

Behe interview transcript

David Marshall

In late July, I interviewed “maverick” biologist Michael Behe by phone, at his office at Lehigh University. Behe is the author of Darwin’s Black Box (Free Press, 1996), which National Review named one of the 100 most important books of the 20th Century. In that book, Behe first described what he called “irreducibly complex” machinery in the cell, which he argued was inaccessible to unguided evolutionary mechanisms. In June, Behe’s follow-up book, The Edge of Evolution (Free Press, 2007) was published. Taking pathogens that cause malaria and HIV as his prime examples, Behe tries to delineate the limits of naturalistic evolution, arguing that mutations can create even the simplest new cellular mechanisms very rarely, and therefore do not explain the development of life in general.

Like many Christians, I have mixed feelings about these arguments. Behe is undoubtedly an interesting thinker, his descriptions of the cell are often marvelous, and it does seem intuitively hard to believe that the biological complexity he and others describe arose through natural mechanisms. Still, his arguments seem to have been soundly rejected by most of his colleagues. Evolutionary biologists Richard Dawkins, Sean Carroll, Kenneth Miller, and Jerry Coyne are among those who have panned his new book. And why would God go to the trouble of specially designing pathogens that prematurely kill millions of people? Dr. Behe kindly agreed to field my questions.

In 1996, you published *Darwin’s Black Box*, which was quite a hit. Why did it take 11 years (for) an encore?

“I wanted to have something new to advance the argument. The book DBB pointed out the basic problem: that there are complex machines in the cell, which I

call irreducibly complex, which are very difficult to approach in a gradual manner.”

Can you define the term “Irreducibly Complex?”

“Irreducibly Complex simply means you have a system, a machine, that consists of a number of different components. And all of the components are needed for the function of the system. That is, you take away one of the components, and the system loses its function. “

There has been quite a bit of controversy over your definition of Irreducibly Complex.

“Yeah. In my opinion, a lot of people try to nit-pick – are hoping that if they find a verbal opening or something then they don’t have to worry about the actual problem anymore.”

By a lot of people you mean Kenneth Miller?

“Well, yeah, he’s certainly one of the main guys. But it’s also the case with other Darwinian scientists. There have been papers published in scientific journals in the past five years or so which have been ballyhooed as, here’s the answer to Irreducible Complexity, which in my estimation are either trivial or miss the point. Nonetheless they have been greeted with editorials in the journals, stories in the *New York Times*, and so on about how cool they are. Other people want to be rid of this thing, too.”

Let’s talk about one of those instances. The centerpiece of *Darwin’s Black Box* was the bacterial flagellum. This is a little outboard motor made up of, I think,

forty different proteins?

“Yeah, roughly.”

And you argued that the complexity of the system made it Irreducibly Complex, that it couldn't have evolved in one giant step by normal evolutionary pathways. In response, people like Kenneth Miller and others have pointed to the Type Three Secretory System, which pumps toxins into a bacteria's victims, made up of about ten proteins, apparently.

“Right.”

Miller and some of his colleagues argue that this disproves your claim that the flagellum is Irreducibly Complex. You've responded that Miller misrepresents your idea of Irreducible Complexity.

“Yeah, that's right. It's been disappointing to me, because I see people trying to play word games, rather than to attend to the problem. As I said in defining Irreducible Complexity, I said that the components are all needed for the function of the system. And the function of the flagellum is to act as this outboard motor. If you remove parts of it, it doesn't anymore act as an outboard motor. Some subset of it can do other things, which, I should point out, Darwinists neither knew about nor predicted when *Darwin's Black Box* was written. So subsequent to *Darwin's Black Box* being written, it's been found out that the flagellum is even more complex than was known at that time. And in what I regard as an impressive display of chutzpah, they take this increased complexity as somehow arguing that it's now going to be easier for it to evolve by a random process.

“The big problem is that the function of pumping protein that the Type Three

Secretory System (TTSS) has nothing in particular to do with the function of acting as a rotary motor. If they had discovered that those ten proteins had acted as an antenna, say, for some photosynthetic system, you know, what would that have to do with being a rotary motor?”

That may be so, but wouldn't you admit that finding a complex of ten proteins that could fit into that system would at least make the evolution of the bacteria flagellum a little easier? I mean, if you find three more complexes of the same size, you just have four parts to snap together instead of forty?

