

# **APPENDIX II**

## **TAB D**

# Rebuttal Analysis of Kevin Padian's Statement

by

Michael J. Behe

Professor of Biological Sciences

Lehigh University

Bethlehem, Pennsylvania

May 15, 2005

## 1 The absolutely critical role of natural selection, the supposed mechanism of Darwinian evolution

It is my strong scientific opinion that in this dispute **we must strive to make it abundantly clear that the critical scientific argument concerns Darwin's proposed MECHANISM of evolution: that is, random mutation and natural selection.** The pivotal question is, has Darwin's unintelligent mechanism been *demonstrated* to be sufficient to explain all of the complexity of life (which, as I wrote in my expert testimony, biologists admit gives the strong appearance of intelligent design), or is there legitimate room for skepticism? If there is room for skepticism, then it is valid — indeed, it is good teaching practice — to point out to students the uncertainties surrounding Darwin's theory.

A very important corollary is that this dispute is *not* about common descent. Non-Darwinian mechanisms for the production of life, such as complexity theory, may be compatible with common descent. Indeed, it is entirely possible that an intelligent agent may have decided to employ common descent in the production of life. The focus of the argument should be on whether or not Darwin's unintelligent mechanism of random mutation and natural selection has *already* been shown to be able to produce all of the complexity of life. If it hasn't, then the question of what did cause the apparent design of life remains open, and intelligent design is a possible answer. That is the crucial scientific and pedagogical question.

### 1.1 Paleontology does not tell us the mechanism of evolution

It is critical to point out that Professor Padian's scientific discipline of paleontology does not, and cannot, tell us what is the mechanism of evolution — what mechanism produced the changes we see in fossil organisms. At best, the evidence of paleontology will be consistent with a proposed mechanism. But many proposed mechanisms may be consistent with the fossil record, so mere fossils cannot show that a proposed mechanism is correct. Since that is indeed the case (see below), then the mechanism of evolution remains substantially unknown, and the possibility of intelligent design or other non-Darwinian mechanisms has not been ruled out. If Professor Padian himself admits the fossil record does not show the mechanism of evolution then, since he is an evolutionary expert on the fossil record, the point will be established. And in fact Padian explicitly admits as much in his written statement.

#### 1.1.1 One example of this

#### 1.1.2 Molecular data "say nothing about the relationships ... of fossil organisms to each other"

On page 2 he writes, "Molecular systematics can say nothing about the relationships or roles of fossil organisms to each other, or to living lineages." He gives an example of hippos and whales, which molecular data show "are each other's closest relatives (Boisserie et al, 2005)". Padian asserts that because of this data "some authors have suggested ... their

common ancestors would have been aquatic.” Yet, he says, that is wrong. He writes that fossil data show “the first hippos were terrestrial, not amphibious.... Therefore, hippos and whales, even if they are each other’s closest relatives among living animals, did not have a common ancestor that lived in the water, but was terrestrial.”

Now, here is the point. Some researchers speculated from molecular data that hippos and whales shared an aquatic ancestor, yet they didn’t. Fossil data indicate they shared a land-based ancestor. That means that the molecular data apparently are compatible with the animals developing in entirely different ways, from either an aquatic or terrestrial ancestor. Since the data are compatible with either, that means the molecular data *can’t tell why* hippos and whales developed the way they did from a common ancestor. That is, it can’t tell us *how* natural selection could have produced whales and hippos. And that means it also can’t tell us *whether* natural selection did so. If it can’t tell us that, then it can’t tell what drove the development of whales and hippos from a common ancestor (and, by extrapolation, the development of virtually any organism in the distant past). That means the Darwinian mechanism of evolution — random mutation and natural selection — is at best speculative. In turn, that means that the question is not settled, and that, along with other mechanisms, intelligent design is a possibility. Students should be allowed to know this is the case.

