Ten Questions to Ask Your Biology Teacher about Design

By William A. Dembski

Professor Will Provine teaches a course for incoming freshman at Cornell University. In it, he contends that Darwin's theory of evolution makes it impossible to believe in the existence of a benevolent God, much less in the God of Christianity. Provine informs his students that by the end of the course any belief they have in God will be shattered. In fact, he gauges the success of the course by the number of new atheists it produces.

In the foreword to my book *The Design Revolution*, Chuck Colson writes: "For years—far too many years—Darwinian evolution, the prevailing orthodoxy in the academy, faced no meaningful challenges. Those who believed in any other theory of biological origins were dismissed as religious cranks or fools. This is now beginning to change."

Indeed, it is changing. With the rise of the intelligent design movement, the image of a defensive, beleaguered, overwhelmed student desperately trying to shore up religious faith against the onslaughts of an invincible Darwinian establishment is finally giving way. Instead, we now have the image of a confident, clued-in, empowered student shaking up the very professors, like Will Provine, who used to teach atheism for fun and profit. The profit may still be there, but the fun is now gone.

The reason the fun is gone is that more and more students are informing themselves about intelligent design and learning to ask the right questions that deflate Darwinism and its atheistic pretensions. According to arch-Darwinist Richard Dawkins, Darwin made it possible to be an intellectually fulfilled atheist. Not any more. Intelligent design is showing that system after biological system is beyond the reach of blind purposeless material processes like the Darwinian mechanism of natural selection.

What is intelligent design? Intelligent design is the science that studies *signs of intelligence*. So defined, intelligent design seems innocuous enough, and includes such fields as archeology, cryptography, and the search for extraterrestrial intelligence (SETI). Is a chunk of rock really an arrowhead? Is a random looking screed really an encrypted message? Is a radio transmission from distant space really a meaningful communication? Such questions are uncontroversial so long as they focus on signs of intelligence from designing agents that could conceivably have evolved by Darwinian means.

But what about signs of intelligence that cannot reasonably have originated from Darwinian or other materialistic processes? According to Darwinism, intelligence is not a basic creative force within nature but an evolutionary byproduct. In other words, Darwinism regards all intelligence as the product of evolution. In contrast, any intelligence responsible for biological systems could not be an evolved intelligence but must exist prior to the systems for which it is responsible. This explains why intelligent design is so controversial: it claims to discover signs of intelligence in biological systems for which the underlying intelligence is not, and indeed cannot be, an evolved

intelligence. Thus, while not directly proving that God exists, intelligent design is far more friendly to theism than Darwinism.

Intelligent design puts the ball back in Darwinism's court. It's not just that students need no longer feel intimidated by Darwinist bullying. Rather, it's that students are now in a position to challenge the Darwinian establishment head on. Darwinism is like a submarine—allow just one pinhole leak, and it implodes. The pinhole leak here is design. What's more, students now have the tools to probe this leak. To do so effectively, however, they need to know the right questions to ask their biology teachers. What follows are ten such questions, along with some pointers to be aware of when asking them:

1. Design Detection
If nature, or some aspect of it, is intelligently designed, how can we tell?

> For design to be a fruitful concept in the natural sciences, scientists have to be sure they can reliably determine whether something is designed. For instance, Johannes Kepler thought the craters on the moon were intelligently designed by moon dwellers. We now know that the craters were formed by blind material processes (like meteor impacts). This worry of falsely attributing something to design only to have it overturned later has hindered design from entering the scientific mainstream.
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> Proponents of intelligent design argue that they now have formulated a precise criterion that reliably infers intelligence while also avoiding Kepler's mistake—the criterion of "specified complexity." An event exhibits specified complexity if it is *contingent* in the sense of being one of several live possibilities; if it is *complex* in the sense of allowing many alternatives and therefore not being easily repeatable by chance; and if it is *specified* in the sense of exhibiting an independently given pattern. For instance, a repetitive sequence is specified without being complex. A random sequence is complex without being specified. A functional sequence, like DNA that codes for proteins, is both complex and specified, and therefore designed.

