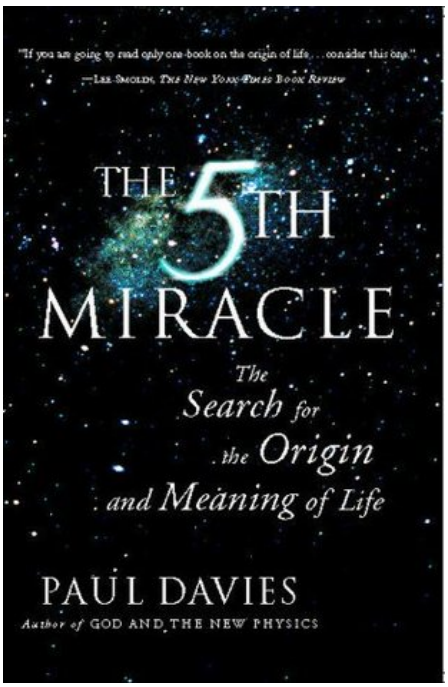

The Fifth Miracle: The Search for the Origin and Meaning of Life

Paul Davies

The Fifth Miracle: The Search for the Origin and Meaning of Life

Paul Davies

The Fifth Miracle: The Search for the Origin and Meaning of Life Paul Davies
Are We Alone in the Universe?

In this provocative and far-reaching book, internationally acclaimed physicist and writer Paul Davies confronts one of science's great outstanding mysteries -- the origin of life.

Three and a half billion years ago, Mars resembled earth. It was warm and wet and could have supported primitive organisms. If life once existed on Mars, might it have originated there and traveled to earth inside meteorites blasted into space by cosmic impacts?

Davies builds on recent scientific discoveries and theories to address larger questions of existence: What, exactly, is life? Is it the inevitable by-product of physical laws, as many scientists maintain, or an almost miraculous accident? Are we alone in the universe, or will life emerge on all earthlike planets? And if there is life elsewhere in the universe, is it preordained to evolve toward greater complexity and intelligence?

Through his search for answers to these questions, Davies explores the ultimate mystery of mankind's existence -- who we are and what our place might be in the unfolding drama of the cosmos.

The Fifth Miracle: The Search for the Origin and Meaning of Life Details

Date	:	Published March 16th 2000 by Simon Schuster (first published 1999)
ISBN	:	9780684863092
Author	:	Paul Davies
Format	:	Paperback 304 pages
Genre	:	Science, Nonfiction, Philosophy, Biology, Evolution, Popular Science

From Reader Review The Fifth Miracle: The Search for the Origin and Meaning of Life for online ebook

Vijay Rangachari says

This is an exceptional book. Paul Davies eludes to finding the meaning and purpose of life by bringing together little pieces of evidence present all around us. Especially absorbing is the fact that he connects many different fields of study i.e. science, math, physics, sociology, art and theology to some extent to bring out the otherwise hidden information. In the process, he has demonstrated that it is not just the information content but also the context is important in developing holistic understanding of life. This must be by far his best book in a series that started with "God and The New Physics".

Christopher says

Awesome read. The chapter on Claude Shannon's information entropy was truly eye-opening for me. Information is actually unpredictability! The less predictable a message, the more information it contains. Fascinating.

Steve Matthews says

A roller coaster dealing with the question of how life may have arisen from matter. Up and down exploring the incredible complexity of even the simplest of life forms and the paths chemistry would have to take to arrive there. That juxtaposed with the huge number of opportunities for even a random event that could arrive at rudimentary life. Ending with the highly unlikely prospect of Darwinian purposeless evolution ever coming up with an intelligent species remotely like us. 20 years since written; would there was a sequel.

Lasse Laitinen says

"The 5th miracle" just fed (in contrast to satiating) my interest in how on Earth (pun probably intended) life came to being in the first place (pun intended). Personally I would have liked a deeper biochemical component, just to be sure how much more it has to say on the very very first steps of life. On the other hand I fully understand that Davies exactly wanted to steer the focus of explanation away from the conventional biochemical realm.

Lora Shouse says

Although I didn’t necessarily agree with everything he said, *The Fifth Miracle* by Paul Davies (another philosopher of science and a theoretical physicist) was a fascinating read. I won’t go so far as to say I couldn’t put it down, but picking it up again was not a chore.

This is another investigation into the possible origins of life. After reading Daniel C. Dennett's *Darwin's Dangerous Idea* with his idea that it is possible to explain the evolution of life from non-life entirely by means of natural selection, it was interesting to see Davies' investigation even further into the possible pre-cellular precursors to life and a different take on where life might have originated.

He keeps returning to the virtual impossibility of life ever originating anywhere, and refuting all the people who believe that the origin of life was almost inevitable. But he lists many instances of life and proto-life existing at much lower levels than previously thought possible.

