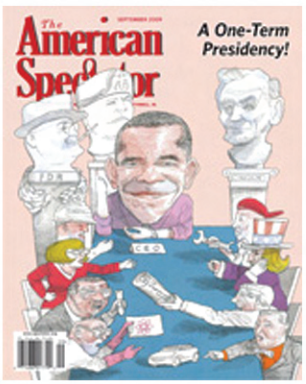

The American Spectator

'A decisive case based upon breathtaking and cutting-edge science.'

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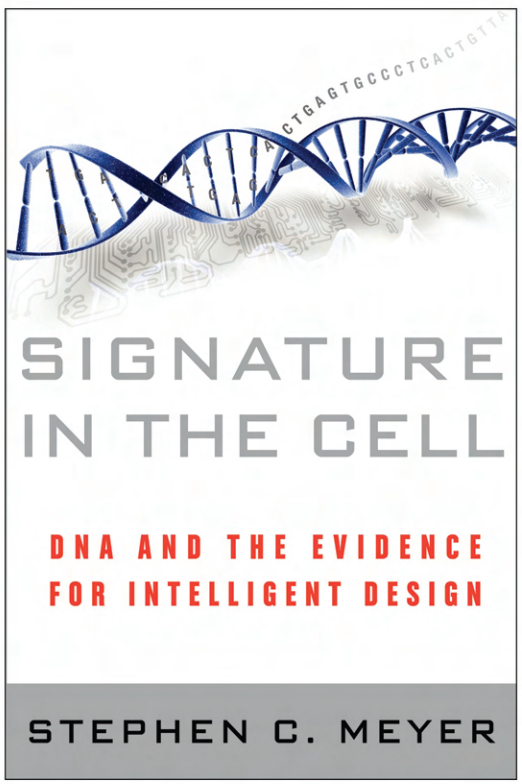

Blown Away

WHEN I LEARNED THAT Dr. Stephen Meyer had written a new book on the evidence of design displayed in living cells, I expected to be impressed by it. I wasn't prepared to have my mind blown—which is what happened.

In *Signature in the Cell*, Meyer marshals the scientific facts and arguments to show that the staggering quantity of information contained in the "computer code" of our cellular DNA almost certainly cannot have been generated by undirected material processes. Instead, Meyer contends, in our combined human experience the kind of complex, functionally specified information that is present in living cells is known to be produced by only one source: an intelligent, purposeful mind.

The implications of that thesis are enormous, and the scientific arguments Meyer presents for it are compelling.

As Director of the Center for Science and Culture at the Discovery Institute, Meyer is a principal architect and advocate of the intelligent design (ID) movement. After gaining altitude for a number of years, intelligent design exploded into the national consciousness in 2004 and 2005 like a starburst shell on the Fourth of July. ID proponents have taken several approaches to demonstrating the existence of design in nature, including arguments based on the dazzling "fine-tuning" of the universe's physical laws, and on the "irreducible complexity" of biological structures and processes (most famously advanced by Prof. Michael Behe in *Darwin's Black Box*).

Signature in the Cell: DNA and the Evidence for Intelligent Design
By Stephen C. Meyer
(HARPERONE, 611 PAGES, $28.99)

Reviewed by Dan Peterson

Of the approaches taken by ID theorists, *Signature in the Cell* is most closely aligned with the pioneering work on design detection published over the last decade by mathematician William Dembski, one of Meyer's colleagues at the Discovery Institute. Dembski and Meyer both rely, at least in part, on information theory and probabilistic analysis to determine whether a phenomenon is best explained as the product of unguided "chance and necessity," or of design by an intelligence.

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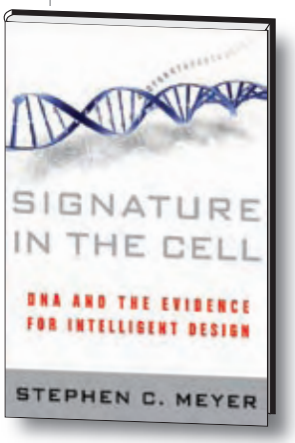
The major contribution by Meyer's formidable new book is to employ these tools in a searching, sustained examination of the nature of the information encoded in DNA, how information is processed in the cell, and how that information and processing machinery might have arisen in the first place. The heart of the book addresses this "origin of life" problem. He tackles it at the level of the detailed molecular biochemistry of DNA and RNA, the cellular processes by which the information encoded in those molecules is replicated, and the mechanisms by which the myriad proteins necessary for cell function are produced.



Meyer's argument is a comprehensive one, rooted in multiple scientific and philosophical disciplines, and he is perhaps uniquely qualified to make it. His background is in physics and earth science, and he earned his PhD from Cambridge University in philosophy of science, with a thesis on origin of life research. Although not himself a biologist, the detailed facts of molecular biology Meyer presents in the book, on which he bases his principal arguments, are sound and accurate scientifically (I checked with an impartial expert). There is far more to the book than biology, but let's start with the argument based on information in the cell.

AS MEYER SHOWS, it was perhaps plausible in the 19th century to believe that purely natural, unguided processes could have produced the first cell. Beginning with Friedrich Wöhler's discovery that an organic compound (urea) could be synthesized solely from inorganic chemicals, the supposition emerged: if organic compounds could arise from inorganic ones, why not life itself?

Darwin's *Origin of Species* did not provide a theory about how life first arose, but he speculated privately that a protein compound "ready to undergo still more complex changes" might have been chemically formed in some "warm little pond, with all sorts of ammonia and phosphoric salts, light, heat, electricity, etc..." By the latter part of the 19th century, the "protoplasmic" theory had gained predominance, in which cells were considered to be little more than bags of nitrogen-rich jelly. It wasn't difficult to imagine that such bland entities could have arisen from random natural processes.

