need for design, purpose, or God (this is very convenient for those who want to escape the demands of religion, morality, and conscience). (2) The promise of getting design without a designer is incredibly seductive—it's the ultimate free lunch. No wonder Daniel Dennett, in *Darwin's Dangerous Idea*, credits Darwin with "the single best idea anyone has ever had." Getting design without a designer is a good trick indeed.

But all good tricks need some sleight of hand to deflect critical scrutiny. With Darwinism, that sleight of hand takes the form of myths. Darwinism depends on several subsidiary myths to prop its primary myth—the myth of invincibility. Artfully invoked and applied, these subsidiary myths have been enormously successful at censoring all doubts about Darwinism. It's instructive to see how this works in detail. A myth of invincibility is all fine and well, but to sustain itself, it requires other myths. The warrior armed only with sword and shield who shouts "*I cannot be defeated!*" hardly inspires confidence in the face of an M1 Abrams battle tank. What, then, are these other myths that sustain Darwinism's myth of invincibility? There are four. Let's run through them bullet-point fashion:

(1) *The myth of fundamentalist intransigence.* According to this myth, only religious fanatics oppose Darwinism. For what else could prevent the immediate and cheerful acceptance of Darwinism except fundamentalist intransigence? Darwinism, to the convinced Darwinist, is a self-evident truth. Biologist Paul Ewald, for instance, will write: “You have heritable variation, and you’ve got differences in survival and reproduction among the variants. That’s the beauty of it. It has to be true—it’s like arithmetic. And if there is life on other planets, natural selection has to be the fundamental organizing principle there, too.” If Darwin’s theory is as sure as arithmetic, what could prevent people from seeing its truth?

Perhaps the failure of people to accept Darwinian evolution is a failure in education. One frequently gets this sense from reading publications by the National Academy of Sciences, the National Center for Science Education, and the National Association of Biology Teachers. If only people could be made to understand Darwin’s theory properly, they would readily sign off on it. But since Darwinists hold a monopoly on biology education in America, something else must be hindering Darwinism’s acceptance. Accordingly, a mindless fundamentalism must reign over the minds of a vast majority of Americans, leading them to dig in their heels and resist Darwinism’s glorious truth, which otherwise would be plain for all to see.

Thus, what many Darwinists desire is not just more talented communicators to promote Darwinism in America’s biology classrooms but an enforced educational and cultural policy for total worldview reprogramming sufficiently aggressive to capture and convert to Darwinism even the most recalcitrant among “religiously programmed” youth. That’s why Darwinists like Daniel Dennett, by all appearances a functioning member and

advocate of democracy, fantasizes about quarantining religious parents. It seems ridiculous to convince Darwinists like him that the fault might lie with their theory and that the public might be picking up on faults inherent in their theory. And yet, as this book will demonstrate, that's exactly what's happening.

For the Darwinist, the myth of fundamentalist intransigence justifies all forms of character assassination, ad hominem attacks, guilt by association, and demonization. No longer able to ignore their critics because of the cultural groundswell against Darwinism, Darwinists routinely begin their responses to critics by labeling them as creationists, which in the current intellectual climate is equivalent to being called a Holocaust denier, a flat-earther, or a believer in horoscopes. Creationism, properly speaking, refers to a literalistic interpretation of Genesis in which God through special acts of creation brings about the biophysical universe in six literal 24-hour days somewhere in the last several thousand years. And yet, when Richard Dawkins replies to David Berlinski's criticisms of Darwinism (see chapter 14), he will call Berlinski a "creationist." This is name-calling. Berlinski is a secular Jew. Recently Berlinski remarked: "I have no creationist agenda whatsoever and, beyond respecting the injunction to have a good time all the time, no religious principles, either." If Berlinski can be branded a creationist, then woe to those who actually have religious convictions and oppose Darwinism.

(2) *The Myth of Prometheus.* This myth is the flipside of the previous myth. If only religious crazies oppose Darwinism, then it is only the intelligent and courageous who embrace it and fully accept its consequences. In the original myth, Prometheus brought fire to humanity and thus gave it control over nature (a power previously reserved to the gods). Prometheus did this at great personal cost, incurring the wrath of

the gods, who chained him to a mountain top and decreed that birds of prey should forever tear and consume his liver. By opposing arbitrary limitations that the gods imposed on humanity, Prometheus symbolized liberation from ignorance and superstition. In place of comforting myths that assure us that we have a special place in the great scheme of things, Prometheus teaches us to spurn the gods and stare the ultimate meaninglessness of reality in the eye without flinching.

Darwinists enjoy styling themselves as Prometheus's heirs. Accordingly, they are humanity's benefactors, conferring scientific insights that tell us the grim truth about our biological origins and thereby liberate us from our benighted fundamentalist past. Darwinism views the organic world as a great competition for life in which all living forms are ultimately destined for extinction. This is a bitter pill, but it is the best medicine we have. Fundamentalism, by contrast, is an opiate that causes us to sleepwalk through life, accepting fairy tales about our biological origins as well as fairy tales about any life beyond death. (Conflating the language of fairy tales with the language of ordinary religious belief is a favorite among more extreme Darwinists like Steven Weinberg.)

The myth of Prometheus has been a public relations bonanza for Darwinists, helping them to score some of their best propaganda points. Take, for instance, the movie *Inherit the Wind*, a fictional portrayal of the Scopes monkey trial in which the forces of reason in the guise of Darwinism struggle against the mindless fundamentalism of a backwater town. The movie portrays Darwinism as the defender of scientific truth and intellectual honesty and also as the great liberator from religious bigotry. Given only this movie, who in their right mind would not support Darwinism? Notwithstanding, the actual Scopes trial, as Edward Sisson recounts in chapter 5 of this book, provides a quite

different picture. Clarence Darrow, the Darwinist attorney who defended Scopes, carefully arranged that Darwinism was never subjected to cross-examination.