His three most likely candidates for where life originated are not in the open ocean but:

1) underground somewhere, catalyzed by clay crystals
2) at the bottom of the deepest parts of the ocean either beneath the ocean floor in the pores of volcanic basalt there or around the "black smoker" ocean vents leaking gases and organic material into the ocean, or
3) on Mars, whence it might have traveled to Earth when some large comet or asteroid impacted the planet blasting pieces of rock off of the planet and all the way to Earth.

He also discusses the idea of "Panspermia" – that life may have been transferred to Earth via comets or similar bodies from outside the solar system. Conversely, he looks at experiments involving what looks like replicating molecules that are simpler than DNA.

David says

This is a wonderful book about the science of biogenesis. How did life arise? Where and when did it arise? Why is this such a difficult question? Paul Davies is an eminent physicist and a good writer; he makes sense out of all the issues. Don't look to this book for answers--you won't find definite answers. But you will certainly read Davies' opinions; he believes that life could have begun on earth deep below the surface, under conditions of very high temperatures. There is lots of evidence to back up this concept. This was a very entertaining read for me.

Heather Browning says

In this book, Davies discusses how life may have arisen on earth, with some reference as to what implications this holds for the 'meaning' of life and the universe. I was most interested in the discussion of the possibility of life on planets other than earth, particularly some of the evidence for microbial life on Mars. The biogenesis stuff, as in the technical details of how exactly life may have arisen were too familiar to me to hold much interest. I'm also not sure I agree with his assertion that if it turns out that life is common in the universe, which would suggest that the 'laws of nature' are such that life is an inevitable outcome of our particular kind of universe, then this means the universe is "designed" for the creation of life. I would think that the view that life is a fortunate by-product, which accompanies the perspective of our own living planet as a sort of 'happy accident', is still tenable even if life turns out to be more common. However, his view does make the search for extraterrestrial life seem even more important than just for the sake of exploration. They are questions that may never be answered in my lifetime, but I hope I'm lucky enough to see some more evidence.

Bob Nichols says

Davies writes about the origin of life ("biogenesis"). In the preface he says that he cannot answer that question without first discussing life. "What, exactly, is it?" he asks. In probing that question, Davies acknowledges that "a definition of life [is] a notoriously difficult problem." While many who look at that question focus on "the chemistry of life," Davies believes that life comes not from "chemistry as such" but from "its informational properties; a living organism is a complex information-processing system."

I don't understand how Davies believes he is making a new argument about the nature of life or how, even, he makes advances in what Darwin put forward. That life takes information from the outside world and incorporates it inside itself over evolutionary time is in a way the definition of adaptation. But adaptation involves an information EXCHANGE with the world and Davies misses one-half of that equation. He has the information coming from the outside and going into the life form, as if the latter is a passive participant in all of this. But a life form is active in applying the information that is relevant to survival and reproduction TO the world. It's first in the sequence. A life form applies its own information onto the world, which may or may not fit it, and the world "acts" back by telling the life form how it needs to adjust to survive. In this way, a transformation occurs in which new information is formed about the world. In other words, there are three sources of information that are involved in this exchange with the world: action, reaction, and transformation.

How this exchange moves from body chemistry to information is not clear, but it does seem essential to what the author is after. Davies goes into some detail describing the chemical workings of the DNA molecule, focusing on the matching up of base pairs, which he refers to as geometry, but he does not discuss how a chemical molecule (a) knows what is relevant in the outside world, (b) mechanically draws that information into itself, (c) takes that now internalized information and stores it in some form of memory, and (d) uses that information to promote survival and reproduction. We know that life has this information processing capacity and we know that there's a chemical basis for it since our bodies are collections of molecules. What is needed is the linkage between the two and this Davies does not really discuss. More on that in a minute.

The second half of the book gets into some exciting discussion about the origins of life, and this is the stronger part of the book. Rather than dividing life into plants and animals, Davies says there are three life divisions and, sequence wise, the Archaea came first, followed by Bacteria and then the Eucarya that contains plants and animals. With the Archaea (3.5-3.9 billion years ago), Davies moves the origin of life from the surface (e.g., Darwin's soupy pond theory) to the thermal vents under the sea or to the deep underground. From here, Davies also describes the possibility that life's origins come from space where organic chemicals essential to life are abundant.

I am neither clear about what Davies thinks about life's space origin nor how his argument about life as "information" relates to life's start deep underground or from space. Davies does clearly state his argument that chemistry follows deterministic, non-random laws and life's essence cannot have forced such chemical processes aside to arrive at a genetic code that overrides these processes. "Life succeeds precisely because it evades chemical imperatives," he writes, adding that "...normal physical laws alone can't crank out life to order." Something more must account for our information processing capacity, but here Davies goes vague, suggesting a "new type of physical law," with some non-convincing discussion of self-organization and complexity theory along the lines of Stuart Kauffman. In short, Davies discredits life's origin as the product of chemical self-assemblage in the precise right way necessary for information processing, but it's not at all

clear what alternative theory he has in mind.

