Book Reviews

On a Threshold

The Galactic Club. Intelligent Life in Outer Space. RONALD N. BRACEWELL. Freeman, San Francisco, 1975 (trade distributor, Scribner, New York). xiv, 142 pp., illus. Cloth, $6.95; paper, $3.95. The Portable University. Reprint of the 1974 edition.

Prehistoric man sought intelligent beings across neighboring mountains; the ancients of Greece and Rome ventured across their central "Mediterranean" locations; the early and medieval Europeans voyaged across the New World's oceans; and so it is now that modern civilization has begun to seek out extraterrestrial intelligence across our Milky Way galaxy and perhaps across galaxies beyond.

Evolving from a common biological ancestor which arose from a complex chronology of elemental and chemical syntheses extending over billions of years, we have reached an impasse after having systematically, albeit not terribly intelligently, explored our planet for rational creatures and valuable resources. But given the nearly trillion trillion stars in the observable universe, some of which are bound to have conditions like those on Earth or otherwise suitable for the evolution of intelligent life from abiological matter, it seems almost inevitable that the universe be teeming with life. Consequently, we now find ourselves on the threshold of the next great evolutionary leap forward—gaining membership in the community of galactic civilizations.

How can we make contact with extraterrestrials? Most analysts prefer electromagnetic waves, especially microwaves, as a means, since they are completely unattenuated by interstellar debris. In *The Galactic Club*, R. N. Bracewell reviews the by now standard arguments for eavesdropping with large radio telescopes in order to initiate contact with advanced civilizations. Through rather shrewd, often convincing examples, mostly scientific but some monetary and political, he suggests that, even with an enormous orchid of 1000 or more radio telescopes (Project Cyclops), substantial difficulties would be encountered in any search or precontact phase, especially the precise choice of a radio frequency.

As an alternative to that strategy, Bracewell reviews his earlier proposals that unmanned interstellar probes constitute the preferred method of contact. Enormous amounts of information can be integrated on board messenger probes parked in the vicinity of a candidate star. Bracewell considers at some length, although nontechnically, how we might recognize such probes sent toward our Sun by distant civilizations, and how we might launch probes to nearby stars in the next millennium. Surveying the case for evidence of past extraterrestrial visitations, he does not hesitate, like all good scientists, to assault the chariots of von Däniken.

The Galactic Club is a short, entertaining book that can be read in a few hours. Lively scenarios illustrate the text, from the emergence of life in a prebiological setting to the colonization of substantial fractions of galactic real estate, and novel illustrations are interspersed. The dialogue is nontechnical, completely understandable to the layperson. Bracewell's discussions of political headaches, alien life-styles, and galactic cultures will entertain the most nonscientific minds. For the numerically inclined, there is a Reader's Guide to the more technical literature. I recommend *The Galactic Club* as a supplement for the nontechnical astro-bio courses that are currently enjoying wide popularity on many college campuses. Today's students want to know who we are, where we are going, and how we relate to the remaining portions of our universe. *The Galactic Club* attempts to place answers to these questions in proper perspective.

Ultimately, however, the prospect for contact with extraterrestrial civilizations is a direct function of the number of such civilizations present in our universe. No one's estimate of this number can be better than the uncertainties of some of the key prebiological sequences that precede the origin of life. If there are many chemical evolutionary paths from inanimate matter to more complex organic things, only one of which leads to a living system, then there may not be a galactic club—we may indeed be alone. On the other hand, if life is an inevitable consequence of chemical evolution given suitable physical conditions, then there is little question that our universe is heavily populated. With the scheduled landing of two Viking spacecraft on Mars within a year, the question whether chemical evolution is rare or inevitable may be answered. Given the latter answer, Earth's application for membership in the galactic club may be approved at any moment.

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A National Repository

A Century of Zoology at the British Museum. Through the Lives of Two Keepers, 1815–1914. ALBERT E. GUNTHER. Dawson, Folkestone, England, 1975 (U.S. distributor, Science History Publications, New York). 534 pp., illus. £17.50; U.S. price, $42.

The two keepers of zoology through whom this history of zoology at the British Museum is developed are John Edward Gray, keeper from 1857 until 1875, and Albert Gunther (the author's grandfather), keeper from 1875 until 1895. The remaining years indicated in the title are dealt with only in the briefest fashion. Both keepers contributed in individual and unique ways to the growth of zoology at the Museum and to the growth of the importance of the Museum in zoological study. This book portrays their contributions through a combination of biography and Museum history. It is at times uneven, overemphasizing one or the other aspect without clearly defining the connection, but in general the information about the family backgrounds, early interests in natural history, and education of the principals serves well in providing an understanding of their roles at the British Museum.

Particular contributions to the development of the zoology department of the Museum are described in some detail. Among those of special interest are Gray's emphasis on the need for detailed catalogs, for adequate space for collections and for staff, and for qualified staff, and his concern that the Museum should serve as a place for popular education as well as scientific study. Gray emerges in this study as a museum curator whose first concerns were his curatorial duties and Gunther as a scientist whose researches were his princi-