

All These Worlds Are Yours

The Scientific Search for Alien Life

Jon Willis

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In *All These Worlds Are Yours: The Scientific Search for Alien Life*, Jon Willis poses an unusual challenge to his reader: Given a budget of \$4 billion, take a major step forward in the search for life beyond Earth. To prepare readers for the task, Willis introduces them to astrobiology, a subject predicated on the assumption that Earth is not the only incubator of life in the universe.

As a reader, you essentially become a student in Willis's astrobiology class for nonscience majors. Your guide lowers the lights and takes you on a journey from Mars to the nearby stars and draws from his own experiences as an astronomer to answer some of the most important questions scientists are grappling with. Readers are invited to propose missions to far-away solar systems or spend their funds on new high-powered telescopes to examine distant exoplanets. For the farthest of those, we can only hope to monitor atmospheric gases as we look for evidence that respiration is upsetting the expected gas equilibrium.

The first chapters read like a tour through the Library of Congress's science section, narrated by Bill Nye and conducted while speeding through on roller skates. This quick romp through the fields of cosmology, geology, biology, and the entire history of life on Earth leaves the reader breathless. Amazingly, the important and controversial topic of evolution, part of every astrobiologist's conception of life, is given a mere two-sentence explanation with a footnote that instructs the reader to refer to *The Blind Watchmaker: Why the Evidence of Evolution Reveals a Universe without Design* by Richard Dawkins (Norton, 1987). So be forearmed and read Dawkins first, for astrobiology cannot be properly understood without knowledge of how evolution allows life to adapt to any habitable environment.

Once Willis has gotten his readers up to speed as amateur astrobiologists, he presents the most enjoyable part of the

book, chapters 4–8. There, he reveals the current status of the search in our galaxy for habitable zones—the locations in the solar system and nearby star systems that have a chance of maintaining the complex chemistry that is the basis for any reasonable notion of life. In particular, he explores current data sets from the astronomical locations where the chances of finding alien life are highest. He starts with Mars, progresses to the water-rich moons of Jupiter and Saturn, and finally examines the plethora of exoplanets that are being cataloged and studied.

Through well-posed questions, the reader is prompted to think about how to spend his or her imaginary budget on missions to each of these recently discovered habitable zones. Choices must be made because the budget—just like the actual NASA budget—is not large enough to do justice to every potential habitable site. Willis is not reticent in giving his own opinions on how the funds should be allocated, but he understands that the reader may not agree.

The book ends with a discussion of SETI's speculative search for intelligent life and the huge interest that would come from the interception of intelligent radio signals from a distant star. However, Willis does not give SETI much chance of success; two-way communication would be nearly impossible for all but the closest stars.



As much as I like Willis's descriptions of planetary destinations for future missions, I find several weaknesses in this book. First, it has no illustrations, even though well-chosen figures would make remarkable phenomena like the geysers of Enceladus a visual reality; nor are there references to webpages that contain such images.

I also found the introduction to be too broad and shallow. Willis could have omitted the cosmology and concentrated on the development of the solar system and history of life on Earth and, yes, dedicated a section to the theory of evolution. Once the chemistry of the cell is explained, the reader will be able to understand the role of the mutations and adaptations that enable the famous survival of the fittest to proceed. The footnotes and reference books recommended are a bare minimum from the vast library that is available. Also, although the delivery is meant to be amusing and fun, it often falls flat, and the jocular tone can distract and annoy the reader.

For a more scholarly but still readable approach to the subject for the beginner, I recommend *Astrobiology: A Very Short Introduction* by planetary scientist David Catling (Oxford University Press, 2013). Catling fills in some of the gaps in the Willis book; for example, he gives a fuller treatment of complex topics like greenhouse warming. However, the wide range of scientific explorations that make up astrobiology require more than one quick read. For you nonscientists interested in the subject, a variety of books—including Willis's—and a search of the latest images online will make all these worlds yours.

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Placing Outer Space

An Earthly Ethnography of Other Worlds

Lisa Messeri

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Photographic panoramas from Mars and flyby shots of Pluto often give lay observers the illusion that they are witnessing planetary exploration firsthand. But such images offer no view of the actual human work of planetary

exploration. The scientists and engineers who work on planetary missions tend to be eclipsed by the technologies they have developed or the discoveries they have made. That