### 1.1.3 Fossil data cannot show the mechanism of natural selection either

Well, if molecular data can’t establish whether natural selection drove the development of creatures such as whales and hippos, how about fossil data? After all, Padian says it was fossil data that showed the ancestor of whales and hippos to be terrestrial. However, Padian explicitly says it cannot. While discussing Darwin’s book, *The Origin of Species*, Padian writes, “His main concern, however, was with the mechanism of natural selection, **which cannot be observed directly in the fossil record....**” [my emphasis] Yet if natural selection can’t be observed in the fossil record, and if molecular data can’t tell us how natural selection could have worked, *then we don’t have any direct evidence showing that natural selection was involved in producing what we find in the fossil record.* In other words, the contention that natural selection drove the development of whales and hippos (and by extrapolation the development of other organisms in the distant past) is simply an assumption; it is not a conclusion based on either the molecular or fossil data.

This point should be strongly emphasized: there are no data that *even in principle* can show what caused changes in organisms in the distant past, whether those changes were caused by random mutation and natural selection, an intelligent cause, self-organization, or other mechanisms. Neither the fossil record nor molecular data can show this, as Padian’s own statements show. Therefore, the claim that Darwin’s mechanism of random mutation and natural selection is the cause of the development of life is speculative at best.

## 1.2 Padian’s characterization of Darwin’s views

Padian explicitly says that:

Darwin was not talking about how major new adaptive changes took place; he was talking about how minor variations could be selected... He was really talking about the “baby steps” of evolution.... He made only the most passing references to how new major adaptive types might emerge....

In other words Darwin himself, says Padian, was concerned only with showing that natural selection could explain minor evolutionary changes. *Yet intelligent design proponents do not dispute that.* The disagreement between Darwinists, ID proponents, and other skeptics of Darwinism such as complexity theorists, is exactly over the “major adaptive types” — how were they produced? Were they simply the sum of minor steps, or did they require other mechanisms? Padian states that Darwin *assumed* that the baby steps would add up to major changes (“though he was convinced that would happen in the course of time...”). However, *an assumption is not evidence, let alone proof.*

## 2 Padian on the fossil record

On page 3 of his expert report Padian writes “The fossil record provides strong support for evolution, and it has since the mid-1800s.” It is my opinion that this point of Padian’s is irrelevant. Once again, as I emphasized here and in my own expert report, it is critical to make clear that intelligent design theory itself has no proper quarrel with the simple fact of “evolution”, understood merely as change over time and common descent, as seen in the fossil record. Rather, intelligent design theory questions only Darwin’s unintelligent *mechanism* of random mutation and natural selection. The critical question for Padian is whether the fossil record provides strong support for random mutation and natural selection as the driving force for major adaptive types. Padian has already frankly admitted that it does not, as quoted above. His admission should be strongly emphasized, to the point of jumping up and down, because that is precisely our point — that the fossil record does not show the mechanism of evolution. The mechanism is simply assumed to be correct by Darwinists based on severely limited data with modern organisms and then extrapolated over vast distances of time. But an assumption is not evidence, let alone proof. Reasonable people can question whether that extrapolation is valid, question whether the unintelligent mechanism of random mutation and natural selection is indeed sufficient.

I think it is likely that other participants in this case will not have made the distinction between “evolution” and the “mechanism of evolution” in their own minds. They may be surprised and impressed to hear a distinguished paleontologist admit that the fossil record does not show the mechanism of evolution, and see the reasonableness of keeping an open mind on the matter.

### 2.1 Details of the fossil record

On pages 10-11 Padian talks about many examples from the fossil record. For all these he should be asked, can we tell what drove any of the changes in the fossil record? Does the fossil record show that natural selection was the mechanism? (He must answer no, in accord with his earlier testimony.)

On page 11, while discussing new whale fossils that have been found in the past decade, he writes, "This brings up the dangers of teaching IDC as if it were scientific; if you rest your case on a lack of evidence ... " But that's a problem for all of science — new evidence can upset old ideas. It was new evidence that led to the conclusion that the ancestor of whales and hippos was a terrestrial rather than an aquatic mammal. It was new evidence that led to the conclusion that the protein secretory Type III apparatus was derived from the flagellum rather than the reverse, as Padian claimed (see my discussion below). New evidence can upset any scientific claims.

On punctuated equilibrium (page 13) — does the fossil record show that natural selection or other unintelligent processes are responsible for the punctuated pattern seen in some of the fossil record? (Padian must answer no, since he has averred that natural selection cannot be seen in the fossil record.)

