

understand and profit from West's explanations. Physics students looking for a simplified introduction to the subject might find the book useful (but they would have to overlook what appears to be a misapplication of Kirchhoff's laws on page 97).

The biomedical content of the book manifests itself in two ways. First, the author uses examples from physiology: Stability is illustrated through graphs displaying the strength of bones, fractal geometry is exemplified by models of the lung and chaotic dynamics by the analysis of electrocardiograph traces. Second, the author chooses specific topics at the forefront of medical research and discusses and studies them in some detail using methods he has described earlier for the analysis of experimental data. These descriptions of experimental analyses are by far the most interesting and useful parts of the book—perhaps because such mundane yet essential topics rarely appear in textbooks. The author explains in detail how to compute Lyapunov exponents, fractal dimensions, correlation functions, power spectra, time series and return maps, as well as how to reconstruct attractors. In the last chapter of this short monograph, specific biomedical data are presented and analyzed according to these techniques. Would-be experimenters and data analysts in all areas of dynamical-systems research—not only biomedical fields—might find this chapter useful and informative.

So far I have given only the good news. The bad news is that this book is so badly written that it is painful to read. In all sincerity, I can say that it is the worst-written book I have ever read. There are abundant errors of every type—misspellings, solecisms, mispunctuations and run-on sentences, to name only a few. Part of the problem is perhaps due to poor editing of the manuscript. Be warned: If you buy this book, be prepared to cringe several times per page.

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The Cosmic Water Hole

Emmanuel Davoust
MIT P., Cambridge, Mass.,
1991. 206 pp. \$19.95 hc
ISBN 0-262-04114-6

Contemplation of life elsewhere in the universe is common to almost all cultures and ages. In ours, discussion of extraterrestrial life involves much more than scientific issues, and for

better or worse, opinions are shaped by everything from supermarket tabloids, science fiction, the global economy, religious and intellectual orientation and attitudes about technology, not to mention ambition and turf protection in the sciences.

The Cosmic Water Hole, a translation from the French, is a book for lay audiences concerning the existence and search for extraterrestrial life. Emmanuel Davoust, an astronomer who studies galaxies at the Observatoire du Midi-Pyrénées, surveys current views of the origins of life on Earth and extrapolates to future times and other worlds. Following conventional wisdom, which asserts that evolution and Copernicanism require the ubiquity of life, the author discusses panspermia, the idea that life on Earth began extraterrestrially, and the prospects for our eventual colonization of space, whether driven by curiosity or catastrophe.

Important themes thread the work. First is the connection between life on Earth and geologic and cosmic activity: that life itself has modified the atmosphere significantly, subsequent to the subsidence of volcanic activity. As a counterpoint, the precariousness of life brings up topical issues, such as global warming and the runaway greenhouse effect, along with the near consensus view that an astronomical catastrophe played a key role in the demise of dinosaurs and the subsequent hegemony of mammals.

A second theme is the punctuated manner of scientific progress, discussed through examples of both the misadventures of science (claims of canals on Mars and other spurious discoveries, problems with science in the US space program, debate over SETI) and the successes (understanding of stellar evolution, the general context of big-bang cosmology, studies of Antarctic meteorites, existence of protoplanetary disks, prospects for discovering extrasolar planets). The politics of science is illustrated through the debate over whether searches for signals or other manifestations of extraterrestrial intelligence are worth pursuing. This latter discussion, which reveals the difficulties of communication and consensus among ourselves, is a sobering anecdote for heady conjectures about two-way communication with other civilizations.

The book discusses past and current attempts at detecting signals from extraterrestrial sources, beginning with Frank Drake's OZMA in 1960. Detection of and contact with extraterrestrial life require a hierarchy of conditions to be satisfied, the book-

keeping for which is contained in the venerable Drake equation. A short description of the largest SETI project under development, NASA's Microwave Observing Project, to commence in the mid-1990s and proceed into the next century, helps introduce the notion of the waterhole, a microwave band containing spectral lines from atomic hydrogen and hydroxyl molecules. The book finishes with a brief discussion of what it means that human beings exist on this planet, given the physical requirements for our existence, and the likelihood that Earth-like conditions may be produced elsewhere. The impact for us of searches outward is posed in terms of the possible shock of contact and contrasted with the inner glow we might feel if we knew that the universe was generally inhabited rather than empty.

The style of *The Cosmic Water Hole* is broadbrush. As such, the author leaves out details that would be of interest to more technically inclined readers. The author compensates for this lack of depth by weaving into the discussion much of the conventional wisdom about the physical universe, including big-bang cosmology and the arrow of time. The reference list serves as a reasonable gateway to the literature, but the book suffers from the absence of an index. A glossary of terms would have been helpful, particularly for lay readers. In places the translation is coarse, and some of the quantitative aspects are inconsistent in different parts of the book.

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NEW BOOKS

Condensed Matter Physics

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