More problematic, Davies argues against such a "fortuitous coming together" happening elsewhere in the universe. He says that despite the vastness of the cosmos, any argument about statistical probability of life such as ours occuring elsewhere "won't wash." "Though the universe is big, if life formed solely by random agitation in a molecular junkyard, there is scant chance it has happened twice," he writes. "If there is only one planet in the universe with life, it has to be ours!" he states. There's nothing inherently wrong with such an "Earth exceptionalism" argument, but it seems to be a fairer statement to make that the cosmos is just too big a place to say that life only exists here.

Ahmed Glall says

???? ????
????? ???? ?????? ????? ??????? ??? ?????? ?? ???? ???? ????
?? ???? ?????? ????? ?? ????? ????? ????? ?? ??? ?????? ??????
?? ?? ???? ????? ????? ???? ?? ???????? ???? ????? ?????? ???? ?????? ?? ????? ?? ???
??????
???? ???? ??? ????? ?? ????? ?????? ??? ??? ?????? ?? ?????????? ???????? ?????? ?????????? ????????
????? ????? ?????? ???? ????
??????? ?? ???? ?????? ?? ??? ????????/???????? ???? ??????? ??? ?????? ????? ?? ???? ?????? ?????? ??????
???? ??? ??? ?????? ?? ??????

Maher El-khalidi says

A truely very good book which deals with the question of the origin of life and the intertwining problems of physics , chemistry and biology !

Suzanne says

I absolutely loved this book. It takes on life's biggest questions; is there a reason, is there a design, is it all random? This is an outcrop of the battle between science and religion while Davies is able to captivate the disbelief of both sides. The possibilities are endless. I love his rationality, his science, and his way of teaching to those who are left one-sided. The 5th miracle is a must read for anyone who is pondering the bigger questions in life.

Huyen says

very interesting presentation of the problem of biogenesis. turns out to be a lot trickier than I thought. Did proteins come before DNA or the other way? How did the first amino acids form and link to make proteins, a pretty statistically difficult process?

But anyway, the main point here is Paul Davies always goes too far. From cosmic Darwinism to the meaning of life. Except for the religious, why the hell should biogenesis have anything to do with the meaning of life? Why does extraterrestrial intelligence alter our philosophy and meaning? It might be a scientific shock that some day we find out the origin of life came from a comet from outer space, but would it be an emotional shock? I might be not smart enough, but totally can't see the link.

Sajith Kumar says

Life is the most wonderful phenomenon in the universe. If you reduce its complexity to its most basic elements, it is nothing more than a collection of ordinary material that doesn’t differ at all from inanimate objects. Still, living beings are so fundamentally different and inexplicable that science has not been able to cast its beacon of searching light on the issue of origins of life. About half a century ago, at the instant when DNA’s secrets were coming out, it was widely believed that the puzzle would be solved in a matter of a few years. But decades later, science has not been able to advance knowledge much deeper than where it was. Paul Davies is a physicist, writer, broadcaster and a professor, who has authored many books on popular science. In this book, Davies presents some unusual ideas on the origin of life. Being an advocate of panspermia, he postulates the origin of earthly life taking place on Mars! A presentable case is made out with novel scenarios and clever reasoning. Since the subtitle also mentions a quest to the meaning of life, philosophical enquiry into the nature of life is also included. We know that evolution does not have foresight nor involve a direction to an ultimate goal towards a higher being. Natural selection makes it blind to be oblivious to the advantage of an entire species as compared to the survival benefit of a particular animal. This book is a model case of how a physicist can introduce novel concepts in a conservative field such as biological studies.

Those who first pick this book up from a bookshelf would wonder at the significance of the title. The mystery is neatly explained in the preface, and is linked to the chapter on Genesis in the Bible. God first created the Universe, then made light, then the firmament and the fourth in line was dry land. After arranging the ‘infrastructure’, God commanded that vegetation may appear on land. This first reference to life in the Bible is arranged as fifth in the sequence of miracles, and hence the title ‘The 5th Miracle’ is the most perfect for a book that makes its quest on the origin, nature and meaning of life. The earth is bountiful in life, and there are indications that the presently inhospitable terrain of Mars was once home to life. There may be several variants of life, which may not resemble life as we know it. Davies spells out autonomy, reproduction, metabolism, nutrition, complexity, organization, growth and development as the essential characteristics that delineate life in any form. At the same time, the chain of unification runs through all forms of terrestrial life whether it is a plant, animal or a simple bacterium. For example, take the protein Cytochrome C, which is made of hundreds of amino acids. This protein is present in plants and animals. The copy in humans differs from that of Rhesus monkeys in just one amino acid, out of a total of hundreds. The human cytochrome protein differs from that in wheat by about 45 amino acids, providing solid proof that man diverged from the line of plants pretty early in his development as compared to simian forms. This is also a proof of evolution at work.