Although the myth of Prometheus has lofty pretensions, for many Darwinists it provides an excuse for elitism and snobbery. Accordingly, they divide the world into the moronic masses who reject Darwinism and its consequences, and then the smart people (themselves) who believe it. Take Richard Dawkins and Daniel Dennett's latest attempt to make atheism more alluring to the wider culture. They propose the word "bright" to serve the same role with respect to atheism as the word "gay" serves with respect to homosexuality. Dawkins writes:

Paul Geisert and Mynga Futrell, of Sacramento, California, have set out to coin a new word, a new "gay." Like gay, it should be a noun hijacked from an adjective, with its original meaning changed but not too much. Like gay, it should be catchy.... Like gay, it should be positive, warm, cheerful, bright. Bright? Yes, bright. Bright is the word, the new noun. I am a bright. You are a bright. She is a bright. We are the brights. Isn't it about time you came out as a bright? Is he a bright? I can't imagine falling for a woman who was not a bright. The website www.celeb-atheists.com suggests numerous intellectuals and other famous people are brights.... A bright is a person whose world view is free of supernatural and mystical elements. The ethics and actions of a bright are based on a naturalistic world view.... You can sign on as a bright at www.the-brights.net. ("The Future Looks Bright," *Guardian*, June 21, 2003; Dennett's "The Bright Stuff" in the July 12, 2003 *New York Times* makes the same point)

Obviously, since an atheistic world view is best nourished on Darwinism (it was Dawkins, after all, who said that Darwin made it possible to be an intellectually fulfilled atheist), it follows that "brights" are necessarily also Darwinists. Perhaps in the future we shall see articles and books about "Darwin's Bright Idea."

(3) *The myth of victory past.* A scene in the Marx Brothers movie *Duck Soup* illustrates this myth. Groucho Marx, president of Freedonia, presides over a meeting of the cabinet. The following exchange ensues between Groucho and one of Freedonia's ministers:

Groucho: “And now, members of the Cabinet, we’ll take up old business.”

Minister: “I wish to discuss the Tariff!”

Groucho: “Sit down, that’s new business! No old business? Very well—then we’ll take up new business”

Minister: “Now about that Tariff...”

Groucho: “Too late—that’s old business already!”

This exchange epitomizes Darwinism’s handling of criticism. When a valid criticism of Darwinism is first proposed, it is dismissed without an adequate response, either on some technicality or with some irrelevancy or by simply being ignored. As time passes, people forget that Darwinists never adequately met the criticism. But Darwinism is still calling the shots. Since the criticism failed to dislodge Darwinism, the criticism itself must have been discredited or refuted somewhere. Thereafter the criticism becomes known as “that discredited criticism that was refuted a long time ago.” And, after that, even to raise the criticism betrays an outdated conception of evolutionary theory. In this way, the criticism, though entirely valid, simply vanishes into oblivion. (At least that’s how things have been in the past. That’s now changing with the Internet and an emerging intellectual community that refuses to be cowed by Darwinist bullying.)

Michael Behe’s challenge to Darwinian evolution provides a recent case study in the myth of victory past. Certain biochemical systems are molecular machines of great sophistication and intricacy whose parts are each indispensable to the system’s function. Such systems are, as Behe defines them in his 1996 book *Darwin’s Black Box*, *irreducibly complex*. What’s more, as Behe also notes, such systems resist Darwinian explanations. Indeed, the biological community has no detailed, testable proposals for how irreducibly complex systems might have arisen by Darwinian means but only a

variety of wishful speculations, a fact admitted by biologists like James Shapiro and Franklin Harold, who have no “creationist” or “intelligent design” agenda. Nevertheless, it is routine among Darwinists to declare that Behe’s ideas have been decisively refuted and even to provide references to the biological literature in which Behe’s ideas are supposed to have been refuted.

But what happens when one tracks down those references in the biological literature that are said to have refuted Behe? David Ray Griffin, a philosopher with no animus against Darwinism or sympathy for Behe’s intelligent design perspective, remarks:

The response I have received from repeating Behe’s claim [that the evolutionary literature fails to account for irreducible complexity] is that I obviously have not read the right books. There are, I am assured, evolutionists who have described how the transitions in question could have occurred [i.e., how, contra Behe, Darwinian pathways could lead to irreducibly complex biochemical systems]. When I ask in which books I can find these discussions, however, I either get no answer or else some titles that, upon examination, do not in fact contain the promised accounts. That such accounts exist seems to be something that is widely known, but I have yet to encounter someone who knows where they exist. [From *Religion and Scientific Naturalism*.]

It will help to see how this Darwinist technique of “passing the buck” actually plays out in practice. The National Center for Science Education is now the premier watchdog group for keeping concerted criticism of Darwinism outside the public square. At the time of this writing, the Public Broadcasting Service is airing a Nova-style video program titled *Unlocking the Mystery of Life*. This program is critical of Darwinism and features Michael Behe’s ideas about irreducible complexity. The National Center for Science Education has a critical response to this program on its website (www.ncseweb.org) written by Andrea Bottaro, an immunologist on the faculty of the

University of Rochester Medical Center. Here is what Bottaro says about irreducible complexity:

The crucial argument ... widely discussed in the video is the concept of “irreducibly complex” systems, and the purported impossibility of conventional evolutionary mechanisms to generate them. Although it was quickly rejected by biologists on theoretical and empirical grounds,[ref#6] “irreducible complexity” has remained the main staple of [Intelligent Design] Creationism. Ironically, this argument was just recently delivered a fatal blow in the prestigious science journal *Nature*, where a computer simulation based entirely on evolutionary principles (undirected random mutation and selection) was shown to be able to generate “irreducibly complex” outputs.[ref#7]

This all sounds quite impressive and damning until one follows the paper trail. Indeed, what are references #6 and #7 to which Bottaro refers? Reference #6 refers to the articles on Kenneth Miller’s evolution website www.millerandlevine.com/km/evol. What’s on this website? Prominently displayed is Miller’s 1999 book *Finding Darwin’s God*. Despite Miller’s promises to the contrary, don’t look for a refutation of irreducible complexity there. None of Miller’s arguments against irreducible complexity in that book withstands scrutiny. For instance, Miller refers his readers to “four glittering examples [in the biological literature] of what Behe claimed would never be found.” Behe claimed that the biological literature is bereft of *detailed* Darwinian explanations for the origin of *irreducibly complex* biochemical machines. Go to the articles that Miller cites, and you’ll find that Miller’s glittering examples not only fail to be detailed but also fail to be irreducibly complex. Miller, therefore, isn’t even in the right ballpark. Behe shows this clearly in his article “Irreducible Complexity and the Evolutionary Literature: Response to Critics” (http://www.arn.org/docs/behe/mb_evolutionaryliterature.htm, last accessed 9/3/03).

