



Origins of Life

Freeman Dyson

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How did life on Earth originate? Did replication or metabolism come first in the history of life? In the second edition of the acclaimed *Origins of Life*, distinguished scientist and science writer Freeman Dyson examines these questions and discusses the two main theories that try to explain how naturally occurring chemicals could organize themselves into living creatures. The majority view is that life began with replicating molecules, the precursors of modern genes. The minority belief is that random populations of molecules evolved metabolic activities before exact replication existed and that natural selection drove the evolution of cells toward greater complexity for a long time without the benefit of genes. Dyson analyzes both of these theories with reference to recent important discoveries by geologists and chemists, aiming to stimulate new experiments that could help decide which theory is correct. This second edition covers the impact revolutionary discoveries such as the existence of ribozymes, enzymes made of RNA; the likelihood that many of the most ancient creatures are thermophilic, living in hot environments; and evidence of life in the most ancient of all terrestrial rocks in Greenland have had on our ideas about how life began. It is a clearly written, fascinating book that will appeal to anyone interested in the origins of life.

Origins of Life Details

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From Reader Review Origins of Life for online ebook

Bob Miller says

The noted physicist does a good job of outlining the issues and the direction of (then) current research.

Ady ZYN says

Highly recommended!

Elisa says

I was dissapointed in this book, but I must give credit to Dyson for trying to get through such a difficult topic.

Elementary Particle says

I was dissapointed in this book, but I must give credit to Dyson for trying to get through such a difficult topic.

Kelly Reid says

To be fair, I speed-read this while waiting for -someone- to finish browsing the book store...but really fascinating stuff. I like the procedural way in which Dyson approaches origins of life. He combines the ideas of a number of scientists into a sort of hybrid theory of his own making.

Under 100 dense pages, and well worth an afternoon's read.

Bobparr says

Le ipotesi sull'origine della vita esposte in maniera accessibile - si', se hai conoscenze di biologia sopra il comune - "e brillante" - qui devo darne atto. Ho letto pagine e pagine scorrendo le lettere che formavano le parole, senza capire una beneamata mazza. Una esperienza quasi religiosa. Cito a casaccio " Piu' che una semplice critica al modello dell'iper ciclo di Eigen, l'analisi di Ursula Niesert è una critica nei confronti di qualsiasi teoria sull'origine della vita che assuma una organizzazione cooperativa di vaste popolazioni molecolari senza offrire esplicativi meccanismi di difesa nei confronti della possibilità di corto circuito delle vie metaboliche". E questa, volendo, si capisce pure...

Nick Black says

Amazon 2008-04-12

Roberto Rigolin F Lopes says

Quite romantic double-origin hypothesis. In a hot hole at the bottom of the ocean life begins. First metabolism (protein) hosted the parasite called replication (amino acids). The relationship was so good that after few eons they became symbionts. Then natural selection started. Thrilling stuff... enjoyed Freeman's toy model and the philosophical discussion at the end. Now the challenge is understand homeostasis, it is like Freeman pushing Schrodinger's ideas to the next level.

Allan says

This is a physicist's napkin expanded to a small book. It contains one essential idea: that in the boundary condition at the inception of homeostasis, the distinction between alive and dead needs to be a small one. The book is really just an exercise in how to write a set of equations where a small distinction between alive and dead can (and will) evolve into a very sharp distinction. This is where all the bother about Q (enzymatic quality) comes in. (I haven't read this book serious for more than a decade, so this is all from memory.) Once you get the main idea presented, you can't think seriously about the origin of life ever again without knowing you have to take something like this into account. Dyson repeats "this is only a model" so often I wanted to throw it against the wall. Yeah, I got that in the first three pages.

The problem with the readership is that many don't yet get that the beginning of an explanation is an explanation that doesn't really explain much. Parallel to the beginning of life that isn't very alive. People who seriously grapple with the really hard problems know this in their bones. This book sheds a very feeble light into a very dark place. Anyone who had ever huddled around a pile of wet twigs when no one had bothered to bring a lighter along won't find themselves disappointed. Think about the scene in Cast Away where Tom Hanks contemplates the seafood service tray with the sure-fire torch. The ocean is what we still don't know about how life began. Dyson wrote a little book noticing that, when struck, certain stones chip differently than others. Some say: Dude, we're hungry and wet. Enough with the stones already. Some say "I *love* crab."

Sean says

biology and chemistry are hardly subjects in which i am educated and this book is still very readable and understandable, while maintaining scientific and intellectual academic integrity.

Bob Nichols says

Dyson states that Schrodinger's "What is Life" (1944) assumes that life's essence is replication and that metabolism was secondary. In this book, Dyson speculates that metabolism came first and was followed by replication. Today, Dyson comments, life and replication are "practically synonymous" but, he asks, "can we imagine metabolic life without replication or replicative life without metabolism?" He believes we can.

Dyson says that for replication to occur, a host is needed and for a host to occur, metabolism is needed. Nucleic acid is the softwear and softwear itself is not capable of metabolism. In Dyson's "double origins hypothesis," softwear without hardware is a parasite. Drawing on Margulis, Dyson speculates that the first "metabolic apparatus" was directed by enzymes that had no genetic component. Subsequently, much later in the history of life, RNA emerged as a parasitic disease within the cell that eventually learned to tolerate and incorporate it and "parasitic RNA grew gradually into a harmonious unity, the modern genetic apparatus."

The book is largely technical and beyond my understanding. Practically, I am not sure about how significant this perspective might be as Dyson does not disagree with the "life as replication" theory, but only says that replication followed metabolism.

At the end of the book, Dyson affirms his agreement with Dawkins that humankind has "overthrown the tyranny of the genes" that has dominated life for 3 billion years as our behaviors "are now to a general extent culturally rather than genetically determined." Well, if we replaced genetic tyranny with cultural determinism, are we free? If culture determines us, how or who determined culture? In the end, do the base cultural patterns reflect a deep inner need to (a) survive as vehicles and (b) to replicate our genes? If so, perhaps we've not left the "tyranny of our genes" afterall. Dyson does not engage these questions.