Before looking at how life originated, a general discussion on why and if life had to appear on earth. When a physicist writes a book on popular science, we can be pretty certain that a reference to the Second Law of Thermodynamics would somehow be included. According to this now famous theory, the entropy, or level of disorder, in the universe always increases. However life brings about order in complexity and it may appear that biological systems violate the thermodynamic principle. This notion is false and Davies really tries his best to dispel doubts in this regard. The Second Law is applicable only to closed systems in which matter or

energy does not enter into the system. However, terrestrial life-forms make an open system, in which the sun's energy is always available. Even with localized order, the entropy of the universe taken as a whole increases, thus underlining the truth of the law. The author faces an uphill task in explaining how life itself took root. Today's beings use a genetic code encoded in the DNA to manufacture proteins essential for their survival and reproduction. The author compares this to software of the DNA and hardware of the proteins. However, all attempts to explain the origin of self-replicating molecules end in confusion, as it is not forceful enough to convince skeptics.

Davies makes an extensive survey of organisms existing in specialized niches like deep sea thermal vents and nutrient-deficient habitats. Pyrolobus fumarii is the organism that sets the record for highest temperature at 113 deg C. Introduction to organisms that thrive in extreme conditions is presented with good reason. Spectacular conjectures on the origin of life – biogenesis – follow next. The author is much interested in the concept of panspermia, the theory that places the origin of life somewhere in the deep mists of space, which reached the earth hitchhiking on a comet or meteor. It is also possible that life originated in Mars; where there is abundant proof that running water flowed through the terrain. Martian meteorites have been found on earth, the most recent and fruitful being a piece of rock discovered in Antarctica. Traces of organisms that once lived in Mars have been detected by researchers, though the chain of reasoning is tenuous and highly imaginative. But problems still persist. Even if it is believed that a meteor impact dislodged a piece of rock containing microbes, it has to undergo the tremendous ordeal of radiation in space, heat of entry into earth's atmosphere and the shock energy of the impact on earth. Since the argument is purely hypothetical, Davies comes up with several mechanisms by which microbes may just be able to survive the bodily transportation to another planet, each being weirder than the previous one.

This book on the origins of life is written by a physicist. We have heard the axiom that 'physicists defer only to mathematicians, while mathematicians defer only to god'! True to the maxim, most of the authors referred in the book are physicists, thus curtailing the real-life significance of it. Even Fred Hoyle is quoted more times than Charles Darwin. This excessive reference is all the more inappropriate when we remember that Hoyle was a stubborn opponent of the Big Bang theory, while still clinging to his pet hypothesis that the Universe always existed. Also, Hoyle is the co-author of a research paper that 'found' that great pandemics visited the earth when our planet travelled through the tail of a comet. Davies expresses rational, even controversial, arguments throughout the book, but some of his remarks seem to be deliberately designed as to be quoted out of context as proof of a creator of the world. For example, "The conclusion has to be that without a trained organic chemist on hand to supervise, nature would be struggling to make RNA from a dilute soup under any plausible pre-biotic condition" (p.131). What about this? Wouldn't this be the choicest nectar for creationists and proponents of intelligent design? Then again, he states on p.263 that "although biological determinists strongly deny that there is any actual design, or preordained goal, involved in their proposals, the idea that the laws of nature may be slanted towards life, even if not contradicting the letter of Darwinism, certainly offends its spirit". This book by a non-expert on biological systems lacks proper depth and appeal. This is only recommended to those who want to learn the theories occupying the extremes of probability.

The book is recommended.

Paul says

An interesting book looking at the very origins of life on earth and explaining the way microbes and bacteria

work and how they live in the most extreme of environments. There is a lot on the second law of thermodynamics and how it relates to biological entities. There is a lot on DNA and RNA and the way that these can be made from amino acids.

He considers the possibility of life having existing on Mars millions of years ago, and the possibilities that microbes could have been carried from one planet to the other after meteor strikes.

Some of the science was a bit beyond me, but the majority was clear.

Bob says

‘The Fifth Miracle’ is a book about the search for the Origin of Life written by a theoretical physicist. Since a lot of the science was kind of complicated I had to read between the lines a lot but still what a great read. Paul Davies’ ideas are pretty incredible not to mention provocative but he explains his thoughts so well that they become believable too; and then he’ll say something like, “but I don’t think it happened that way.” Funny. By the end of his book he’s raised a lot more possibilities and questions than he has answered about where and how life might have begun; and even, “What is life anyway?”