What about the rest of Miller’s website? Miller lists several articles critical of Behe: “Design on the Defensive” (actually a collection of four articles directed at Behe),

“A Review of *Darwin’s Black Box*,” “Answering the Biochemical Design Argument,” and Miller’s most recent essay, “The Flagellum Unspun: The Collapse of ‘Irreducible Complexity’.” Ironically, Miller wrote this last article for a book I’m editing with Darwinist Michael Ruse for Cambridge University Press (*Debating Design: From Darwin to DNA*). What’s more, Behe is a contributor to that book.

Clearly, “The Flagellum Unspun” was Miller’s big chance to put his best foot forward and wipe the floor with irreducible complexity. And yet Miller’s entire argument consists not in providing a detailed Darwinian pathway to the irreducibly complex system that has become the mascot of the intelligent design movement (i.e., the bacterial flagellum), but in pointing out that such pathways are not logically impossible because irreducibly complex systems (like the flagellum) include subsystems (like the type III secretory system) that perform functions in their own right and therefore could be acted on by natural selection.

Four years after the publication of *Finding Darwin’s God*, this has become Miller’s core argument against Behe, and he repeats it in the other articles critical of Behe on his website (the biological systems change from article to article, but the core argument remains unchanged). According to Miller, the parts of an irreducibly complex system are never totally functionless. Rather, those parts have functions and thus are grist for selection’s mill. Accordingly, selection can work on those parts and thereby form irreducibly complex systems.

For the Darwinian faithful, such a handwaving argument is all that’s required to refute irreducible complexity. The unconverted, however, want to know not why nothing is stopping natural selection from producing irreducible complexity but why we should

think that natural selection can actively foster irreducible complexity (as it must if Darwinism is true—the biology of the cell, after all, is chock-full of irreducibly complex biochemical machines). To understand the difference, imagine yourself randomly sampling Scrabble pieces from an urn. Nothing is stopping the pieces from spelling the first few lines of Hamlet’s soliloquy. But if they do spell the first few lines of Hamlet’s soliloquy, something more than chance was involved. Likewise, with irreducibly complex systems, their emergence implicates more than just Darwin’s selection mechanism.

To sum up, Bottaro’s reference #6 purports to justify the rejection by the biological community of Behe’s work on irreducible complexity. But in fact all it does is point the reader to the rationalizations employed by the biological community for sidestepping the challenge posed by irreducible complexity. Reference #6 is therefore an exercise in misdirection.

What about reference #7? This reference is to Richard Lenski et al.’s May 8, 2003 paper in *Nature* titled “The Evolutionary Origin of Complex Features.” This paper describes a computer simulation and thus contains no actual biology. Go to the discussion section, and you’ll read: “Some readers might suggest that we ‘stacked the deck’ by studying the evolution of a complex feature that could be built on simpler functions that were also useful. However, that is precisely what evolutionary theory requires....” In other words, the computer programmers built into the simulation what they thought evolution needed to make it work. The validity of this study therefore depends on whether the simulation faithfully models biological reality.

Unfortunately, the simulation presupposes the very point at issue. It therefore begs the question and doesn't prove a thing about real-life biological evolution. The Lenski simulation requires that complex systems exhibiting complex functions can always be built up from (or decomposed into) simpler systems exhibiting simpler functions. This is a much stronger assumption than merely allowing that complex systems may include functioning subsystems. Just because a complex system can include functioning subsystems doesn't mean that it decomposes into a collection of subsystems each of which is presently functional or vestigial of past function and thus amenable to shaping by natural selection.

The simulation by Lenski et al. assumes that all functioning biological systems are evolutionary kludges of subsystems that presently have function or previously had function. But there's no evidence that real-life irreducibly complex biochemical machines, for instance, can be decomposed in this way. If there were, the Lenski et al. computer simulation would be unnecessary. And without it, their demonstration is an exercise in irrelevance. Bottaro's "fatal blow" against irreducible complexity is therefore nothing of the sort. Behe's ideas about irreducible complexity, and in particular the criticism they raise of Darwinism, remain very much alive and topics for discussion among biologists.

(4) *The myth of the scientific juggernaut.* Despite all the propaganda to the contrary, science is not a juggernaut that relentlessly pushes back the frontiers of knowledge. Rather, science is an interconnected web of theoretical and factual claims about the world that are constantly being revised and for which changes in one portion of

the web can induce radical changes in another. In particular, science regularly confronts the problem of having to retract claims that it once boldly asserted.

Consider the following example from geology. In the nineteenth century the geosynclinal theory was proposed to account for how mountain ranges originate. This theory hypothesized that large trough-like depressions, known as geosynclines, filled with sediment, gradually became unstable, and then, when crushed and heated by the earth, elevated to form mountain ranges. To the question “How did mountain ranges originate?” geologists as late as 1960 confidently asserted that the geosynclinal theory provided the answer. In the 1960 edition of Clark and Stearn’s *Geological Evolution of North America*, the status of the geosynclinal theory was even favorably compared with Darwin’s theory of natural selection. Whatever became of the geosynclinal theory? Within a few years, the theory of plate tectonics, which explained mountain formation through continental drift and sea-floor spreading, decisively replaced the geosynclinal theory. The history of science is filled with such turnabouts in which confident claims to knowledge suddenly vanish from the scientific literature.

The geosynclinal theory was completely wrong. Thus, when the theory of plate tectonics came along, the geosynclinal theory was overthrown. Often, however, theories are not completely wrong. Instead, they offer some legitimate insights. Nevertheless, upon further investigation the theories need to be revised. Frequently this takes the form of a contraction. The problem is that when theories are first proposed, their originators try to push them to account for as much as possible—indeed, for too much. Only later do the limitations of the theory become evident.

It is always a temptation in science to think that one's theory encompasses a far bigger domain than it actually does. This happened with Newtonian mechanics—physicists thought that Newton's laws provided a total account of the constitution and dynamics of the universe. Maxwell, Einstein, and Heisenberg each showed that the proper domain of Newtonian mechanics was far more constricted (Newtonian mechanics works well for medium sized objects at medium speeds, but for very fast and very small objects it breaks down, and we need relativity and quantum mechanics respectively). So too, the proper domain of the Darwinian selection mechanism is far more constricted than most Darwinists would like to admit. In particular, large-scale evolutionary changes in which organisms gain novel information-rich structures cannot legitimately be derived from the Darwinian selection mechanism.

