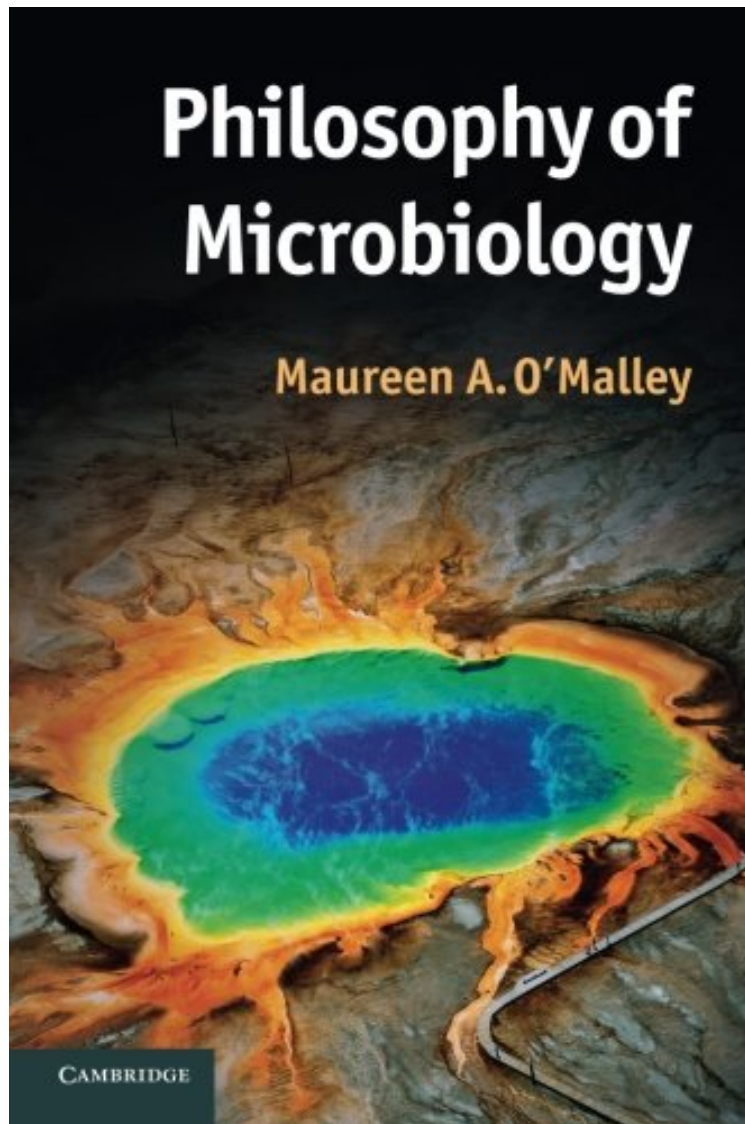


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# Philosophy of Microbiology

*Dr Maureen O'Malley*

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#1146080 in Books Maureen O Malley 2014-08-29 2014-08-28Original language:EnglishPDF # 1 8.98 x .79 x 5.98l, .84 #File Name: 110762150X280 pagesPhilosophy of Microbiology | File size: 72.Mb

**Dr Maureen O'Malley : Philosophy of Microbiology** before purchasing it in order to gage whether or not it would be worth my time, and all praised Philosophy of Microbiology:

0 of 0 people found the following review helpful. prob good for aBy L. Leonardquite complicated; prob good for a specialist0 of 3 people found the following review helpful. A facinating fresh look at the world of the ProtistsBy John S. DouglasAbout time someone looked at this topic of understanding the underlying principles and some mysteries of the world of the autonomous cells called Protists. There is so much that we just don't understand regarding what makes