“No, I disagree. Because, again, it doesn't even start to explain the function of the bacteria flagellum itself. It's like saying, wow, let's see, you're trying to explain your car. And you start by saying, you know, it needs the wheels, and it needs the steering wheel, and it needs the chaise. And then later on you discover it's got an engine, and somebody points out that lawnmowers have engines, too. Would that make the explanation of how a car can be put together any easier? I would submit that it wouldn't. The original problem of just getting wheels and a steering wheel has just been exacerbated by your knowledge that it requires an engine too, and that the engine you are thinking about is not the same size, does not fit the job you are contemplating for it, and so does not help you.”

Are you saying that the ten proteins that go into the TTSS were not part of the original forty that you had discussed in *Darwin's Black Box*?

“Well, uh, there actually are differences between the TTSS proteins and the flagellar proteins. But leave that aside, it can be that those are part of the flagellum. Let me point out that the observation of that doesn't say where the TTSS came from. It doesn't say how it got it's ability. It doesn't say how it could be modified into becoming a flagellum. It doesn't say how the other parts of the

flagellum come from. And as a matter of fact, it says a total of nothing about the Darwinian evolution of such things.”

But doesn't it at least give you one little stone in the middle of the pond?

“I do not think so. The problem with Darwinists, in my view, is that they see things in nature, and they automatically try to connect them into their framework. But if you look at it skeptically, as I do, they're not doing anything other than observing things in nature. There's no evidence that one could get from one to another. There's no evidence that one could get from either one, the Type Three, or the flagellum, in the first place. So again, the observation is that these things are there. There's no evidence at all that you could go from one to the other. Perhaps you could go from the more complex flagellum to the less complex TTSS.”

Before I ask about your new book, can I ask about your use of the term “Darwinian?” You seem to use the two terms evolution and Darwinian in slightly different ways. You seem to use evolution to refer to common descent, and the general idea that creatures can change over time. And (by) Darwinism, you seem to mean the whole modern paradigm of exactly how that occurs.

“Well, yeah. The importance of Darwin's ideas was not that he thought common descent was true. I'm not a historian of science, but from what I understand, a number of folks had proposed that organisms descend from other organisms before Darwin wrote *Origin of Species*. And their ideas were always teleological, that is, there was some purpose behind it. They were following some inner drive, or were guided, or some such thing. Darwin's importance was that he proposed some mechanism by which this could happen without any guidance, without any purpose, or some such thing. He proposed random variation plus modern selection. In the modern jargon, since DNA and so on has been discovered, that's

translated into random mutation and natural selection. So you're right, I separate those two – the idea of common descent, and the question of what might drive such a process.”

But what you're attacking in *The Edge of Evolution* is actually the ability of mutations to account for the complexity of life. And of course Darwin didn't actually know about mutations. It seems a little bit disconcerting at times, the use of that term.

“I'm not quite sure why. He postulated random variation. He certainly didn't know what was the basis for it, but that was pretty much what his idea was, that somehow a variation could arise in an organism and be inherited. And so over time that variation could spread through the population. Now, with the advance of science, we realize that what would have to happen is that there would have to be a change in the DNA of the creature, and that would be the basis of the variation. In *the Edge of Evolution*, I say that's a non-persuasive idea for the mechanism of evolution.”

Some critics represent your new book, *the Edge of Evolution*, as a retreat from your earlier position. Richard Dawkins described you as a man who has given up. But that wasn't really my impression. My impression was that you're expanding your earlier argument.

“Yeah. I don't know what Dawkins was thinking, or if he was thinking at all. No, I view my book as a deepening, as an extension. In *Darwin's Black Box*, I just pointed to particular examples of very complex systems, and argued that they were resistant to Darwinian explanation. In the new book, I try to make it into a more general statement, and argue that Darwinian processes are unlikely to account for things that are even less complex – much less complex – than the systems that I

talked about in the first book.”

You focus on some very unpopular heroes – the malaria bug, HIV, e coli.

“Yeah, it’s just because that’s where the data is. It’s just because malaria has such large populations, and is so wide spread. Also because it causes such problems that medically we follow it closely.

What do you mean by the “edge of evolution?”

“‘The edge of evolution’ is my literary way of saying, what is it reasonable to think that Darwinian processes can do. That is, what can random mutation and natural selection really be expected to do. What does the data show? And on the flip side, since I’ve argued that ID is necessary to explain some parts of biology, how deeply into biology is it reasonable to think intelligent design extends? So the rough dividing line between randomness and purpose is what I call the edge of evolution.”