Sometimes, as in the geosynclinal case, theories are replaced in their entirety by completely new theories. At other times, as with Newtonian mechanics, theories prove inadequate outside a certain range of phenomena and need to be supplemented (no one any longer learns geosynclinal geology, but all freshman physics students still learn Newtonian mechanics, though later in their course of study they also learn about quantum mechanics and relativity theory). In both these instances, however, defective theories give way to new and improved theories. But that's not always the case. It's also possible for theories to be overthrown or contracted without offering a replacement theory.

Consider the case of superconductivity. Here science did not require a replacement theory ready and available to establish the inadequacy of an existing theory when the experimental evidence went against the existing theory. Such case studies are particularly important in the debate over evolution because they show that one may

legitimately criticize Darwinism without having to argue for the adequacy of a replacement theory. Instead of trying to shoehorn recalcitrant data into theories that are empirically inadequate, science is regularly forced to give up overconfident claims that cannot be adequately justified. The rational alternative to Darwinism, therefore, need not be intelligent design but rather, as David Berlinski points out in chapter 14, intelligent uncertainty.

With regard to superconductivity, the Dutch physicist Kamerling Onnes discovered this phenomenon in 1911. Superconductivity refers to the complete disappearance of electrical resistance for materials at low temperatures. Back when Onnes made his discovery, however, there was no theory to account for superconductivity. Such a theory was not proposed until 1957, namely the BCS theory, named for Bardeen, Cooper, and Schrieffer, who received the Nobel Prize in physics for their theory in 1972. The first paragraph of the Nobel press release describes the BCS theory as providing “a complete theoretical explanation of the phenomenon.” (see www.nobel.se/physics/laureates/index.html). But the theory didn’t stay complete for long. In the 1980s Bednorz and Müller discovered superconductors at much higher temperatures than previously identified and explained by BCS. To date, no replacement theory for BCS has been found that extends to high-temperature superconductors. BCS, instead of being “*the* theory of superconductivity,” now merely explains a quite limited range of superconductors.

Science can get things wrong—indeed, massively wrong. What’s more, sometimes we can tell that science has gotten something wrong without having to tell what the correct or true explanation is. Also, unlike religion, science has no prophets.

There are no scientific prophets to tell us what course science must take or avoid taking. Different courses need to be tried, and only after they are tried does it become clear what was fruitful and what was fruitless.

The aim of this book is to expose and unseat the myths that have gathered around Darwinism. Of course, by itself this book will not accomplish that end—Darwinism’s myths are simply too entrenched in our intellectual culture for a single book like this to overturn them. As David Berlinski once remarked to me, “A shift in prevailing scientific orthodoxies will come only when the objections to Darwinism accumulate so forcefully that they can no longer be ignored.” Think of this book, therefore, as ramping up the objections to Darwinism and its chapters as straws that, along with other straws, eventually will break Darwinism’s back.

Why does Darwinism’s back need to be broken? Because it is no longer merely a scientific theory but an ideology. Darwin’s original proposal was actually quite modest: organisms adapt to their environments as a result of random variation and natural selection. Stated thus, Darwin’s theory is incontrovertible and legitimately characterizes certain small-scale evolutionary changes. But this same theory is supposed to explain how the whole diversity and complexity of life came about. And having accounted for all of biology, it is supposed to account for just about everything else. As David Berlinski put it in the March 2003 issue of *Commentary*:

The term “Darwinism” conveys the suggestion of a secular ideology, a global system of belief. So it does and so it surely is. Darwin’s theory has been variously used—by Darwinian biologists—to explain the development of a bipedal gait, the tendency to laugh when amused, obesity, *anorexia nervosa*, business negotiations, a preference for tropical landscapes, the evolutionary roots of political rhetoric, maternal love, infanticide, clan formation, marriage, divorce, certain comical

sounds, funeral rites, the formation of regular verb forms, altruism, homosexuality, feminism, greed, romantic love, jealousy, warfare, monogamy, polygamy, adultery, the fact that men are pigs, recursion, sexual display, abstract art, and religious beliefs of every description.

Even such overweening ambitions would not be so bad if Darwin's theory were not held dogmatically. But it is held dogmatically and even ruthlessly. Darwinism has achieved the status of inviolable science, combining the dogmatism of religion with the entitlement of science. This is an unhappy combination. In consequence, critics encounter a ruthless dogmatism when challenging Darwin's theory. The problem isn't that Darwinists don't hold their theory tentatively. No scientist with a career invested in a scientific theory is going to relinquish it easily. Typically, a scientist's lack of tentativeness toward a scientific theory simply means that the scientist is convinced the theory is substantially correct. But scientists who hold their theories dogmatically go on to assert that their theories *cannot* be incorrect. Moreover, scientists who are ruthless in their dogmatism regard their theories as inviolable and portray critics as morally and intellectually deficient. (That's why most responses by Darwinists to critics begin with an ad hominem argument aimed at destroying the critic's credibility.)

How can a scientist keep from descending into dogmatism? There's only one way, and that's to look oneself squarely in the mirror and continually affirm: *I am a fallible human being ... I may be wrong ... I may be massively wrong ... I may be hopelessly and irretrievably wrong*—and mean it! It's not enough just to mouth these words. We need to take them seriously and admit that they can apply even to our most cherished scientific beliefs. Human fallibility is real and can catch us in the most unexpected places.

The problem with dogmatism is that it is always a form of self-deception. If Socrates taught us anything, it's that we always know a lot less than we think we know. Dogmatism deceives us into thinking we have attained ultimate mastery and that divergence of opinion is futile. Self-deception is the original sin because it deceives us into believing that self-deception is impossible. Richard Feynman put it this way: "The first principle is that you must not fool yourself, and you are the easiest person to fool." Feynman was particularly concerned about applying this principle to the public understanding of science: "You should not fool the laymen when you're talking as a scientist.... I'm talking about a specific, extra type of integrity that is [more than] not lying, but bending over backwards to show how you're maybe wrong." (From Feynman's autobiography *Surely You Must Be Joking Mr. Feynman*.)