2. Generalizing SETI
The search for extraterrestrial intelligence (SETI) is a scientific research program that searches for signs of intelligence from distant space. Should biologists likewise search for signs of intelligence in biological systems? Why or why not?

> Biologists don't have a problem with SETI. As far as they're concerned, looking for signs of intelligence from distant space is a perfectly legitimate scientific enterprise. Nevertheless, many biologists regard it as illegitimate to look for signs of intelligence in biological systems. In their view, any such signs of intelligence are fundamentally misleading because the Darwinian mechanism of natural selection is supposed to be able to mimic the effects of intelligence apart from actual intelligence. As Richard Dawkins puts it, "Biology is the study of

complicated things that give the appearance of having been designed for a purpose." Yes, biological systems *appear* to be designed. But in fact they are not designed, and to look for signs of actual intelligence will only lead biologists astray. Better to look not for signs of intelligence but for how natural selection explains certain apparent signs of intelligence. This is the received wisdom in the biological community. This received wisdom is at best a mistake and at worst a prejudice. It is entirely an open question whether all appearance of design in biology is only an appearance. Proponents of intelligent design argue that signs of actual intelligence are present in biological systems and lie beyond the reach of natural selection.

3. Biology's Information Problem

How do we account for the complex information-rich patterns in biological systems? Where did they originate?

In a widely cited speech, Nobel laureate David Baltimore remarked, "Modern biology is a science of information." Manfred Eigen, Bernd Olaf-Küppers, John Maynard Smith, and many other biologists have likewise identified information as biology's central problem. For matter to be alive, it must be suitably structured. A living organism is not a mere lump of matter. Life is special, and what makes life special is the arrangement of its matter into very specific *forms*. In other words, what makes life special is in*form*ation. Where did the information necessary for life come from? This question cannot be avoided. Life has not always existed. There was a time in the history of the universe when all matter was lifeless. And then life appeared—on earth and perhaps elsewhere. Biology's information problem is therefore to determine whether (and if so how) purely natural forces are able to bridge the gulf between the organic and inorganic worlds as well as the gulfs between different levels of complexity within the organic world. Conversely, biology's information problem is to determine whether (and if so how) design is needed to complement purely natural forces in the origin and subsequent development of life.

4. Molecular Machines

Do any structures in the cell resemble machines designed by humans? How do we account for such structures?

In December 2003, the biology journal *BioEssays* published a special issue on "molecular machines." In the introductory essay to that issue, Adam Wilkins, the editor of *BioEssays*, remarked, "The articles included in this issue demonstrate some striking parallels between artifactual and biological/molecular machines. In the first place, molecular machines, like man-made machines, perform highly specific functions. Second, the macromolecular machine complexes feature multiple parts that interact in distinct and precise ways, with defined inputs and outputs. Third, many of these machines have parts that can be used in other molecular machines (at least, with slight modification), comparable to the interchangeable parts of artificial machines. Finally, and not least, they have the

cardinal attribute of machines: they all convert energy into some form of 'work'." How, then, do biologists explain the origin of such structures? They don't. In 2001, cell biologist Franklin Harold published *The Way of the Cell* with Oxford University Press. In it he remarked: "There are presently no detailed Darwinian accounts of the evolution of any biochemical or cellular system, only a variety of wishful speculations."

5. Irreducible Complexity

What are irreducibly complex systems? Do such systems exist in biology? If so, are those systems evidence for design? If not, why not?

Michael Behe's concept of irreducible complexity raises acute difficulties for Darwinism. Irreducible complexity is a "package-deal" feature of many biological systems. Package deals are all-or-nothing deals. You can have the whole package or you can have none of it, but you can't pick and choose pieces of it. In biology, especially at the molecular level, there exist molecular machines (see last question) that cannot be simplified without losing the machine's function. In other words, take away parts and you can't recover the machine's function. One such irreducibly complex molecular machine that has become the mascot of the intelligent design movement is the bacterial flagellum. This is a tiny motor-driven propeller on the backs of certain bacteria. It is a marvel of nano-engineering, spinning at tens of thousands of rpm. Biologist Howard Berg at Harvard calls it "the most efficient machine in the universe." It is irreducibly complex.