Some time in the past, you agree, things changed to become what they are now. You argue that such changes have not occurred while we’ve been watching these little pathogens. What difference does that make? If an intelligent designer created malaria for some strange reason, why shouldn’t he have done it under our noses, instead of a million years ago? The watched pot never boils?

(Laughs) “Well, that’s a good question. I guess that could happen. But a designer, or an intelligent agent, can do things when he wants to. But a statistical process, a random process, should be pretty much operating all the time. Let’s say, suppose I wanted to flip a coin. I could cheat and cause the coin to come up a hundred heads in a row. Then I could walk away and use a fair coin and get a

random statistical distribution of heads and tails. But if somebody wanted to come along and say, no, getting a hundred heads in a row is something we should expect within a reasonable short time, and they start flipping a coin, and never get such a thing, then we can decide that this random statistical process is not adequate to get a hundred heads in a row. Because while we were watching it, and there were an enormous number of malarial parasites, e coli, HIV viruses and those examples that I talked about, then that rules out a random statistical process as an explanation for new complex biological functions. “

But you're talking about changes in particular spots in the genome. Wouldn't the possibility of a change somewhere on the genome be a lot larger, many orders larger, than on one particular spot?

“That's not the case. That's why I think these examples are so powerful. Nobody, least of all me, was telling the malarial parasite which spot in its genome it had to change. In nature, it could change anything that it's little heart wanted to change. (Laughs.) The population of malarial parasites in one year is on the order of one to 10 to the 20th. That means that there should be at least a trillion mutations in every spot on its genome. Every single nucleotide in its genome should have a trillion changes, each and every year. Gene duplication of every gene should happen a trillion times a year. If any of those could have been helpful to the malarial parasite, then they should have increased by natural selection. But what we see are a couple things: that there are only a very few mutations out of the many, many trillions possible mutations that are helpful to the parasite. And those are – the one that helps best, the mutations in the protein called PFCRT, require several changes at once, and is therefore extremely rare.”

For the sickle cell?

“No, this is actually for the – “

The chloroquine.

“Yeah.”

So why hasn't malaria evolved to deal with sickle cell?”

“Because apparently it would require several changes which would not be beneficial before it could deal with sickle cell.”

Jerry Coyne asks if you're expecting the anti-bodies to evolve little hands to grab the malaria and squeeze it.

(Laughs) “Well, you know, he's of course being facetious. But there are molecular machines that grab on to things and constrict them and all sorts of things. The machinery in the immune system is very sophisticated, and it had to come from somewhere. And Darwinists maintain that such sophisticated machinery, which can specifically grab onto things, and mechanically constrict them, and all sorts of other fancy tricks – they're saying that that occurred by random mutation and natural selection. So it seems to me that if they're maintaining that process can produce the molecular machinery we do see in the cell, then it's disingenuous for them to say that we shouldn't expect it to do anything fancy while we're watching it. It's only when we're not looking at it that all these impressive changes occur.”

You also mention fruit flies. These bugs have been used for research for a hundred years now, irradiated, subject to toxins, mutated. Edward Lewis was one of several people to win Nobel Prizes for his work torturing fruit flies, in part by

inducing a series of mutations that cause it to develop four wings instead of two. But the wings don't work. Do you know of any more successful mutants?

“Of drosophilus?”

Yes.

“Uh . . . hmm . . . I can't say that I do. No, in a word.”

People try to knock the scientists' cap off your head a lot. But if you wouldn't mind, could you take it off yourself for a moment and explain how you understand these ideas from the perspective of a Christian as well as a scientist? What do you say, that God created malaria? Or did the devil do that? How do we understand this process of design?

“Yes, I'm a Christian. I think God is designer and all sorts of stuff. But let me begin by saying I was taught Darwinian theory in parochial school – I'm a Catholic – and never had any particular reason to doubt it. I used to be kind of a Ken Miller-esque type of person. God, you know, set up the universe to produce life by Darwinian processes. Who am I to disagree? But the more I learned about it, the more I was persuaded that no, Darwinian processes are inadequate.

“The way I view it is that God, in order to achieve the goal of life – which I assume was the goal – had to set up a universe that had some minimum characteristics. First of all, you know, it had to have stars in it, had to have atoms, and all that kind of fine-tuning stuff that people talk about in physics. But apparently that's not enough. You need more information than that. And as I explain in the book, you can view all of this as simply setting up the universe, fine-tuning the universe, at deeper and deeper and deeper levels.”