### 3 Padian on the effect of teaching intelligent design theory

On page 4 Professor Padian writes that "If IDC were presented in science classes as if it were science, (1) students would completely misapprehend the structure and logic of science." It is my opinion that this is unfortunate, inflammatory rhetoric. Here is an example to show he is wrong in his rhetoric. Following from my discussion above, it would be interesting to ask Padian something like the following: If in discussing the difficulties with Darwinism [which, I understand, is what Dover policy seeks to do; it does not seek to discuss ID] students were asked to discuss whether the fossil record demonstrates Darwin's mechanism of natural selection, would that help them correctly apprehend the structure and logic of science? Again, based on his expert statement, Padian would have to answer yes. I think this should be very strongly stressed. This one admission at a stroke establishes the principle that Darwinism has a difficulty: its mechanism cannot be established by the fossil record, as Kevin Padian himself admits. And it shows that students would better understand science if they knew of this difficulty for Darwinism.

In this section, Padian continues bombastically: "(2) their understanding of evolutionary biology would be deficient and misinformed." He should be asked whether having students discuss the question of whether or not the fossil record demonstrates Darwin's mechanism of natural selection would help alleviate any deficiency and misinformation about evolutionary biology. He continues, "(3) taxpayer dollars would be wasted." In the same vein, he should be asked: Are taxpayer dollars well spent in helping students understand that the fossil record does not show Darwin's mechanism of natural selection?

## 4 Padian on Irreducible Complexity

Padian begins on page 4, “‘Irreducible complexity’ is a very old idea, dating back at least to the father of ‘Natural Theology’, William Paley, and English theologian of the late 18<sup>th</sup> Century.” It should be pointed out that old ideas are not necessarily incorrect. For example the ancient Greeks developed geometry and the concept of democracy, both of which continue to be useful. The question is not whether an idea is older or newer; the pertinent matter is whether an idea may be correct.

### 4.1 His mischaracterization of the concept

It is apparent from his expert report that Padian does not understand the concept of irreducible complexity as I wrote about it in *Darwin’s Black Box*. He is using the term in ways I did not intend and is caricaturing it. As a practical matter, I don’t know how easy it would be to get these topics explained in court and understood by laypeople, so that they could see the difficulty. However, it would be good to emphasize whenever possible that everything in this case turns on definitions of words. I have shown in my own expert report that the word “evolution” can mean a number of things, and that the only sense of the word which ID disputes is Darwin’s proposed unintelligent mechanism of natural selection. I also showed that the word “theory” is used in many senses, both in scientific and common usage.

Well, the same is true of the term “irreducible complexity.” The definition of the term is critical. In *Darwin’s Black Box* I defined irreducible complexity in the following way:

By irreducibly complex I mean a single system which is composed of several well-matched, interacting parts that contribute to the basic function, and where the removal of any one of the parts causes the system to effectively cease functioning. An irreducibly complex system cannot be produced directly (that is, by continuously improving the initial function, which continues to work by the same mechanism) by slight, successive modifications of a precursor system, because any precursor to an irreducibly complex system that is missing a part is by definition nonfunctional.<sup>1</sup>

Padian writes that “one cannot simply excise the organs from a living organism and expect it to function, because experimental mutilation does not simulate an ancestral state.” With inflammatory language (“mutilation”) Padian is mischaracterizing the concept of irreducible complexity. I strongly emphasized in *Darwin’s Black Box* that the concept could only be applied at the molecular level of biology.

Biochemistry has demonstrated that any biological apparatus involving more than one cell, such as an organ or a tissue, is necessarily an intricate web of many different, identifiable systems of horrendous complexity. The ‘simplest,’ self-sufficient, replicating cell has the capacity to produce thousands of different proteins and other molecules, at different times and under variable conditions. Synthesis, degradation, energy generation, replication, maintenance of cell architecture, mobility, regulation, repair, communication—all of these functions take place in virtually every cell, and each function itself requires the interaction of numerous parts. Because each cell is such an interwoven meshwork of systems, we would be repeating the mistake of Francis Hitching by asking if multicellular structures could have evolved, step-by-step, in Darwinian fashion. That would be like asking not whether a bicycle could evolve into a motorcycle, but whether a bicycle factory could

evolve into a motorcycle factory! Evolution does not take place on the factory level; it takes place on the nut and bolt level.<sup>2</sup>