Sadly, Feynman's sound advice almost invariably gets lost when Darwin's theory is challenged. Richard Dawkins and Daniel Dennett are so over-the-top in their enthusiasm for Darwinism and animus against anyone who doesn't share their enthusiasm that they are easy targets. But what about the American Civil Liberties Union when it threatens to sue school boards and teachers for allowing criticism of Darwinian evolution to be taught? I'm not talking about teaching an alternative to Darwinism, like the theory of intelligent design. I'm simply talking about teaching criticisms of the theory as they appear in the peer-reviewed literature by recognized evolutionary biologists like the late Stephen Jay Gould (cf. the case of Roger DeHart, which was reported in the national press). What about the National Center for Science Education when it pressures high schools to exclude books critical of Darwinism from their libraries (as happened in Melvindale, Michigan)? Do we live in a society of rational discourse where controversial

ideas like Darwinism can be reasonably disputed without fear of reprisal, or is this one of those topics for which uniformity of opinion has to be enforced?

We now face a Darwinian thought police that, save for employing physical violence, is as insidious as any secret police at ensuring conformity and rooting out dissent. To question Darwinism is dangerous for all professional scholars but especially biologists. As Michael Behe pointed out in an interview with the *Harvard Political Review* (www.hpronline.org/news/251835.html), “There’s good reason to be afraid. Even if you’re not fired from your job, you will easily be passed over for promotions. I would strongly advise graduate students who are skeptical of Darwinian theory not to make their views known.”

Although the Darwinian thought police has been hugely successful at quashing dissent among academics and the intellectual elites, they are having a much harder time ensuring conformity in the wider populace. Gallup poll after Gallup poll indicates that only about ten percent of the U.S. population accepts Darwinian evolution. The rest of the population is committed to some form of intelligent design (dividing fairly evenly between God-guided evolution and special creation).

Now it goes without saying that science is not decided at an opinion poll. Nevertheless, the overwhelming rejection of Darwinian evolution in the population at large is worth pondering. Given that Darwinism is the majority position among biologists, why has the biological community failed to convince the public that natural selection is the driving force behind evolution and that evolution so conceived (i.e., Darwinian evolution) can successfully account for the full diversity of life? This question is worth pondering because in most other areas of science, the public prefers to sign off

on the considered judgments of the scientific community (science, after all, holds considerable prestige in our culture). Why not here? Steeped as our culture is in the fundamentalist-modernist controversy, the usual answer is that religious fundamentalists, blinded by their dogmatic prejudices, willfully refuse to acknowledge the overwhelming case for Darwinian evolution.

The problem with this explanation is that fundamentalism, in the sense of strict biblical literalism, is not nearly as common as Darwinists make out. Most religious traditions do not make a virtue out of alienating the culture. Despite postmodernity's inroads, science retains tremendous cultural prestige. The religious world would rather live in harmony with the scientific world. Many religious believers accept that species have undergone significant changes over the course of natural history and therefore that evolution has in some sense occurred (consider, for instance, Pope John Paul II's 1996 endorsement of evolution). The question for religious believers and the public more generally is the extent of evolutionary change and the mechanism underlying evolutionary change—in particular, whether material mechanisms alone are sufficient to explain all of life.

The real reason the public continues to resist Darwinian evolution is that the Darwinian mechanism of incidental change and natural selection seems utterly inadequate to bear the weight that Darwinists place on it. Specifically, the claim that the Darwinian mechanism can generate the full range of biological diversity strikes people as an unwarranted extrapolation from the limited changes that mechanism is known to effect in practice. The hard empirical evidence for the power of the Darwinian mechanism is in fact quite limited (e.g., finch beak variation, changes in flower coloration, and bacteria

developing antibiotic resistance). For instance, finch beak size does vary according to environmental pressure. The Darwinian mechanism does operate here and accounts for the changes we observe. But that same Darwinian mechanism is also supposed to account for how finches arose in the first place. This is an extrapolation. Strict Darwinists see it as perfectly plausible. The public remains unconvinced.

As this book shows, the public is right to remain unconvinced. This book divides into four parts. The first part shows why Darwinism faces a growing crisis of confidence. Robert Koons starts the ball rolling with his chapter “The Check Is in the Mail.” In this chapter Koons details how Darwinism substitutes theft for honest labor, insulating Darwinian theories from all possible criticism. Koons argues that the real motivation for Darwinism is to be found in a thoroughgoing metaphysical attack on the idea of agency, both human and divine, that has been ongoing for two hundred years. He also suggests that by undermining the idea of reasonable and responsible agency, Darwinism helped prepare the way for a variety of destructive experiments in social engineering. Next comes Phillip Johnson’s well-known essay “Darwinism as Dogma,” which originally appeared back in 1990 in *First Things*. This essay masterfully disentangles Darwinism’s entanglements with materialist philosophy. And finally, there is Marcel Schützenberger’s 1996 interview with *La Recherche*, conducted shortly before his death, in which he recapitulates his ideas about functional complexity and the challenge this feature of biological systems poses to Darwinism. The original interview was in French. David Berlinski translated it into English for the journal *Origins & Design*. I edited the translation for clarity and style.

Part two focuses on Darwinism's cultural inroads. Nancy Pearcey starts things off with a sweeping overview. The effect of reading her essay is dizzying as she documents how Darwinism has inveigled itself into one academic discipline after another. Next comes Edward Sisson's brilliant analysis of how the professionalization of science has rendered science incapable of correcting itself in the case of Darwinism (essentially, the critic of Darwinism faces a prisoner's dilemma in which perpetuating Darwinian falsehoods, either by actively promoting them or by silent complicity, is the best strategy for advancing one's career). J. Budziszewski's chapter on natural law is a much needed corrective to an emerging literature that seeks to combat postmodern ethical relativism with a distorted version of natural law based on Darwinism. And finally, Frank Tipler's chapter on refereed journals shows how the peer-review process increasingly stifles scientific creativity and enforces orthodoxies like Darwinism. Although I commissioned this chapter for this volume, it has such huge public policy implications for the practice and funding of science that it has now also appeared on the web (www.iscid.org).

