

LITERATURE REVIEWS

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OVER THE EDGE

The Edge of Evolution: The Search for the Limits of Darwinism.

Michael J. Behe. 2007. NY: Free Press. 336 p. Hardcover \$ 28.00.

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Michael Behe's sequel to *Darwin's Black Box*, *The Edge of Evolution*, has apparently driven many of his critics figuratively over the edge. So sure are some that Behe must be wrong that they clearly have not bothered to actually read the book before writing "reviews," focusing more on Behe's intelligence and sanity than addressing his carefully constructed argument and the exhaustive empirical evidence he marshals in support of it.

So what is it that has driven Behe's critics over the edge of civil discourse into a frenzy of *ad hominem* attacks? Like most brilliant insights, at first inspection the only thing apparently remarkable about Behe's latest is the fact that no one has articulated it previously. A long-held claim of Darwin-doubters has been that while the neo-Darwinian mechanism of mutation coupled with selection may be capable of doing something, it is incapable of turning an amoeba into a giraffe or algae into an oak tree. The Darwinian claim is that small changes can accumulate over vast time periods resulting in large cumulative changes. Behe pointed out in *Darwin's Black Box* that some structures cannot be produced by small cumulative changes. These irreducibly complex (IC) structures require a set of parts to all be present before they can function. Given that natural selection can only select functional things, components lacking function outside of IC structures cannot be selected prior to the existence of the IC structure; they cannot accumulate in many small steps over any amount of time via mutation and selection.

In Darwinian evolution, time is the magic that allows transformation of various types of organisms into very different kinds. Organisms repro-

duce over time: with more time, more reproductive events occur resulting in more potentially mutated individuals on which natural selection can work. The essence of Behe's argument from IC in *Darwin's Black Box* is that given any amount of time and natural selection, the jump between nothing and a novel irreducibly complex entity like the bacterial flagellum is larger than the neo-Darwinian mechanism can span and thus it does not account for the IC structures and biochemical pathways that abound in nature. Checking Behe's IC argument against history is impossible, particularly given the time spans invoked by Darwinists.

In *The Edge of Evolution*, Behe uses malaria as a case study to circumvent appeals to the magic of deep time. Because the malaria parasite *Plasmodium* reproduces in such stupendous numbers within infected humans and its mosquito vectors, the probabilistic resources *Plasmodium* has to draw on in its battle against the human immune system and anti-malarial drugs are immense. The millions upon trillions of *Plasmodium* parasites living at any moment soon eclipse the probabilistic resources available to mammals over the putative 200 million years since they emerged as shrew-like creatures around the same time as dinosaurs. The evolutionary possibilities available to mammals over hundreds of millions of years are modeled well over the past century of well documented *Plasmodium* history. It turns out that mutations have been capable of making tiny changes rendering *Plasmodium* immune to treatments like Chloroquine, but not to the sickle cell or thalassaemia mutations that have occurred in humans making them, at great cost, immune to malaria.

Plasmodium can be viewed as a natural experiment illustrating what capabilities the neo-Darwinian mutation-selection mechanism possesses. Despite its remarkable reproductive abilities, *Plasmodium* has not developed new molecular machinery to deal with new drugs or human adaptive mutations. The edge of evolution – the limit to what mutation coupled with selection can achieve – seems to be restricted to mutations that disrupt to varying degrees the normal function of already existing proteins. Production of novel new molecular machines or biochemical pathways – with one or two possible exceptions like antifreeze proteins, which Behe discusses – appears beyond its abilities irrespective of time. This same phenomenon is also commonly illustrated in bacterial antibiotic resistance.

Arguments about creation and evolution aside, Behe demonstrates in *The Edge of Evolution* the very practical importance of assuming design and understanding what unguided natural processes can really do. Malaria has killed innumerable people over the course of history and the carnage

continues in areas where it is endemic. Any treatment strategy must take into consideration what mechanisms *Plasmodium* has at its disposal to counter current and future therapies. The pessimistic assumption of infinite adaptive abilities will do no good. Understanding the very real limits to adaptation in *Plasmodium* can rationally inform the quest for more effective treatments like, for example, the use of multiple drugs in combination to overwhelm what can be realistically expected from *Plasmodium* mutations in its victims.

In many respects Behe is Darwinists' worst nightmare come true. He espouses common descent, has no problem with long periods of time, quotes no holy books (unless *The Origin of Species* counts) and provides a logically coherent argument rooted in empirical evidence. As a biochemist, Behe's expertise in the areas he writes about overshadows that of many of his Darwinist critics. All that seems to be left for his critics to do is to attack his character and intelligence, but as he is in fact a nice guy, a tenured professor at a prestigious university and a brilliant productive scientist, these attacks seem to reflect more on the desperation of his opponents than on Behe himself.

The Edge of Evolution is an eminently readable book, perhaps easier to follow than *Darwin's Black Box*. It should be at the top of the reading list of all who truly wish to understand what unguided mutation and selection can achieve. This should include advocates of religiously charged theories about the history of life, like Darwinism and creationism, as well as advocates of more religiously neutral ideas like Intelligent Design and those who are simply interested in the science. Aside from those interested in the philosophical aspects of design in nature, Behe has broken new ground for ID advocates, producing a book that contains ideas of philosophical depth and practical use in the fight against malaria, one of humanity's greatest scourges.

Editor's Note: Original pagination was p 35-38.