I specifically rebutted the misapplication of the concept of irreducible complexity to whole animals and organs in an article in the journal *Biology and Philosophy*.<sup>3</sup>

In his example Orr has not adhered to the concept of irreducible complexity as I defined it. First, my definition requires that one consider “a single system.” Whole organs, such as lungs or swim bladders, are not “single systems.” Indeed, lung tissue contains many of the separate, irreducibly complex systems I described in *Darwin's Black Box*: cilia; intracellular transport systems; blood clotting proteins; and so on. If the origins of those molecular systems are currently unexplained, then systems built on them (such as cells or organs) are unexplained as well. In my book I strongly emphasized that one has to examine biological systems at the molecular level to determine if they were likely produced by Darwinian processes or not. The reason is that whole cells and organs contain so many active, unknown components—a typical cell contains thousands of specific, separate macromolecules, most acting, both separately and together, in unknown ways—that one is dealing with a “black box” whose capacities are substantially obscure.<sup>4</sup>

Padian's use of the concept at the level of the whole organism is inappropriate, inflammatory, and misleading, and shows that he is either unable or unwilling to make proper distinctions.

#### 4.2 Padian and Richard Dawkins disagree on the domain of irreducible complexity

Padian writes that “The notion of ‘irreducible complexity’ may work for manmade devices such as watches, but it has never been established as a biological concept.” So therefore he thinks the notion is indeed legitimate in nonbiological circumstances. It is worth noting that the prominent Darwinian advocate Oxford biologist Richard Dawkins disagrees with Padian — he thinks the notion is legitimate for biology, at least as a reason for explaining why some biological features don't occur. In his recent book *The Ancestor's Tale* Dawkins writes:

It is perfectly legitimate to propose the argument from irreducible complexity as a possible explanation for the lack of something that doesn't exist, as I did for the absence of wheeled mammals.

Dawkins even thinks irreducible complexity is a legitimate concept for space aliens to use when investigating the biology they may find on earth:

Nevertheless, to be fair, it is possible to imagine validly using some version of the argument from design, or the argument from irreducible complexity. Future visitors from outer space ... may face some tricky judgements in the messy overlap between natural evolution and human design. ... Francis Crick, no less, has speculated semi-seriously in *Life Itself* that bacteria may not have originated on this planet but been seeded from elsewhere. ... Given that the illusion of design conjured by Darwinian natural selection is so powerful, how do we, in practice, distinguish its products from deliberately designed artefacts? ... Could there be genuinely persuasive examples of irreducible complexity in nature: complex organisation made of many parts, the loss of any one of which would be fatal to the whole? If so, might this suggest genuine design by a superior intelligence, say from an older and more highly evolved civilisation on another planet?<sup>5</sup>

Dawkins then argues that the flagellum is not irreducibly complex, which I have disputed in a published article.<sup>6</sup> Nonetheless, it is very interesting to note that Dawkins and Padian disagree among themselves over the extent of the applicability concept of irreducible complexity. Thus irreducible complexity is a matter over which reasonable people may disagree. Therefore, if one is not committed to a Darwinian view of life and dismisses design out of hand, as Richard Dawkins does, it seems legitimate to ask if the concept can be extended to current biology, and ask whether any features of the molecular machinery of the cell are irreducibly complex.

#### 4.3 Padian on the bacterial flagellum

On page 5 Padian writes, “the function of the flagella [which are missing a number of components] in these bacteria is no longer in propulsion, but in protein secretion.” He’s speaking of something called a type III secretory system. Padian goes on to say,

The reasonable conclusion is that the structures we call flagella at first served the secretory purpose (and before this, perhaps other purposes), and only later changed behaviorally and structurally to work in propulsion.

However, a number of researchers who work on the flagellum have concluded that the flagellum came first, and that the type III secretory system was later derived from it.<sup>7</sup> Nguyen et al (2000) say bluntly, “We suggest that the flagellar apparatus was the evolutionary precursor of Type III protein secretion systems.” **Thus Padian’s “reasonable conclusion” is the EXACT OPPOSITE of what some researchers in the field think!** Padian’s mistake illustrates a severe weakness of Darwin’s theory: If Darwin’s theory is compatible with a conclusion and its opposite, then Darwin’s theory is of little use on the topic except for airy speculations that may or may not turn out to be correct.

