

Alone in the Universe?

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Extraterrestrial Intelligence. By Jean Heidmann. Cambridge University Press: 1995. Pp. 235. £16.95, \$24.95.

Extraterrestrials: Where are They? Second Edition. Edited by Ben Zuckerman and Michael H. Hart. Cambridge University Press: 1995. Pp. 239. £25, \$39.95 (hbk); £11.95, \$19.95 (pbk).

It is indeed sobering that, after almost four decades of scientific investigations into extraterrestrial life, the field of exobiology (or bioastronomy) thrives despite its inability to demonstrate that its subject matter even exists. The modern era began in 1958 with the suggestion (in *Nature*) by Giuseppe Cocconi and Philip Morrison that a search should be made at radio wavelengths for signals originated by extraterrestrial intelligence. There have been more than a hundred searches (mostly at radio wavelengths), a few of which have been multi-year efforts sweeping the entire sky at specific frequencies. In 1976, a more direct approach was taken when the Viking spacecraft searched for evidence of organic chemistry in the Martian soil. Although nothing has yet been found, our Copernican sensibilities continue to foster the idea that we are unlikely to be special.

Extraterrestrial Intelligence by Jean Heidmann, an astronomer at the Paris Observatory, Meudon, is an excellent translation of the 1992 French original. Aimed at the general public, it succinctly covers all the important aspects of the field. In the first half, Heidmann takes the reader all the way from the Big Bang to the formation of the Solar System and the origin and evolution of life. He then deals in the second half more specifically with extraterrestrial intelligence — what it might be like and how one might search for it. Actual searches are described right up to Project Phoenix, the aptly named successor to the NASA project that the US Congress axed in 1993, as well as Projects Serendip and BETA, which now each simultaneously sample 200 million frequency channels. Heidmann writes in a lucid, agreeable personal style, but the lack of editing for an international audience seems peculiar — one is ever conscious that the book was originally written for readers in France (for example, Fourier transforms cannot be mentioned without referring to Baron Joseph Fourier himself). Also unusual for a popular book is the lack of illustrations, but this does not noticeably

detract from its accessibility.

Extraterrestrials: Where are They? edited by the astronomers Ben Zuckerman and Michael Hart stems from a 1978 symposium, but in this expanded second edition about a half of the text is either revised or

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Artist's impression of a remote-controlled robot for lunar mineral prospecting. In *Moon Handbook: A 21st Century Travel Guide*, Carl Koppeschaar weaves fact with fiction in an imaginative excursion around Earth's nearest neighbour in the year 2020. Moon Publications, \$10, £6.95 (pbk).

entirely new. Almost half of the individual chapters are moderately technical, the others more accessible for nonexperts. Authoritative, precise and well-written treatments are given for topics including the origin of life, evolution, interstellar travel and colonization techniques, UFO debunking, and search strategies for extraterrestrial intelligence. The tenor of the volume is sceptical about the idea that extraterrestrial intelligence exists at all, although more optimistic views are fairly

represented. The central argument against the existence of extraterrestrial intelligence, sometimes called the Fermi paradox, is that, if it is abundant in the Milky Way, then surely at least one technical civilization would have embarked on interstellar colonization and would now indeed pervade the entire Galaxy. Since "They" evidently are not now in our planetary system, then they must not exist at all.

The evolutionary biologist Ernst Mayr rails against physicists and astronomers who are optimistic about the existence of extraterrestrial intelligence, arguing that their biological naivety has misled them, and that the probability of intelligence and radio-bearing culture arising on an Earth-like planet is infinitesimally small. In fact, much of the intractability of estimating the likelihood of other life forms is precisely because we have of course only one example and have no robust way to estimate its *a priori* probability.

Pat Rawlings/NASA

The cosmologist Richard Gott intriguingly uses the Copernican principle (as in his article in *Nature* 363, 315; 1993) to estimate that the number of radio-transmitting civilizations in the Milky Way may be as high as 100 (with 95 per cent confidence), implying that our nearest neighbour is relatively distant and will not be detected unless its power levels greatly exceed ours.

The eleven chapters that remain unrevised from the first edition are in general not out of date, with the exception of Hart's on the habitability zone for planets around a star. In a 1979 study he argued that life-supporting conditions could last for billions of years on an Earth in only a razor-thin range of distances from the Sun (5 per cent of that of the Earth from the Sun), but recent work by J. Kasting and colleagues has widened this zone by a factor of roughly ten.

As we learn more and more about the Universe, the debates and research on the origin of life, extraterrestrial life and extraterrestrial intelligence will but grow. Discoveries such as that of the planets recently detected orbiting other Sun-like stars only whet our appetite and spur us on to scientific exploration of this fundamental question. In the sixteenth century, Europeans asked "Could it be that we are not at the centre of the Universe?". Four hundred years later, humans similarly ask "Could it be that we are not alone?" □

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