Outward Searchers

SETI Pioneers. Scientists Talk about Their Search for Extraterrestrial Intelligence. DAVID W. SWIFT. University of Arizona Press, Tucson, 1990. xiv, 436 pp., illus. $35.

Are we alone? The question of extraterrestrial life is at once one of the oldest and one of the most profound. It is only in the present generation, however, that planetary exploration, radio astronomy, studies of the origin of life, and electronics have synergistically matured and produced at their confluence a scientific community interested in the Search for Extraterrestrial Intelligence (SETI). The first milestone occurred in 1959 with the seminal article of Philip Morrison and Giuseppe Cocconi pointing out that radio communication between the stars was possible with our present technology and that the 21-centimeter wavelength emitted by hydrogen provided a preferred channel. At the same time, Frank Drake independently came to similar conclusions and carried out the first radio search for extraterrestrial life. The book *Intelligent Life in the Universe* (1966) by Carl Sagan and Iosef Shklovskii had an enormous effect on both professionals and laypersons, as did the NASA *Project Cyclops* report (1971) by Bernard Oliver and John Billingham. As SETI gained some respectability, further radio searches were carried out on a small scale in both the United States and the Soviet Union. This led by the mid-1970s to a push within NASA for a long-term SETI project, one that has only in the past year received a green light—first observations are planned for the Columbian quincentennial in 1992.

It is this pioneer epoch in the development of SETI that David Swift, a sociologist at the University of Hawaii, has sought to capture in his book. The format is highly unusual—with the exception of short introductory and concluding sections, *SETI Pioneers* consists solely of transcripts of interviews with 17 of the key persons in the field. One might think this a deadly formula, but in fact the interviews are smoothly transcribed and Swift in most cases has skillfully remained in the background and let the interviewees speak for themselves. Thus he allows some of the most imaginative scientific thinkers of our time to hold forth on their views regarding SETI and extraterrestrial life and on how the field has developed. On the other hand, substantial editing of these interviews would have improved the ratio between questions and answers that are meaty and intriguing and those that are routine, repetitive, or uninteresting. Furthermore, there appears to have been little if any checking of the accuracy of the interviewees' statements. There are many basic errors (historical and otherwise) and in several cases inconsistencies between interviews. Nor does Swift supply any footnotes or cross-references at points where the nonexpert could have used assistance in understanding an allusion or a technical term (although there is a brief glossary).

Swift's goal in presenting complete transcripts was to create an unbiased text from which readers could directly learn about individuals' ideas and personalities. Indeed, the book's great strength is that one meets fascinating characters—insightful, erudite, and even witty—and is exposed to a host of provocative scientific, political, and philosophical views (many having little to do with SETI). Oliver likens the Galactic Club of technical civilizations to the National Academy of Sciences: both organizations spend most of their time deciding about new members. Morrison describes congressmen as Aristotelian in the sense that they assume that Earth is the center of the universe and that we need to clear up problems here before finding out about other worlds. Charles Seeger describes the entire history of life on Earth as only "one powerful datum" and says we need to find more such "data." Billingham describes the troubles a SETI project has had fitting into NASA's usual style: "The contrast couldn't be more extreme between SETI and sending a spacecraft that you know will land on Mars within three seconds of four o'clock in the afternoon on a certain day in August 1994." Melvin Calvin gives the views of a biochemist. Freeman Dyson suggests looking for telltale radio emission from the "skid marks" of a braking interstellar spacecraft. Jill Tarter and Paul Horowitz give the views of a later generation. Interviews by Oliver with three Soviet SETI practitioners are also included. The most interesting of these is with Nikolai Kardashev; for instance, we learn of the influence in the 1950s of one Professor Tihov in Kazakhstan who demonstrated that plant life existed on Mars in his laboratory of "extraterrestrial botanics."

These relatively raw transcripts thus have their positive aspects, but they also mean that *SETI Pioneers* fails as a scholarly work. I would have been far more satisfied if Swift had given us a book analyzing in detail (and quoting interviews to support arguments) the kinds of questions raised in the preface and discussed in the brief conclusions: Who were these scientists who became involved in what at first was very much a fringe enterprise? What was in their personal and professional backgrounds that might have led them toward SETI? How were they viewed by their colleagues? Swift points out that all the SETI pioneers have been highly respected in their primary disciplines, but nevertheless are willing to spend a small (in most cases) fraction of their time in this type of speculative exploration. Almost all are from urban centers of high technology or prestigious universities, with Cornell University and Silicon Valley playing major roles. Swift also discusses how the astronomer Otto Struve was an important catalyst in the early development of SETI and uncovers the remarkable statistic that the SETI pioneers are without exception first-born sons or only children. But this type of discussion and analysis makes up only 5% of the book.

SETI Pioneers is thus a problematic book of unusual format about fascinating people engaged in an exciting endeavor. It has notable strengths and glaring weaknesses. I suspect that readers will react with a range of opinions as broad as those concerning the likelihood of success in SETI itself.

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An Explanation of Behavior

The Triune Brain in Evolution. Role in Paleocerebral Functions. PAUL D. MACLEAN. Plenum, New York, 1990. xxiv, 672 pp., illus. $75.

Paul MacLean was one of the trailblazers of neuroscience whose work in the 1940s and '50s provided many of the insights into the functions of the brain upon which today's neuroscientists build. MacLean in particular made contributions that drew attention to the role of brain areas such as the amygdala, septum, and cingulate cortex in emotion and motivation. He introduced the encompassing term *limbic system* to recognize the functional interrelatedness of these brain