Padian’s remarks here exemplify the criticism that many skeptics level at Darwinian theory — it can be used to justify virtually any result, even incorrect results, even mutually exclusive results, even results which are the opposite of each other. It would be very useful, I think, for students to learn of the plasticity of Darwinian theory. Writing of the flagellum and type III secretory system, Saire remarked:

It is often not possible to prove directionality of an evolutionary process. ... At present, too little information is available to distinguish between these possibilities with certainty. As is often true in evaluating evolutionary arguments, the investigator must rely on logical deduction and intuition. According to my own intuition and the arguments discussed above, I prefer pathway 2 [for the type III system deriving from the flagellum]. What’s your opinion?<sup>8</sup>

#### 4.4 “Reasonable conclusion” is actually raw speculation

It might be good to ask Professor Padian a series of questions, the purpose of which is to show that he is speculating, that the scientific community doesn’t know how the flagellum or

any other complex molecular machine was in fact produced, and that Darwinian theory is compatible with virtually any speculation, and is prone to just-so stories. For example:

- It is now thought that the secretory system was derived from the flagellum, not vice versa as you stated. You don't cite any scientific sources in your expert statement on this topic. What was the basis for your opinion that "the reasonable conclusion is that the structures we call flagella at first served the secretory purpose"? Did you not read the contrary opinions?
- Since "the reasonable conclusion ... that the structures we call flagella at first served the secretory purpose" seems incorrect, does that mean that reasonableness is not a reliable guide to evolutionary processes?
- Was it a "reasonable conclusion" for scientists to claim that whales and hippos had an aquatic ancestor (which also was incorrect)?
- You wrote that the flagellum, before protein secretion, perhaps served other purposes. Is that also a "reasonable conclusion"? Might that reasonable conclusion also be wrong?
- Do you have any other basis for your opinions on the flagellum other than their claimed reasonableness?
- You wrote that the flagellum only later changed behaviorally and structurally to work in propulsion. Is that also a "reasonable conclusion"? Might that reasonable conclusion also be wrong?
- It seems that "reasonableness" is compatible with incorrect conclusions. Is there actually any experimental evidence to show that the bacterial flagellum could develop by unintelligent processes?
- Is there any evidence, besides your personal feeling that it's a "reasonable conclusion" to think that the bacterial flagellum evolved by random mutation and natural selection?"
- What fraction of our knowledge about the evolution of, say, the cell, is based on "reasonable conclusions"?
- Is it a "reasonable conclusion" that the bacterial flagellum is not irreducibly complex?
- Is it a "reasonable conclusion" that it arose by random mutation and natural selection?
- Is it a "reasonable conclusion" that unintelligent processes account for the development of life?
- Can a skeptical person legitimately doubt that evolutionary claims that are merely "reasonable conclusions" in fact are correct?
- Can people disagree about what is a "reasonable" conclusion?
- Can other people have a different opinion about what is a "reasonable conclusion" than you do?
- Can people take into account past examples of "reasonable conclusions" which turned out to be wrong when deciding what credence to place in current evolutionary claims?
- Should students be taught which evolutionary claims are merely "reasonable conclusions"?
- Should students be taught what assumptions determine whether a conclusion in

- evolution is reasonable?
- Should students be taught that reasonable conclusions can be wrong?
  - Should students be taught specific examples of conclusions that were thought to be reasonable, but which turned out to be wrong?
  - Would it benefit students' science education to be shown that Darwinian theory is compatible with incorrect conclusions?
  - etc., etc.

#### 4.5 On specified complexity

On page 7 Padian writes that "Every slight genetic and phenotypic modification to an organism can be preserved by natural selection and other mechanisms." However, earlier he said explicitly that natural selection cannot be seen in the fossil record. So the question is, how does he know this? Is it a "reasonable conclusion", like other "reasonable conclusions" that turned out to be incorrect? He says that "every slight modification" can be preserved by natural selection. Does that include modifications that are deleterious — harmful? Of course not. Padian was just writing carelessly. However, if natural selection preserves only beneficial mutations, then the question becomes, how common are beneficial mutations? And how common are beneficial mutations which build consecutively upon each other? And how common are beneficial mutations that form a series leading to a new structure like the bacterial flagellum? Whatever he answers, he should be asked, how does he know this? How does he know that there exists a long path of beneficial mutations, unbroken by the occurrence of harmful mutations, leading to complex structures. Is his answer a "reasonable conclusion" or is there experimental evidence demonstrating this?