Although it was soon learned that cells were considerably more complex than that, it wasn't until 1953, when Watson and Crick discovered the double helix structure of DNA, that all easy assumptions about life's origins were shattered forever. Scientists quickly realized, and proved conclusively, that the DNA molecule was something very special: a repository of an immense amount of information, nearly exactly analogous to computer code, that specifies how proteins necessary for life are manufactured in the cell.

And that's where the book becomes mind-blowing. In a few chapters, Meyer lays out with admirable clarity the chemical processes by which information is stored in the DNA molecule and details the tightly integrated cell machinery for transcription of that information. He describes the built-in error correction mechanisms that allow that information to be read and duplicated with astounding accuracy. He shows how the primary code in DNA (which is not suited to forming proteins directly) is translated into a higher-level code, which in turn specifies the sequencing of the 20 amino acids used to form proteins, and he delineates the mechanism by which amino acids are then assembled in precise order in the cell's ribosome to become functional proteins.

These and other cellular processes are set forth in considerable technical detail. It takes a bit of concentration, but with the help of the book's many illustrations and Meyer's lucid writing style, the technical scientific descriptions are remarkably easy to follow.

By the time the reader is done with them, an unbidden conviction takes shape: these astonishingly intricate molecular machines, and the informational software that drives them, could not have arisen, even in a vastly simpler form, as a result of chance combinations of chemicals on the primitive earth.

Meyer then nails down that precise point with biological and mathematical tools. Let's look for a moment at the magnitude of the improbabilities we are dealing with here.

As Meyer notes, it has been calculated that the mathematical chance of producing a functional protein (*any* functional protein, not a specific protein) of a modest length of 150 amino acids, out of all of the possible sequences 150 amino acids long, is about one in 10^{74}. Since the number of atoms in our galaxy may be estimated to be 10^{65}, it would be about a bil-

lion times easier to find a single marked atom in the Milky Way by a completely random search than to produce a functional protein 150 amino acids long by chance. Historically, those advocating that life could arise from random combinations of molecules typically have invoked lengthy time periods that would permit such unlikely results to occur. In the 1950s, a biochemist quoted by Meyer explained that, "Time is in fact the hero of the plot.... Given so much time, the impossible becomes possible, the possible probable, and the probable virtually certain."

Well, no. Life on earth, according to most scientists, developed within the first billion years or so after earth's formation. A billion years (nine zeros) seems like a long time, but any scenario relying on chance is hopelessly, pathetically, impossibly inadequate when confronted with probabilities such as 1 out of 100,000,000,000,000,000,000,000,000,000,000,000,000,000,000,000,000,000,000,000,000,000,000,000,000,000 (74 zeros for the modest protein just mentioned).

FEW WOULD ARGUE ANYMORE that complex proteins arose by a purely random process. But the problem is that preexisting DNA is needed to make proteins, while many highly specific, preexisting proteins and protein complexes are required for DNA to direct the manufacture of proteins. So which came first, the DNA chicken or the protein egg? Meyer examines several "protein first" theories and "DNA first" theories, but they are so beset with difficulties that most researchers have now looked elsewhere to try to come up with a purely materialist explanation.

A currently favored approach is the "RNA world" hypothesis. This is a framework that seeks to avoid the chicken-and-egg problem by positing a world in which short segments of single-stranded RNA, as opposed to the more complicated double-stranded DNA, appeared spontaneously and then "evolved" into more complex structures and, eventually, cells. The principal advantage of this theory is that RNA (like DNA) can perform information storage functions, and RNA (like proteins) can perform at least some enzymatic functions. Thus, the argument is that everything started with RNA, and DNA and proteins came from RNA later.

It's an intriguing argument, but Meyer advances several powerful and perhaps insurmountable reasons to believe that it cannot account for the origin of life. See the book for details, but the clincher is that the RNA world scenario, like other "chance and necessity" theories, simply cannot account for the creation of information that is both complex (improbable) and specified (in relation to a target or function).

In the chapters following his main biological and probabilistic arguments, Meyer moves to broader themes, and this is where his breadth of learning and insights from multiple disciplines come to the fore. He addresses topics such as the nature of scientific reasoning, why ID is not an argument from ignorance, the types of inferences that are scientifically justified when seeking to explain past events, and, finally, the relationship of the ID debate to competing philosophical and religious views. This illumination of context is invaluable in placing both the claims and the criticisms of ID in perspective.

In a few chapters, Meyer lays out with admirable clarity the chemical processes by which information is stored in the DNA molecule, and details the tightly integrated cell machinery for transcription of that code.

Perhaps improbably, given the subject, this is also a book of considerable charm. When dealing with scientific points, Meyer often provides a brief history of how science has understood and approached that problem over time. His account of how the extremely unlikely duo of Watson and Crick beat the scientific heavyweights to the punch in deducing the structure of DNA is by itself worth the price of admission.

Throughout, the book is cast in the form of a personal narrative, recounting how the author first became engaged with what became known as ID, and with the people and concepts that advanced his thinking. In both the historical and personal narratives, Meyer frequently tosses in a personal sketch or anecdote, thus adding a human dimension to the scientific controversies. His style is familiar, good-natured, imaginative, crisp, and clear.

Signature in the Cell is a defining work in the discussion of life's origins and the question of whether life is a product of unthinking matter or of an intelligent mind. For those who disagree with ID, the powerful case Meyer presents cannot be ignored in any honest debate. For those who may be sympathetic to ID, on the fence, or merely curious, this book is an engaging, eye-opening, and often eye-popping read.