

**Five Billion Years of Solitude: The Search for Life Among the Stars** **FREE**

Marc Kushner



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overview reading. Nonetheless, the student will need to go elsewhere for greater detail on those topics.

I particularly enjoyed reading through the end-of-chapter exercises, which presented real-world examples, not abstract physics puzzles. I was also pleased to see the out-of-the-box question asking students to estimate the total lifetime cost of building and launching a space satellite. Most, if not all, contemporary professional astronomers need to tackle such questions of cost analysis.

Two other good recent multiwavelength treatments are George Rieke's *Measuring the Universe: A Multiwavelength Perspective* (Cambridge University Press, 2012) and Edmund Sutton's *Observational Astronomy: Techniques and Instrumentation* (Cambridge University Press, 2012). Like Lawrence's book, Rieke's covers all the basics, but it is more geared to graduate-level work. And it features the traditional separation of wavelength regimes. In *Measuring the Universe*, there is much more physics, leading to a large number of equations that interrupt the flow of the text. *Observational Astronomy* is an intense read adapted from a graduate course aimed at both the theorist and the observer. It also separates the wavelength regimes and is more mathematically oriented; in particular, it provides a greater coverage of statistics. Nice sections on cosmic-ray, neutrino, and gravitational-wave detectors also make it suitable for the experimental physicist.

The theorist may do better with Sutton or even Rieke. But the student will find that Lawrence hits all the vital points, and the observer will find that everything he mentions is of practical value.

**Kimberly Weaver**

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## Five Billion Years of Solitude

### The Search for Life Among the Stars

Lee Billings

Current, 2013. \$27.95 (304 pp.).

ISBN 978-1-61723-006-6

Back in rosy 2001, the search for extraterrestrial life was taking off. The SETI Institute was developing the huge Allen telescope array. NASA was studying a \$10-billion mission concept called the

Terrestrial Planet Finder to discover habitable worlds orbiting other suns. (I designed instrumentation for that project.) In *Five Billion Years of Solitude: The Search for Life Among the Stars*, journalist Lee Billings paints a desolate picture of how economic and ecological calamities have dampened those and other grand dreams. At the same time, the book celebrates the ongoing work and the tenacious spirit of the scientists involved.

Seeking life on extrasolar planets has become a subfield of its own. Billings




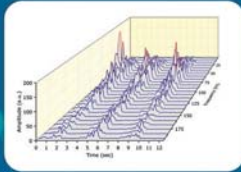
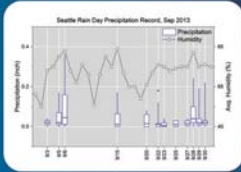
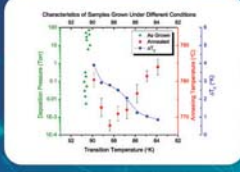
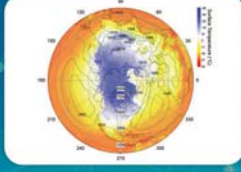

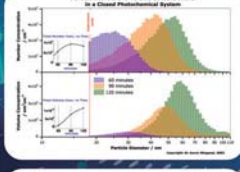
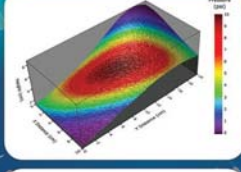
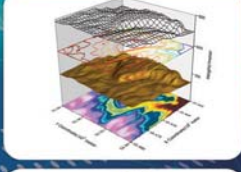
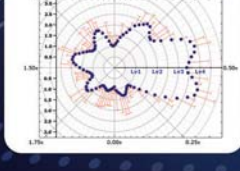
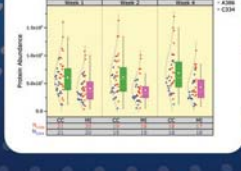

highlights some of the discipline's core concepts, including the Drake equation, the carbon cycle, and various methods for finding extrasolar planets. Balancing lofty visions with down-to-earth economics, he also discusses such controversial topics in space politics as the cancellation of the US space shuttle program and the dollar value of a habitable planet.

But education is not all the reader will receive from *Five Billion Years of Solitude*. The book also portrays—like

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no other I have read—the losses that astronomers and planetary scientists in the field have struggled with during the past decade and the determination and hope that have carried us along. Many of the contemporary players are my friends and colleagues; their touching portraits ring true.

All the characters mentioned, including the historical ones, have stories of perseverance whose details both terrify and inspire. French astronomer Guillaume Le Gentil waited in Asia for eight years to observe the 1769 transit of Venus and returned home to Paris to find himself declared dead and his estate dissolved. And MIT planetary scientist Sara Seager lost her husband to cancer in 2011; as a widow and single mother, she became even more dedicated to finding Earthlike extrasolar planets.

*Five Billion Years of Solitude* avoids most of the clichés of popular books about aliens even if it does include one appearance of the “mind like a steel trap” metaphor and several (maybe too many) uses of the word “vast.” Although the information presented is generally easy to absorb, I found myself wishing for a few illustrations depicting such abstract concepts as gravitational lenses and cosmic time. And only once did I wince at a scientific mistake: Radio telescopes can be made much larger than optical telescopes—not because different wavelengths have different light-gathering requirements, as suggested on page 170, but because their surfaces do not need to be as precisely shaped. Billings can easily fix this in the next printing.

I was a pale and pudgy postdoc when I joined the NASA panel for the Terrestrial Planet Finder. I felt like I had been called to serve on the Manhattan Project. It seemed like the most pressing technological issue of the time was the search for microbes on other planets. Now that those dreams have faded, I’ve sometimes felt wounded and lost. But this book showed me a welcome glimpse of how my colleagues are dealing with the situation—as scientists, we don’t often get to share our feelings with one another directly.

Maybe Earth’s inhabitants are destined to remain alone among the stars. But as Billings realized, sharing our solitude—and a good story or two—makes it seem a little bit less lonely.

**Marc Kuchner**

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