Does Padian know that there are gradual pathways accessible to natural selection that could lead to any function at all? (As I show in Exhibit 11 of my expert report, Barry Hall has shown that some enzymes that destroy antibiotics cannot evolve to deal with some newer antibiotics.) If not, then how does he know that the pathways leading to what we find in nature were traversed by natural selection? Is it merely a "reasonable conclusion" to think so?

In fact, his declaration is nothing but assumption and speculation, a reiteration of the way Darwinian theory thinks the world should work. It is not evidence, let alone proof.

#### 5 Falsifiability

On the top of page 5 Padian writes that "it is impossible to test this notion [of irreducible complexity]." In the very next paragraph, he writes that some bacteria contain fewer flagellar components than other bacteria, "thereby falsifying Behe's claim." In other words, he is asserting two contradictory claims: 1) irreducible complexity can't be tested; and 2) it has been falsified. But if it can't be tested, it can't be falsified! Therefore, either Kevin Padian can't think straight on the issue of testability/falsifiability, or he is willing to use any

convenient stick to beat intelligent design.

Padian writes on page 7 that “the fossil record falsifies the notion of ‘specified complexity’...” So does that mean the idea of specified complexity is falsifiable and testable? (Yes, it must.) He writes “complex structures and their functions DO evolve, step by step...” Does the fossil record show that they evolve by the unintelligent process of random mutation and natural selection? (Padian has already written that the fossil record cannot show natural selection.) Is Padian’s idea that natural selection leads to “complex structures and their functions” a “reasonable conclusion” that could be false, like his other “reasonable conclusion”? In fact, Padian is again speculating, and reiterating his preference for Darwin’s theory.

Padian categorically asserts on page 14,

there is no way that IDC proponents will accept that their Intelligent Designer cannot exist; this premise is their central *raison d’être* and cannot be negated, or they lose their whole argument.

I am a living example that Padian is wrong. In fact I used to think Darwinian evolution was correct, but changed my mind based on scientific considerations. I used to hold views quite similar to those of Kenneth Miller, a Catholic biologist who is an expert witness for the plaintiffs. If I was convinced that the scientific evidence showed me to be wrong, I could quite happily switch back to a Miller-like view. However, I disagree with Padian about what the scientific evidence shows.

Padian blusters, “Nothing would make IDC proponents reject their propositions; they are matters of faith, not science.” On the contrary, I have written in an article in the philosophy of science journal *Biology and Philosophy* that

*In fact, intelligent design is open to direct experimental rebuttal. Here is a thought experiment that makes the point clear. In Darwin’s Black Box I claimed that the bacterial flagellum was irreducibly complex and so required deliberate intelligent design. The flip side of this claim is that the flagellum can’t be produced by natural selection acting on random mutation, or any other unintelligent process. To falsify such a claim, a scientist could go into the laboratory, place a bacterial species lacking a flagellum under some selective pressure (for mobility, say), grow it for ten thousand generations, and see if a flagellum—or any equally complex system—was produced. If that happened, my claims would be neatly disproven.<sup>9</sup>*

I went on to say that the situation on falsifiability is exactly the opposite of what Padian claims — intelligent design is wide open to falsification, but Darwinism is not:

Let’s turn the tables and ask, how could one falsify a claim that a particular biochemical system was produced by Darwinian processes? (Coyne’s remarks about a Precambrian fossil hominid are beside the point since I dispute the mechanism of natural selection, not common descent. I would no more expect to find a fossil hominid out of sequence than he would.) Kenneth Miller announced an “acid test” for the ability of natural selection to produce irreducible complexity. He then decided that the test had been passed, and unhesitatingly proclaimed intelligent design to be falsified (“Behe is wrong”; Miller 1999, p. 147). But if, as it certainly seems to me, *E. coli* actually fails the lactose-system “acid test,” would Miller consider Darwinism to be falsified? Almost certainly not. He would

surely say that the experiment started with the wrong bacterial species, used the wrong selective pressure, and so on. Leave aside the question of whether that is a legitimate response or not. The point here is that ID could potentially be falsified by the results of a single series of rather straightforward experiments, such as Barry Hall conducted. (Hall 1982, 1999) Darwinian evolution can't....

