

experts disagree about how the evidence should be interpreted. Fagan's attempts to use scientific methods to unlock non-western world views are not always successful. Although the linked chapters on current thinking about Palaeolithic cave art and ethnographic San (Bushman) art from South Africa work well, it is all too easy (and misleading) to think of the former as simply a more ancient version of the latter. Transforming shamans, magical visions and supernatural animals may be more attractive than old ideas such as 'sympathetic hunting magic', but they remain assumptions for all that.

Nevertheless, the first part of the book is effective: the stories are fresh, the insights dramatic, and Fagan tells the unfolding drama with verve. The chapter about the power of ancestors among the Dande of central Africa sparkles, mainly because of the author's direct involvement with archaeological investigations there. This is Fagan at his best.

But the narrative loses tension and focus as soon as it touches Stonehenge. Perhaps this most famous of megalithic monuments is just too familiar and over-published for a brief chapter to grab attention. Whatever the reason, the book's momentum and novelty fall away sharply from this point. Despite an interesting vignette of Colin Renfrew's work on the archaeology of cult at the Aegean site of Phylakopi, and an erudite and well-rounded account of North American Moundbuilders, there is little in the second half of the book to compare with the first. A lack of sharpness, some throwaway 'I was there' phrases and a sense of skimming across important issues do not help.

Towards the end, one could almost sense the publisher's deadline approaching. The chapter on the Maya is far too cursory, and the penultimate offering on Aztec Mexico contains nothing that has not been published many times before in popular books. An account of the 30-year-old project to map the pre-Aztec metropolis of Teotihuacan, a standard account of Aztec history, warfare and sacrifice, and a few pages about the excavations of the late 1970s at the Great Aztec Temple, peppered with snippets on sacred landscapes, do not really gel. The material is startling indeed, yet for some reason the account fails to connect.

Fagan has spotted a gap in the market, and with considerable skill has positioned this book accordingly. Its topicality, wide-ranging examples and lack of serious competitors make it a welcome introduction to what he calls "the archaeology of the intangible". Nevertheless, I was left with a sense that, given a little more time, this could have been so much better. □

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Is anybody out there?

Other Worlds: The Search for Life in the Universe

by Michael D. Lemonick
Simon & Schuster: 1998. Pp. 272. \$25

Alien Life: The Search for Extraterrestrials and Beyond

by Barry Parker
Plenum: 1998. Pp. 254. \$27.95, £16.94

Astronomical and Biochemical Origins and the Search for Life in the Universe: Proceedings of the 5th International Conference on Bioastronomy (IAU Colloquium 161)

edited by C. B. Cosmovici, S. Bowyer and D. Werthimer
Editrice Compositori: 1997. Pp. 814. \$100, Lire 160,000 (pbk)

David W. Hughes

The progress of science depends not only on asking the right question, but also on having the technical ability to make a reasonable attempt at producing an answer. Here the question is: "Are we alone in the Universe?". There are three possible answers: "Yes", "No" and "Don't know". At the end of the twentieth century we are still firmly stuck with the last one. Moving to either of the other possibilities would be one of the most significant steps in the history of scientific endeavour.

The answers "Yes" and "No" would be equally amazing, but the former would never be accepted. The Universe is so vast, and has already existed for so long, that we would never prove to everyone's satisfaction that a scintilla of life does not exist beneath some far-off stone, or on a planet behind one of the billions of distant stars.

But if we are not alone in the Universe, why have our co-inhabitants not been to see us, or at least phoned? Why is the Earth not littered with the remnants of crashed interstellar probes? Why are our skies not alive with the cross-talk of millions of interstellar communications? Our technological sophistication is not a serious problem here; the existence of extraterrestrial life should be obvious just by looking and listening.

If it is assumed that life is ubiquitous, we then have to ask if it is all based around the chemistry of carbon, and whether water is the universal solvent. Is the creation of life inevitable wherever it is warm and wet for aeons? Does all universal life depend on DNA, RNA and protein? And does it always take about 2.5 billion years for blue-green algae to evolve into *Nature* readers?

Why are there millions of living species on Earth but only one species of high intelligence? Does some extraterrestrial life also become intelligent, inquisitive and techno-

logical? Does it also develop the potential for self-destruction? And, assuming that life does exist out there, where does life on Earth rank in the intelligence and development league table of the Universe?

These and other bioastronomical questions have taken on greater urgency with the recent discovery of a host of planets around nearby Sun-like stars, hints that life could have existed on our neighbouring planet Mars, and the realization that conditions on Jupiter's moon Europa might be conducive to microbial life. This urgency is spawning conferences and books.

Astronomical and Biochemical Origins and the Search for Life in the Universe is a collection of 84 papers and reviews that were given in July 1996 at a bioastronomy conference in Capri, Italy. The topics include organic material in interstellar clouds, comets and meteorites; the search for planets around nearby stars and the form and distribution of these planetary systems; the origin and evolution of life and intelligence; and SETI, the search for extraterrestrial intelligence in the radio, infrared and optical wavebands. The author list is replete with the names of the famous, and to have three Nobel laureates at the same small meeting is most unusual. The papers are erudite but remarkably easy to understand: the interdisciplinary nature of this field forces researchers to keep jargon and obscurity to a minimum.

Other Worlds by Michael D. Lemonick and *Alien Life* by Barry Parker are both first-class, entertaining and authoritative examples of the art of scientific popularization; it is very difficult to choose between them. Both distil the contents of the bioastronomy enterprise and present a highly readable account of present progress and possible future developments.

Lemonick spent a great deal of time travelling to observatories and laboratories and talking to the astronomers and other scientists who are working at the frontiers of this fascinating subject. His account is full of anecdotal insights.

Parker, on the other hand, concentrates on the science and ideology. He contrasts panspermia with spontaneous generation, reviews the various forms of the anthropic principle, considers the influence of the discovery of extremophiles on the extent of stellar habitable zones, re-examines the Drake equation, and balances the expected waves of galactic colonization against the perceived absence of the 'calling cards' of extraterrestrial visitors. His speculation is firmly based on sound, well explained scientific principles, and he encourages us to prepare for the inevitable — and not too distant — conversation with an alien. □

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