Part three examines the dynamics of converting to and deconverting from Darwinism. Often, in the writings of Darwinists (e.g., Ronald Numbers's book *The Creationists*), one gets the impression that the more educated people become, the more reasonable Darwinism seems. Part three shows that this is not the case. Michael Behe, raised as a Roman Catholic and trained as a biologist, accepted Darwinism as he began his scientific career. Only later, as he reflected on what he had been taught about evolution, did his doubts about Darwinism arise and finally lead to a full deconversion from Darwinism. Michael Denton, by contrast, never accepted Darwinism. Though early in his life he rejected Darwinism because of his religious faith, Denton continued to reject

Darwinism even after he had shed his religious faith and learned an awful lot of biology. James Barham began as Christian fundamentalist, turned to a hardcore atheistic brand of Darwinism, and then, after thinking deeply about the nature of biological function, turned to a naturalized form of teleology at odds with both fundamentalism and Darwinism.

Finally, part four examines the nitty-gritty of why Darwinism is a failed intellectual project. After reviewing and overturning many of the key evidences used to prop Darwinism, Cornelius Hunter shows why Darwinism should properly be regarded not as a positive scientific research program but as a reactionary metaphysical program whose justification depends intrinsically on naive assumptions about what God would and would not have done in designing biological systems. Next Roland Hirsch overviews many of the recent advances in molecular biology and biochemistry, showing how Darwinism has failed both to anticipate and to explain them. After that, Christopher Langan carefully examines the nature of causality and shows how Darwinism depends on a superficial analysis of causality to hide its fundamental conceptual problems. Finally, we come to the chapter that inspired this book, David Berlinski's June 1996 *Commentary* essay "The Deniable Darwin." In exposing Darwinism's failure to resolve biology's information problem, this essay provoked an enormous response (over thirty published letters pro and con). In addition to this essay, this chapter includes some of the key letters by Darwinists critical of Berlinski's essay. It also includes Berlinski's replies to these critics.

In commending this volume to the reader, I wish to leave Darwinists with this closing thought: *You've had it way too easy till now.* It is no longer credible to conflate informed criticism of Darwinism with ignorance, stupidity, insanity, wickedness, or

brainwashing. Informed critiques of Darwinism have consistently appeared ever since Darwin published his *Origin of Species* (cf. the work of Louis Agassiz, St. George Mivart, Richard Goldschmidt, Pierre Grassé, Gerald Kerkut, and Michael Polanyi). Unfortunately, because Darwinism's myths are so entrenched, such critiques have till now been unable to reach a critical mass and actually overthrow Darwinism. That is now changing. We'll know that a critical mass has been achieved when it becomes widely acceptable among intellectuals to challenge Darwinism. When that happens—when it becomes acceptable to say that the emperor has no clothes—Darwin's actual theory will assume the modest role in science that it deserves and Darwinism's grandiose pretensions will become dissertation fodder for 19th and 20th Century intellectual history. In other words, Darwinism will be history.

Contributors

James Barham was trained in classics at the University of Texas at Austin and in history of science at Harvard University. He is an independent scholar who has published articles on evolutionary epistemology, the philosophy of mind, and the philosophy of biology in both print and electronic journals, including *BioSystems*, *Evolution and Cognition*, *Rivista di Biologia*, and *Metanexus.net*. Barham was born in Dallas, Texas, in 1952, and raised conventionally as a Southern Baptist. A childhood fascination with astronomy and physics led him to question his religious upbringing at an early age. Russell's *Why I Am Not a Christian* influenced him profoundly, as it has so many provincial youth, and by the seventh grade he was a defiant (not to say, village) atheist. Barham always had an equal attraction to the sciences and the humanities, but for many years felt no contradiction between the world of purpose, meaning, and value revealed through literature, music, and the visual arts, and the tough-minded reductionism endorsed, as he supposed, by science. Gradually, however, Barham became increasingly troubled by the tension between the two incompatible sides of his personal worldview. Finally, in the late 1980s he discovered the literature of nonlinear dynamics, which led directly to his second loss of faith—in metaphysical Darwinism. Since then, he has been laboring to develop a theory of purpose, meaning, and value as objective realities and emergent properties of the *sui generis* dynamics of the living state of matter, as well as to trace some of the implications of this theory for our understanding of human nature. In this vein he is working on a book to be called *Neither Ghost nor Machine*.

Michael J. Behe was born in 1952 and grew up in Harrisburg, Pennsylvania. In 1974 he graduated from Drexel University in Philadelphia, with a Bachelor of Science degree in Chemistry. He did his graduate studies in biochemistry at the University of Pennsylvania and was awarded the Ph.D. in 1978 for his dissertation research on sickle-cell disease. From 1978-1982 he was a Jane Coffin Childs postdoctoral fellow at the National Institutes of Health where he investigated DNA structure. From 1982-85 he was Assistant Professor of Chemistry at Queens College in New York City, where he was awarded a Research Career Development Award from the National Institutes of Health. In 1985 he moved to Lehigh University where he is currently Professor of Biochemistry. In his career he has authored over 40 technical papers and one book, *Darwin's Black Box: The Biochemical Challenge to Evolution*, which argues that living systems at the molecular level are best explained as being the result of deliberate intelligent design. *Darwin's Black Box* has been reviewed by the *New York Times*, *Nature*, *Philosophy of Science*, *Christianity Today*, and over one hundred other periodicals. He and his wife reside near Bethlehem, Pennsylvania, with their eight children.

David Berlinski was born in New York City in 1942 and educated at the Bronx High School of Science, Columbia College, and Princeton University, from which he received his Ph.D. He taught philosophy and logic at Stanford University during the 1960s, and

during the 1970s worked as a management consultant with McKinsey and Company and as a senior quantitative analyst for the City of New York. During the late 1970s, Berlinski served as a professor of mathematics at the Université de Paris at Jussieu, and thereafter held research positions at the Institute for Applied Systems Analysis in Austria, and the Institut des Hautes Etudes Scientifiques in France. He has taught mathematics and philosophy at altogether too many American universities. His books include *On Systems Analysis*, *Black Mischief: Language, Life, Logic, Luck*, *A Tour of the Calculus*, *The Advent of the Algorithm*, and *Newton's Gift*. He is as well the author of three novels. He now lives in Paris.