How do evolutionary theorists propose to account for such systems? They have no detailed, testable, step-by-step proposals for how irreducibly complex systems like this might have arisen. All evolutionary theorists have been able to do is note that because systems like the flagellum are irreducibly complex, they must have arisen via a gradual series of simpler systems that served functions *different* from the machine in question (the functions need to be different because to simplify an irreducibly complex system is to destroy its function). But merely appealing to such a gradual series of simpler systems doesn't tell us how, or even whether, irreducibly complex systems evolved, much less by Darwinian or other materialist means. The burden on evolution's defenders is to demonstrate that at least one irreducibly complex molecular machine found in nature really can be formed by some specific, fully articulated series of gradual steps. So far, evolutionary theorists have nothing like this. Wishful speculations is the best they've come up with.

6. Reusable Parts

Human designers reuse designs that work well. Life forms also repeat the use of certain structures (the camera eye, for example). Is this evidence for common descent, evolutionary convergence, common design, or a combination of these?

Within evolutionary biology, there are only two ways to explain similar biological structures. The first is to attribute them to common descent. Thus two organisms

share a structure because they inherited it from a common evolutionary ancestor. The other option is to attribute similar structures to convergence. Thus two organisms share a structure because it evolved more than once (separate evolutionary pathways "converged" on it). By adopting an engineering approach to biological structure, intelligent design explains similar structures in terms of common design. Note that this is not to preclude that a repeated structure arose via an evolutionary process. But in that case it would be a guided evolutionary process and not a blind, purposeless evolutionary process as in Darwinism. Common design, perhaps expressed through evolutionary convergence, accounts for the repetitions of many biological structures (like the camera eye in humans and squids) far better than common descent or blind evolutionary convergence.

7. Reverse Engineering

In trying to understand biological systems, molecular biologists often need to "reverse engineer" them. Is this evidence that the systems were engineered to begin with?

In regular engineering one begins with a plan to construct a machine that serves a given function and then builds the machine according to plan. In reverse engineering, by contrast, one starts with a finished machine and tries to determine what its purpose is and how it was constructed. Scott Minnich, a University of Idaho molecular biologist and prominent proponent of intelligent design, will often remark in his public lectures that the only way for biologists to understand the workings of the cell is to approach its various systems as a reverse engineer. Thus the molecular biologist may take a functioning system in the cell, perturb it, see how the cell behaves differently to infer the system's function. Alternatively, the molecular biologist may interfere at various points in the system's self-assembly to determine how the system is constructed. In all such cases, the molecular biologist acts as an engineer making intelligent interventions and not as a gambler throwing dice. If we need the science of engineering to understand biological systems, then it is a good bet that the systems are themselves designed.

8. Predictions

Do intelligent design theory and neo-Darwinian theory make different predictions? Take, for instance, junk DNA. For which of the two theories would the idea that large stretches of DNA are junk be more plausible?

Neo-Darwinian theory views any two organisms as having evolved from a common evolutionary ancestor and explains the evolution of any organism as the outcome of a blind, purposeless process. As a consequence, evolution is likely to exhibit many false starts, dead-ends, and remnants that serve no purpose (called "vestigial structures"). Intelligent design can accommodate such historical contingencies because it recognizes the operation of natural processes at odds with design (much as a rusted automobile is the effect both of design and natural forces—in this case, mechanical engineering and weathering).

Nonetheless, intelligent design argues that there are features of biological systems that lie beyond the reach of Darwinian and other material mechanisms. Moreover, unlike Darwinism, which sees organisms as cobbled together by a trial-and-error process (i.e., natural selection acting on random variations), intelligent design sees real design in organism and thus keeps looking for design even when evolutionary theorists throw in the towel and invoke vestigiality. Interestingly, most of the structures regarded as vestigial in humans a hundred years ago are now known to have a function (for instance, the appendix plays a role in the immune system). Similarly, molecular biologists are now finding uses for stretches of DNA previous referred to as "junk." John Bodnar, for instance, has found "non-coding DNA in eukaryotic genomes [that] encodes a language which programs organismal growth and development."