“To answer your original question, did God make malaria? Or did somebody else, some evil, nasty type of being? Well no, I’m no theologian, but I don’t see any reason why God couldn’t set up the whole shebang. Just because some organisms have some ill effects for us, that doesn’t mean that they can’t have other effects in nature that are good or necessary. Just like plate tectonics might have some ill effects for us if it causes a tsunami or something. But without plate tectonics and the geological processes that drive them, life would not be possible on the earth.”

But it would certainly be possible without malaria.

“Well, how do you know that?”

Let me just say it’s a guess.

“OK. I understand. I don’t know what good malaria might be, or mosquitoes in general. But maybe they are useful for something. I’m just saying I don’t see any logical difficulty in saying God made things which cause us a lot of problems, but nonetheless they might have their own good uses.”

Don't biological structures seem terribly ad hoc? The tail bone, the appendix, the male nipple.

"I'm a molecular kind of guy. I look to the molecular level of life . . . I do not rule out randomness in life. It's clearly the case that some processes are (random). But this is really an argument from ignorance. A classic example these days is junk DNA. There are lots of juicy quotes from Darwinists from ten, twenty years ago, saying that no designer would design DNA (like this) . . . yet these days, as workers discover more and more, this argument seems based on ignorance, rather

than positive arguments."

You're generally careful to stick to biological facts. But in some ways, ID tests the edge of science implicitly, if not explicitly, and your foes are quick to pick up on that. At the end of *Edge of Evolution*, you do make a few nods in the direction of what EO Wilson called consilience, trying to join data from different fields, including astronomy and the idea of anthropic coincidences and all of that. Do you think it's improper for scientists to consider historical data as well in their attempts to come to grips with what this show is all about?

"I'm not quite sure I understand what you mean."

Well, you can almost look at the history of man as a sort of punctuated equilibrium, with things happening that don't quite fit into Edward Wilson's story of material reality. And what you're saying is that life itself has been a kind of punctuated equilibrium in which an intelligent designer has intervened in the course of natural development, or has prompted that development.

"Yeah. I specifically, as you recall, I specifically say that this does not require intervention. A lot of people are allergic to that concept."

Well, OK, front-loaded, or . . .

"Yeah, front-loaded . . ."

Or side-loaded.

"Yeah, or whatever. Uh, now what was the question again? I'm sorry." (Laughs)

Do you see it as legitimate to consider historical data as well as scientific data in figuring out what the “big show” is all about?

“Well yes. I think historical data is scientific data. I don’t make a distinction between the two. For example, is the Big Bang historical data? I would guess it is. The origin of the moon? Historical data, I would think so. So I don’t distinguish too strongly between those two. As a matter of fact, if you’re talking about evolution . . . “

What about the resurrection of Jesus Christ?

“Oh, I see, I see. Well, I wasn’t thinking in terms of the resurrection. I think, well certainly, one can. But I certainly didn’t consider that in my book. Did you want me to specifically address that?”

No, I was just wondering what you thought about the general idea of understanding the meaning of life not just from scientific data, but from historical data.

“Absolutely! Yeah. Like I said, I’m a Christian. And like other Christians, I think God has communicated through us in historical times, and that in fact, Christ is his Son, and that in fact, communicated directly to us. And so I think yeah, that’s a very important aspect to consider. And I think that’s historical data – the way the world really works. But that takes different sorts of arguments.”

On a scale of 1 to 10, how sure are you that Intelligent Design is true?

"10. With apologies to my critics, I'm absolutely sure that it's true. It's astonishing to me (that people don't see it)."

Does it bother you, being seen in the biological community as what Richard Dawkins calls a "maverick?"

(Laughs.) "Leper is probably the better word. Yeah, it does. I don't propose this to tweak anyone's nose or to advance any agenda by because I think it's true."

"One can't even talk about this in a calm and intelligent manner. People fire off letters to the chairman of your department . . . There is no scientist with a reputation to lose who would publicly say they have found this to be true. It's astounding. People object even to people like me making these arguments."

(The tape had run out by this time. Dr. Behe added that his colleagues at Lehigh were kind, but that "The folks in the department have gotten a lot of static from outsiders" for hosting "this crazy guy." He added that he was sorry they had to put up with the grief.)