J. Budziszewski (Ph.D. Yale, 1981) is professor of government and philosophy at the University of Texas at Austin. He is a political theorist and philosopher of natural law. His recent work focusses on the repression of moral knowledge—what we really know, how we tell ourselves that we don't know what we do, and what happens to the structures of conscience and moral judgment when we try. Presently he is writing a book on the momentum of evil. A fellow of the Wilberforce Forum as well as Discovery Institute's Center for Science and Culture, he is also a member of the Board of Directors of the Institute on Religion and Democracy. His articles have appeared in journals of law, ethics, theology, public policy, and political theory, and his academic books include *The Resurrection of Nature: Political Theory and the Human Character* (Cornell University, 1986), *The Nearest Coast of Darkness: A Vindication of the Politics of Virtues* (Cornell University, 1988), *True Tolerance: Liberalism and the Necessity of Judgment* (Transaction, 1992), *Written on the Heart: The Case for Natural Law* (InterVarsity, 1997), *The Revenge of Conscience: Politics and the Fall of Man* (Spence, 1999), and *What We Can't Not Know: A Guide* (Spence, 2003).

William A. Dembski is associate research professor in the conceptual foundations of science at Baylor University and a senior fellow with Discovery Institute's Center for Science and Culture in Seattle. He is also the executive director of the International Society for Complexity, Information, and Design (www.iscid.org). A graduate of the University of Illinois at Chicago where he earned a B.A. in psychology, an M.S. in statistics, and a Ph.D. in philosophy, he also received a doctorate in mathematics from the University of Chicago in 1988 and a master of divinity degree from Princeton Theological Seminary in 1996. He has held National Science Foundation graduate and postdoctoral fellowships. Dr. Dembski has published articles in mathematics, philosophy, and theology journals and is the author of several books. In *The Design Inference: Eliminating Chance Through Small Probabilities* (Cambridge University Press, 1998), he examines the design argument in a post-Darwinian context and analyzes the connections linking chance, probability, and intelligent causation. The sequel to *The Design Inference* appeared with Rowman & Littlefield in 2002 and critiques Darwinian and other naturalistic accounts of evolution. It is titled *No Free Lunch: Why Specified Complexity Cannot Be Purchased without Intelligence*. Dr. Dembski is currently coediting a book with Michael Ruse for Cambridge University Press titled *Debating Design: From Darwin to DNA*.

Michael John Denton studied medicine at Bristol University. He was awarded a BSc in Physiology in 1964 and an MBChB degree in 1969. As a post graduate he studied developmental biology at Kings College, London University where he gained a PhD in 1974. He trained in Pathology at the Post Graduate Medical School, London and at the Hospital for Sick Children in Toronto. Since 1989 he has been a Senior Research Fellow in Human Genetics in the Biochemistry Department at the University of Otago, Dunedin, New Zealand. For the past 20 years his main research focus has been on the genetics of human retinal disease. His group has made a major contribution to the field by identifying several new genes responsible for retinal diseases. He has had a long standing interest in evolutionary biology. He has written two books on the subject *Evolution: a Theory in Crisis* and *Nature's Destiny*. He holds that the intrinsic properties of matter have played a significant role in directing the course of evolution. He has argued in recent publications that molecular forms such as the protein folds are determined by natural law not natural selection and that much of life's order is predicable in principle from physics. He was recently invited to present these views in *Nature* and in an article for the recently published *Encyclopedia of Evolution* (Oxford University Press). He has an article on the same subject in press in the *Journal of Theoretical Biology*.

Roland F. Hirsch is a program manager in the Office of Biological & Environmental Research in the Office of Science of the U.S. Department of Energy (DOE). His responsibilities include managing research in structural molecular biology, analytical chemistry, and genome sequencing instrumentation, and research supporting the cleanup on contamination at the Manhattan Project sites. He received his A.B. from Oberlin College (1961) and M.S. and Ph.D. (1965) from the University of Michigan. Prior to joining DOE he was a health scientist administrator at the National Institutes of Health. He served on the faculty of Seton Hall University from 1965 to 1988, the last four years on leave with the Chemical Sciences Division of DOE. At Seton Hall he was chair of the Chemistry Department, Associate Dean of the college of Arts and Sciences, and mentor to six students receiving the Ph.D. in chemistry. He has served as chair of the 7500-member North Jersey Local Section of the American Chemical Society (ACS), as well as the 9000-member Division of Analytical Chemistry, and the ACS Committee on International Activities, and received the Award for Distinguished Service in the Advancement of Analytical Chemistry in 2000. His essay in this volume is based in part upon his award address.

Cornelius G. Hunter is a graduate of the University of Michigan where he earned a B.S and M.S. in aerospace engineering and the University of Illinois where he earned a Ph.D. in Biophysics. He is the author of the award-winning *Darwin's God: Evolution and the Problem of Evil* and has recently completed its sequel, *Darwin's Proof: The Triumph of Religion Over Science*. He is currently Senior Scientist at a high-tech research firm and part-time post-doctoral researcher at the University of California at San Diego. Dr. Hunter's research interests include molecular biophysics, computational biology, and optimal estimation and control of nonlinear systems. He is currently developing a new method for describing the three-dimensional protein backbone structure and Bayesian

methods for predicting protein local structure from the corresponding amino acid sequence. He is also investigating long-range signals in protein amino acid sequences and their correlation with tertiary structure. Dr. Hunter's interest in the theory of evolution involves both the scientific, historical, and theological aspects of the theory. His work has helped to expose the scientific weaknesses of evolution. He has shown that popular theological ideas motivated Darwin's development of evolution and that these ideas remain critical in today's defense of the theory.

Phillip E. Johnson is the Jefferson Peyser Emeritus Professor of Law at the University of California at Berkeley. Prof. Johnson is a well-known speaker and writer on the philosophical significance of Darwinism. His books on this topic include *Darwin on Trial*, *Reason in the Balance*, *Defeating Darwinism by Opening Minds*, *The Wedge of Truth*, and *Asking the Right Questions* (all InterVarsity). After completing his law degree at the University of Chicago, Prof. Johnson was a law clerk for Chief Justice Earl Warren of the United States Supreme Court. Prof. Johnson taught law for over thirty years at the University of California at Berkeley. He is the author of two widely used textbooks on criminal law: *Criminal Law: Cases, Materials, and Text*, 6th edition (West Pub., 2000) and *Cases and Materials on Criminal Procedure*, 3rd edition (West Pub., 2000). Prof. Johnson entered the evolution controversy because he found the books defending Darwinism dogmatic and unconvincing. Prof. Johnson is an advisor to Discovery Institute's Center for Science and Culture.