them tick, lets have some more on the subject especially the sensory world, is there quorum sensing going on? 5 of 5 people found the following review helpful. FUNGI praise for Philosophy of Microbiology By B. Bunyard Philosophy of Microbiology Maureen A. O'Malley Probably the two college courses that I've enjoyed teaching the most have been Microbiology and Evolutionary Biology. Half the discussion during Microbiology lecture centers on evolution evolution of single-celled organisms, of course, but multi-celled creatures too. Microbes are great models for the discussion of evolution. And it is for this reason that about half the discussion during Evolutionary Biology class is on the topic of microbes. Philosophy of Microbiology by Maureen A. O'Malley is like the part of the Venn Diagram where the two circles, one for Microbiology and one for Evolutionary Biology, overlap. Each chapter in this excellent and concisely written (well, most of it is concise, see brief quibbles below) book starts out with an important topic of Microbiology, provides a brief overview and historical perspective, then she follows with a discussion of the latest hows and whys, all of which would have resulted in the early microbiological pioneers brilliant heads spinning! Maureen A. O'Malley is a philosopher of biology and teaches at the University of Sydney. Her thesis is that the field of biological philosophy has pretty much ignored prokaryotes (single-celled organisms without membrane-bound organelles the bacteria and archaea), perceiving them as being unsophisticated and not very advanced, evolutionarily. They cannot compete with much more sophisticated and elegant higher kingdoms of life. Microbes are dull, very small, their diversity poorly known, and they don't even reproduce sexually, thus they couldn't have a whole lot to excite genetically or otherwise, right? Wrong! All those old dogmas are now starting to go out the window as newer and more sophisticated tools for research come to the fore. O'Malley centers her book on four main features of microbes, each poking a finger in the eye of dogma. First is microbial biomass and diversity. Most life on planet Earth is microbial. Most, as in sheer numbers as well as diversity. There is almost no place on Earth that you cannot go without finding microbes; your own body is more bacterial cells than your own cells many times more, in fact. That we don't have descriptions and formal names for 99.9% of microbes on planet Earth is simply due to the fact that we currently cannot culture and see them on a Petri plate. Molecular methods are beginning to pull back the veil on these missing life forms. Another feature of microbes is their tendency to coexist in mutually beneficial relationships with pretty much all other organisms single-celled and multicellular. O'Malley also deftly explores microbial influence on the major evolutionary transitions, as well as their ability to impact planetary processes. Some of the author's best discussions involve topics that, at arms length, seem the most fundamental and simplistic. How do you define a microbe? Biology 101 stuff, right? Not so fast. Turns out, today we know a lot more about microbes than was known a few centuries ago when the field got started. For example, a common criterion for microbial life forms is living as a single cell. Except that most microbes don't live solitarily. They usually live in large collectives or biofilms or colonies in their habitat. (They don't necessarily form true systems or tissues, as in multicellular organisms.) Then there's the problem of viruses and their ilk. Living, not living? (Depends on whom you ask.) And remember the archaea? I remember their discovery vividly, as that was when I was an undergrad. (OK, there were species of archaeobacteria as they were then known, from further back but those were pretty much all oddball extremophilic types known only from strange out-of-the-way places.) It was not all that long ago that the archaea were an ancient and not so significant group of bacteria then we started to find more and more species. And discovered they weren't older than bacteria after all. Indeed, we now know they're much more like us (animals) than bacteria. In fact very recent research hints that it may have been an archaean cell that engulfed a proteobacterium, leading to the common ancestor of all eukaryotic cells. (The proteobacteria was / is / are the mitochondria of modern-day eukaryote cells.) The argument over which kingdom (or should it be domains?) in which to place all the prokaryotes is not likely to be settled anytime soon. Fungi have long suffered from the same identity crisis as there are single- and multi-celled forms. As late as the 1980s some researchers have argued the kingdom Fungi was an artificial group. Advanced molecular tools have quelled those arguments but led to the discovery of Cryptomycota and Microspora and new discussions of just what a fungus is. Similarly, discoveries are coming to light almost daily about our own microbiota and microbiome (the bacterial world that lives on and within each of us) that calls into question just what it means to be a human. What is a species? What is sexual reproduction? All the most basic concepts of Biology, right? When applied to bacteria, things are different. (All the while keep telling yourself, this is not strange, or an exception to any rule. Most life on the planet is microbial, thus the microbial way is more typical than we would suppose.) That bacteria do not sexually reproduce (and that is open for debate), does not mean they go without genetic diversity. Turns out DNA is coming and going (termed lateral gene transfer or LGT) from many (most? all?) the individuals in a community. And recent findings are showing that eukaryotes are involved in LGT, in some capacities as well: plant-to-fungi, fungi-to-plant, and fungi-to-fungi transfers are all known to occur even if the mechanisms are not yet understood well. I did have one quibble regarding O'Malley's overly simplistic discussion of sexual reproduction, its role in bringing about genetic diversity, and how bacteria obviate the need for sexual reproduction (via LGT and some other genetic tricks). The benefits of sexual reproduction in organisms are not solely of genetic diversity. Hamilton and Axelrod brilliantly showed that sexual reproduction is highly advantageous (and thus highly selected for) for ridding the next generation of cellular parasites (e.g. in animals, when the sperm cell fuses with the egg cell, all the cellular parasites and other baggage of the male is left behind, outside the egg). But that's a minor quibble. Another was the very lengthy discussion of magnetotaxis in

the very first chapter. (Magnetotaxis is the capacity of some bacteria to use the earth's magnetic field to move away from regions with an excessively high concentration of oxygen. The philosophical question is then whether the magnetotaxis forms part of their perception of the world.) Another minor quibble. My biggest beef with *Philosophy of Microbiology*, and it's not a deal-breaker, was the lack of due given microbes to the current Era of Genomics were now entering. Basic biology, taxonomic, medical, genetic, agricultural so many disciplines of biological research have exploded in just the last few decades and it's all due to brand new tools for investigating and tinkering with the DNA of organisms. And just about all of this has come about because of the informational and physiological simplicity of microbes. This was hardly discussed. Barely a mention of PCR (and no mention at all of its colorfully famous inventor Kary Mullis). These few minor shortcomings aside, *Philosophy of Microbiology* presents some fascinating at times astounding discussions of a world all around us. But a world that most of us never get to see. -Britt A. Bunyard (Review originally published in *FUNGI* 2015, vol 8 no.3.)

Microbes and microbiology are seldom encountered in philosophical accounts of the life sciences. Although microbiology is a well-established science and microbes the basis of life on this planet, neither the organisms nor the science have been seen as philosophically significant. This book will change that. It fills a major gap in the philosophy of biology by examining central philosophical issues in microbiology. Topics are drawn from evolutionary microbiology, microbial ecology, and microbial classification. These discussions are aimed at philosophers and scientists who wish to gain insight into the basic philosophical issues of microbiology.

"Many readers will be familiar with the basic concepts behind the topics discussed in this book, but the author's treatment of these topics is guaranteed to make readers think about them more deeply and in new ways ... Recommended. Graduate students, researchers/faculty, professionals/practitioners." R. K. Harris, *Choice* "Philosophy of Microbiology raises new questions relevant to both historical and contemporary topics in the philosophy of science, such as modelling and individuality. I recommend this book to philosophers of science who wish to see old philosophical questions in a new and stimulating context." Alison K. McConwell, *British Journal for the Philosophy of Science* "Philosophy of Microbiology is a thought-provoking and comprehensive look at the influence of microbiology on how we conceive of and study the living world." Paul Sniegowski, *The Quarterly of Biology* About the Author Maureen O'Malley is a Senior Researcher in the Department of Philosophy at the University of Sydney.