I think Professor Coyne and the National Academy of Sciences have it exactly backwards. A strong point of intelligent design is its vulnerability to falsification.<sup>10</sup> A weak point of Darwinian theory is its resistance to falsification. What experimental evidence could possibly be found that would falsify the contention that complex molecular machines evolved by a Darwinian mechanism? I can think of none.

That would be a good question to ask Padian: What experiment would falsify his belief that Darwinian mechanisms are responsible for the changes in the fossil record, or that natural selection built the bacterial flagellum? (Remember, he says the fossil record doesn't show natural selection, and that some evolutionary predictions have turned out opposite to what was first thought.)

## 6 Miscellany

On page 6-7 Padian asserts that William Dembski "has never subjected his full view of 'specified complexity' to peer review." However, Dembski's book *The Design Inference*, in which he speaks of specified complexity was published by an academic publisher, Cambridge University Press, and was indeed subjected to thorough peer review.

On page 8 Padian identifies Phillip Johnson as "a founder of the Center for the Renewal of Science and Culture." Although he is a senior advisor to the center, he is not a founder of the center.

Signed: \_\_\_\_\_ Date: \_\_\_\_\_

was first thought.)

## 6 Miscellany

On page 6-7 Padian asserts that William Dembski "has never subjected his full view of 'specified complexity' to peer review." However, Dembski's book *The Design Inference*, in which he speaks of specified complexity was published by an academic publisher, Cambridge University Press, and was indeed subjected to thorough peer review.

On page 8 Padian identifies Phillip Johnson as "a founder of the Center for the Renewal of Science and Culture." Although he is a senior advisor to the center, he is not a founder of the center.

Signed: Michael J. Beale

Date: May 15, 2005

## ENDNOTES

1. Behe, M.J. 1996. *Darwin's black box :the biochemical challenge to evolution*. The Free Press: New York, p. 39.
2. Behe 1996, pp. 46-48.
3. Behe, M.J. 2001. Reply to my critics: A response to reviews of *Darwin's Black Box: the biochemical challenge to evolution*. *Biology and Philosophy* **16**:685-709.
4. As an aside, ordinary mechanical contraptions such as a mousetrap or a clock don't have to be examined at the molecular level because the parts are not themselves complex assemblages of active components, as are cells. However, more sophisticated artificial devices, such as computers, may indeed have to be examined at the molecular—or at least microscopic—level to determine if they are irreducibly complex.
5. Dawkins, R. 2004. *The ancestor's tale: a pilgrimage to the dawn of evolution*. Houghton Mifflin: Boston, pp. 549-550.
6. Behe, M.J. 2004. Irreducible Complexity: Obstacle to Darwinian Evolution. In *Debating Design: from Darwin to DNA*. (eds. WA Dembski and M Ruse), pp 352-370. Cambridge University Press: Cambridge.
7. Macnab,R.M. 1999. The Bacterial Flagellum: Reversible Rotary Propellor and Type III Export Apparatus. *J. Bacteriol.* **181**:7149-7153.; Nguyen,L., Paulsen,I.T., Tchieu,J., Hueck,C.J., and Saier,M.H., Jr. 2000. Phylogenetic analyses of the constituents of Type III protein secretion systems. *J. Mol. Microbiol. Biotechnol.* **2**:125-144; Galan,J.E. and Collmer,A. 1999. Type III secretion machines: bacterial devices for protein delivery into host cells. *Science* **284**:1322-1328; Saier,M.H., Jr. 2004. Evolution of bacterial type III protein secretion systems. *Trends Microbiol.* **12**:113-115.
8. Saier, M.H., Jr. 2004. Evolution of bacterial type III protein secretion systems. *Trends Microbiol.* **12**:113-115.
9. Behe 2001.
10. Indeed, some of my religious critics dislike intelligent design theory precisely because they worry that it will be falsified, and thus religion will appear to suffer another blow from science. See, for example, Flietstra, R. A response to Michael Behe. *Books & Culture* [Sept/Oct], 37-38. 1998 and Oakes, E.T. 2001. "Newman, Yes; Paley, No", *First Things* 48-52.