Robert C. Koons is Professor of Philosophy at the University of Texas at Austin. A graduate of Michigan State University, Oxford (B.A. First Class Honours, 1981), and UCLA (Ph.D. in philosophy, 1987), Koons was a Marshall Scholar, Danforth Fellow and a Richard M. Weaver Fellow. He is the author of *Paradoxes of Belief and Strategic Rationality* (Cambridge University Press, 1992), winner of the Gustave Arlt Award in the Humanities, and *Realism Regained: An Exact Theory of Causation, Teleology and the Mind* (Oxford University Press, 2000), as well as articles in such journals as *Mind*, *American Philosophical Quarterly*, and *Philosophical Studies*. He is a Senior Fellow of the Center for Science and Culture of the Discovery Institute, a faculty affiliate of the Intercollegiate Studies Institute, and a member of the American Philosophical Association, the Association for Symbolic Logic, the Society for Exact Philosophy, the National Association of Scholars, and the Society of Christian Philosophers. His research is primarily in the areas of the philosophy of logic and mathematics, metaphysics, epistemology, metaethics, and philosophical theology. He is currently researching problems of mental and teleological causation and related questions in the metaphysics of events, time, substances, and the mind.

Christopher Michael Langan is an independent researcher and reality theorist whose extraordinary intellect has not prevented him from living a rough, unsheltered, and exciting life. Challenged from early childhood with extreme poverty, inadequate schooling, and the responsibility of helping care for his younger siblings, he learned

young to value brawn as highly as brains. After working as a cowboy, firefighter, construction worker, and bar bouncer in various nightclubs across the East End of Long Island, he came to the attention of the media in 1999 for combining one of the world's highest IQs with a bare-knuckled lifestyle and a lack of formal higher education. Having conducted original investigations in fields including mathematics, physics, cosmology, and the cognitive sciences over more than two decades, Christopher has contributed articles on these and other topics to a number of alternative intellectual periodicals and has authored a collection of philosophical essays, *The Art of Knowing*. A fellow of the International Society for Complexity, Information and Design, he recently published an intriguing account of his groundbreaking theory of reality, the Cognitive-Theoretic Model of the Universe, in its journal *Progress in Complexity, Information, and Design*. He is the co-founder and President of a nonprofit organization, the Mega Foundation, established to offer aid, support and camaraderie to the "severely gifted," a small and often-neglected population with whose plight he is intimately acquainted.

Nancy R. Pearcey is a senior fellow of Seattle's Discovery Institute and a free-lance writer. She studied under Francis Schaeffer at L'Abri Fellowship in Switzerland and went on to earn a master's degree from Covenant Theological Seminary, followed by graduate work in history of philosophy at the Institute for Christian Studies in Toronto. She also studied violin at Iowa State University and in Heidelberg, Germany. Mrs. Pearcey has been writing and speaking on the relation between science and the Christian worldview since 1977. In 1991, she became the founding editor of BreakPoint, a daily radio commentary program, and was executive editor of the program for nearly nine years. During the same period, she was policy director and senior fellow of the Wilberforce Forum, and coauthored a monthly column in *Christianity Today*. Pearcey has served as managing editor of the journal *Origins & Design*, an editorial board member for Salem Communications Network, and a commentator on Public Square Radio. Her articles have appeared in *The Washington Times*, *Human Events*, *First Things*, *Books & Culture*, *World*, *The Human Life Review*, *Christianity Today*, and the *Regent University Law Review*. She is coauthor of the books *How Now Shall We Live?* and *The Soul of Science*.

Marcel-Paul Schützenberger (1920-1996) was Professor of the Faculty of Sciences at the University of Paris and a member of the French Academy of Sciences. He was trained as a mathematician and doctor of medicine. In 1966 Schützenberger participated in the Wistar Symposium on mathematical objections to neo-Darwinism. His arguments were subtle and often misunderstood by biologists. Darwin's theory and the interpretation of biological systems as formal objects were, he observed, at odds insofar as randomness is known to degrade meaning in formal contexts. But Schützenberger also argued that Darwin's theory logically required some active principle of coordination between the typographic space of the informational macromolecules (DNA and RNA) and the organic space of living creatures themselves—which Darwin's theory does not provide. In this January 1996 interview with the French science monthly *La Recherche*, here reprinted in English, he pursued these themes anew, finding inspiration for his ideas both in the mathematical ideas that he had pioneered and in the speculative tradition of French

biological thought that stretched from Georges Cuvier to Lucien Cuenot. M.-P. Schützenberger was a man of universal curiosity and great wit; throughout his life he was both joyful and unafraid.

Edward Sisson is a partner at a large Washington D.C.-based international law firm, specializing in litigation arising out of multi-million dollar corporate acquisitions. He also maintains an extensive pro bono practice in the areas of international democracy, human rights, and the arts. Prior to becoming a lawyer, he spent nine years producing experimental avant-garde multi-media music theater performances, based in San Francisco and on tour across the US and Europe. His final production, “Actual Sho,” was chosen by the US State Department to represent the US at major avant-garde festivals in Belgrade, Yugoslavia, and Wroclaw, Poland, in 1987. Before becoming a theater producer he was an apprentice architect. He earned his law degree magna cum laude at Georgetown (1991) and earned his bachelor of science at the Massachusetts Institute of Technology, majoring in environmental design (1977); he also attended Pomona College, majoring in English and Philosophy (1973-75).

Frank J. Tipler is Professor of Mathematical Physics at Tulane University in New Orleans. He is the co-author of the acclaimed book *The Anthropic Cosmological Principle*, about the relationship between cosmology and intelligent life. He does research in two areas of physics: global general relativity, and the physics of computation. Global general relativity deals with the structure of the cosmos on the largest scales, and computation physics is concerned with the limits on computers imposed by the laws of physics. Tipler’s conclusion that there are no ultimate limits to computation (or to the biosphere) is discussed in his book *The Physics of Immortality*, which was on the German best seller list for 15 weeks. Selected by the New York Times as one of the Notable Books of 1994, *The Physics of Immortality* has been translated into four languages in addition to English, and more than 200,000 copies are in print world wide. Tipler was the post-doctoral student of four scholars: Abraham Taub, Ranier Sachs, Dennis Sciama, and John Wheeler. Tipler’s web site, selected by USA Today as a Hot Web Site for the week of May 11, 1998, is: www.math.tulane.edu/faculty_html/tipler.html.