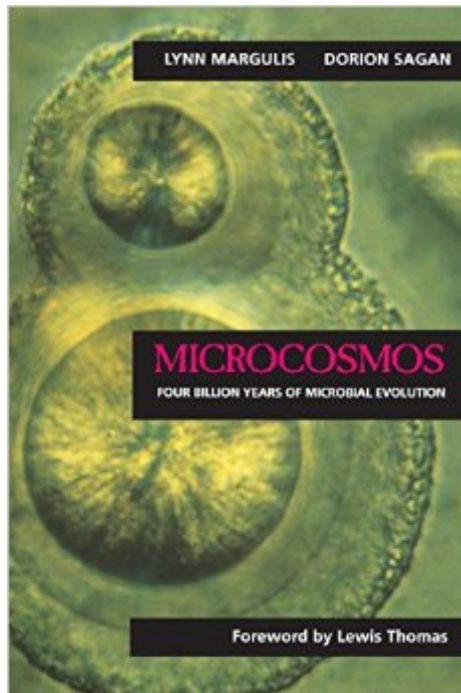


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# Microcosmos: Four Billion Years Of Microbial Evolution



## Synopsis

BACK IN PRINT WITH A REVISED PREFACE  
Microcosmos brings together the remarkable discoveries of microbiology of the past two decades and the pioneering research of Dr. Margulis to create a vivid new picture of the world that is crucial to our understanding of the future of the planet. Addressed to general readers, the book provides a beautifully written view of evolution as a process based on interdependency and the interconnectedness of all life on the planet.

## Book Information

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## Customer Reviews

If you're one of those who has felt worried that the earth might not survive what we're doing to it, then worry no longer! We, as a species which has brought 'wholesale ecological carnage' to the planet may not survive, but the earth surely will! What soon emerges from this insightful book is that humankind is a relatively young species, still 'vulnerable, error-prone.' Humans are not seen as the dominant species - the pinnacle of evolution - but as one of the still immature species. The real players are the species that have been here the longest, the bacteria. 'Even nuclear war would not be total apocalypse, since the hardy bacteria underlying life on the planetary scale would doubtless survive it.' Margulis and Sagan relegate Darwin to a secondary place within the order of things: the most powerful and important changes in evolution happen not through mutation - as Darwin would have it - but through symbiosis, '...the merging of organisms into new collectives, proves to be a major power of change on Earth.' In particular oxygen-breathing bacteria merged with other organisms to enable oxygen-based life on the once alien surface of this hydrogen filled planet. 'The symbiotic process goes on unceasingly.' 'Fully ten percent of our own dry body weight consists of

bacteria - some of which.... we cannot live without.' That's an estimation of ten thousand billion bacteria each! Imagine a droplet of water with a membrane holding the water in place and allowing certain nutrients in. This is a simplified description of how it is imagined the first bacteria came into being. The book offers a fascinating history of the evolution of life on our planet. This is a wonderful story full of fantastic developments spanning thousands of millions of years.

Microcosmos is a natural history of the unseen beings upon whom we depend every moment for survival: the microbes. Margulis, who is currently Distinguished University Professor in the Department of Geology at the University of Massachusetts, did undergraduate work in biology and received her PhD in Genetics. She worked with James Lovelock on developing the Gaia theory, which posits that the earth can be regarded as a sort of super-organism. In *Microcosmos* we see all aspects of her education and sensibilities -- a close attention to scientific detail and a "big picture" approach to how living entities coexist. In the introduction she lays out her philosophy about life on earth, for which she was roundly criticized by many reductionist scientists. In the past, she writes, all life on Earth was traditionally studied as being merely a prelude to the appearance of humans. Now, overwhelming evidence suggests that microbes (one-celled organisms) not only inhabit every known living thing on earth, they are also indispensable to the survival of all living things. They, not human beings, are the most important beings on the planet. Furthermore, in opposition to one of the most accepted tenets of Neo-Darwinism, Margulis states that life did not colonize the planet by competition so much as by networking. Cooperation between one-celled creatures led, over billions of years, to the evolution of beings such as ourselves, who possess the capability for self-conscious awareness. Our human consciousness, of which we are so proud, "may have been born of the concerted capacities of millions of microbes that evolved symbiotically to become the human brain." Strong words! Yet, Margulis sets forth compelling evidence in the remainder of her book to support her bio-philosophical ideas.

Margulis and Sagan return us to the days of life's inception. It's a journey in time and scope, travelling far back and down in size. Looking at the microbial world might seem unrewarding, but they escort us through a rich trove of information. The knowledge contributes to our understanding of how we work. Although mysteries remain hidden in that distant time, the authors clearly demonstrate the logic of how early life has developed into ourselves and our animal and plant neighbours on this planet. The title suggests that the journey must necessarily occur at high speed, but they demonstrate that if we don't appreciate the beginning the remainder of the trip will be

undertaken in obscurity. A better knowledge of the origins, they suggest, will also give us better insight into what the future heralds. After some preliminary discussion of how life started, the authors move into the realm of cellular organisms. The various ideas of life's origins are fascinating, but not until it achieved the level of individual micro-organisms does life take on meaning. The authors describe the events occurring during the long reign of the prokaryotes. These simple organisms were little more than a bag containing some genetic information. Yet, their emergence was the start of true life. While it's easy to think this "primitive" organism has faded into oblivion with the passage of time, the authors remind us that all our bacterial neighbours [and some inhabiting us!] are of that distant family. When conditions varied in certain localities, these simple creatures performed some amazing tricks. One of these resulted in a devastating event the authors term The Oxygen Holocaust. The original prokaryotes thrived on hydrogen, making useful compounds of it and other elements.

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