9. Following the Evidence

What evidence would convince you that intelligent design is true and neo-Darwinism is false? If no such evidence exists or indeed can exist, how can neo-Darwinism be a testable scientific theory?

The evolutionist J. B. S. Haldane was once asked what would convince him that evolution was false. He replied that finding a rabbit fossil in pre-Cambrian rocks would do quite nicely. Such a fossil would, by standard geological dating, be out of sequence by several hundreds of millions of years. Certainly such a finding, if rigorously confirmed, would overturn the current understanding of the history of life. But would it really overturn neo-Darwinism or confirm intelligent design? It would not. Haldane's rabbit is easily enough explained as an evolutionary convergence. Moreover, for the materialist biologist, no evidence whatsoever could confirm intelligent design.

So long as some unknown or unexplored Darwinian evolutionary pathway might have led to the formation of some biological structure or organism, it is to be preferred over an intelligent design explanation. And since the unknown and unexplored allow for an infinity of loopholes, the committed materialist regards Darwinian and other materialist explanations of life's origin and subsequent development as always trumping intelligent design, regardless of the evidence. Note that intelligent design does not stack the deck this way. In particular, unlike Darwinism, intelligent design is refutable. To refute intelligent design, it is enough to display specific, fully articulated Darwinian pathways for the complex systems that, according to intelligent design, lie beyond the reach of the Darwinian mechanism (systems like the bacterial flagellum in question 5). Though Darwinists mistakenly charge intelligent design with being untestable, it's their theory that in fact is untestable.

10. Identifying the Designer

Can we determine whether an object is designed without identifying or knowing anything about its designer? For instance, can we identify an object as an ancient artifact without knowing anything about the civilization that produced it?

> As the science that studies signs of intelligence, intelligent design investigates the effects of intelligence and not intelligence as such. A sign, after all, is not the thing signified. Intelligent design does not try to get into the mind of a designer or speculate about the characteristics of a designer. Its focus is not on the identity of a designer (the thing signified) but on the artifacts due to a designer (the sign). A designer's identity and characteristics are, to be sure, interesting questions, and one may be able to infer something about what a designer is like from the designed objects that a designer produces. But the identity and characteristics of a designer lie outside the scope of intelligent design.
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> That's as it should be. The fact is that we infer design repeatedly and reliably without knowing anything about the underlying designer. Some biologists, before they permit intelligent design into biology, require getting into the mind of the designer and knowing what sorts of biological systems we should expect from the designer. But, as Stanford philosopher of biology Elliott Sober admits, "To infer watchmaker from watch, you needn't know exactly what the watchmaker had in mind; indeed, you don't even have to know that the watch is a device for measuring time. Archaeologists sometimes unearth tools of unknown function, but still reasonably draw the inference that these things are, in fact, *tools*."

Phillip Johnson has written an insightful book titled *The Right Questions: Truth, Meaning and Public Debate*. In that book he shows that truth is best served not by having all the answers but by knowing the right questions, especially the tough questions suppressed by the intellectual elite of our society. In particular, truth demands that we ask the tough questions about Darwin and evolution. As Richard Halvorson has aptly remarked, "We must refuse to bow to our culture's false idols. Science will not benefit from canonizing Darwin or making evolution an article of secular faith. We must reject intellectual excommunication as a valid form of dealing with criticism: the most important question for any society to ask is the one that is forbidden." Intelligent design doesn't have all the answers. But it is asking the right questions—questions forbidden by the Darwinian establishment. For a more thorough examination of the questions posed here, as well as many others, consult my new book *The Design Revolution: Answering the Toughest Questions about Intelligent Design* (InterVarsity, 2004).

Original article can be found at The Design Inference website.