"A world-famous outcrop of pillow lavas of Cretaceous age forming part of an ophiolite sequence, Wadi Jizi, Oman." [From *Volcanoes: A Planetary Perspective*; courtesy of D. A. Rothery, Open University, England]

Planetary Perspective can help educate those decision-makers responsible for responding to such situations, while leaving the rest of us grateful that these burdens don't fall on us.

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Radio Days

Beyond Southern Skies. Radio Astronomy and the Parkes Telescope. PETER ROBERTSON. Cambridge University Press, New York, 1992. xii, 357 pp., illus. $75 or £40.

The history of the radio telescope at Parkes in New South Wales and of the Australian radio astronomy community is of special interest for a number of reasons. First, radio astronomy is a science well defined in time, its initial growth arising directly from the radio and radar developments of the World War II period. Second, the Australian group was uniquely placed to move into high gear at the end of the war; with its wide-ranging early successes, it obtained a high profile in Australia, putting it in a strong position to seek further support for the Parkes telescope. Another reason for its success was its loose group structure, in which authority and expertise were spread among many individuals, in contrast with the "great man" syndrome that characterizes many laboratories and can leave an operation without a succession.

The evolution of radio astronomy took different forms in different countries. In Australia the CSIRO (Commonwealth Science and Industrial Research Organization) Radiophysics Laboratory, which developed its own successful radio and radar program during World War II, was given a free hand by its director, E. G. (Taffy) Bowen, to pursue whatever programs of radio research looked most promising. Within several years radio astronomy and cloud physics (including rainmaking) emerged as the most rewarding areas. A staff of skilled physicists and engineers steeped in radio techniques who had already worked together as a team and had the necessary equipment on site broke straight into the field with seminal discoveries of the radio emission from the sun and discrete radio sources. The group quickly became famous.

All the world's other major radio astronomy groups got off to a slower start. In Europe the relevant groups grew around individuals who moved from wartime radio enterprises to the universities. Not only did Europe take longer to recover from the war, the research activity had to be reestablished at new locations, with new instruments and a high proportion of new staff (mainly graduate students). The groups at the Universities of Cambridge and Manchester in the United Kingdom, Leiden in the Netherlands, and Bonn in Germany and at the Ecole Normale Supérieure in France emerged as the most successful. It is possible that radio astronomy in the United States got off to such a slow start because some influential members of the astronomical community at the time who had no involvement with radio during the war and were skeptical about the prewar discoveries of background radio emission discouraged work in this area. Lee du Bridge, head of the MIT Radiation Laboratory, which developed radar in the United States, apparently promoted the idea, although few of his staff went directly into radio astronomy. The Naval Research Laboratory carried the torch for a while but at a level that did not match efforts in Europe. It was not until the early 1950s that radio astronomy gained real momentum in the United States, with significant developments in half a dozen universities. By this time Sir Bernard Lovell had obtained funds for his 250-foot telescope and the foundations were complete.

In the late 1950s the Australian radio astronomy group underwent a major metamorphosis, leading to the decision to construct the Parkes 64-meter-diameter telescope. Strong scientific arguments were advanced for a telescope with a large collecting area, including the diversity of astronomical programs that were possible. Principal among these were radio source surveys for objects that increasingly looked to be at cosmological distances and H-line observations. In addition, the role of serendipity could not be stressed enough. The individual radio astronomy groups—previously bound together by the overarching Joe Pawsey but now operating under strong leaders of their own—could not all support the decision by Bowen to go this route. This resulted in Chris Christiansen and Bernard Mills moving to the University of Sydney, where they not only continued their own first-class work but, even more important, trained the next generation of researchers, who would be vital for the health of the present Australia Telescope National Facility.

Not only did Bowen have to promote the idea, he had to find a financial backer for the telescope. The Australian government could not cover the full capital costs. Not inappropriately, Bowen approached his former American wartime colleagues and eventually obtained grants from the Carnegie and Rockefeller foundations, despite the fact that there was no direct return to American science. The support was matched pound for pound by the Australian government.

The agreed-upon design was for a 210-foot telescope operating to a wavelength of 10 centimeters; hence this instrument would be more accurate than the Jodrell Bank 250-foot telescope completed in 1957, which could just reach the critical 21-centimeter wavelength of neutral hydrogen. Interestingly, Freeman Fox, the firm that did the design study and provided the supervising engineers, also constructed Australia's other great man-made landmark, the Sydney Harbour bridge. Like so many radio telescopes, the Parkes telescope is capable of working at wavelengths considerably shorter than the one prescribed by the original design, enabling it to respond to modern astronomical demands.

When we assess the contributions of the Parkes telescope, it is clear that the unexpected and the unforeseen feature high on the list. Top billing must go to the lunar occultation observation of 3C273, which led directly to the identification of quasars. Without doubt the radio source surveys built up over the first 10 years of the telescope's operation transformed our understanding of the southern sky. The discovery and subsequent mapping of the linear polarization of radio sources, found to be much stronger than previously believed, constituted a major contribution to the astrophysics of celestial plasmas. The detection of pulsars in the southern sky two years after the telescope was completed was another significant accomplishment. The credits should also include southern studies in line and continuum of the Milky Way, whose center passes directly overhead at Parkes.

With the 50th anniversary of the great blossoming of radio astronomy after World War II only two years away, it may safely be said that radio astronomy has come of age, taking its place alongside the other astronomies that have helped us unravel the nature of the distant universe. The large radio telescopes have a prime role to play in the future: All have been or will be resurfaced to extend their useful life. The collapsed Green Bank 300-foot telescope is being replaced by a modern instrument. Not only can they all contribute as individual telescopes, they have a unique role to play in high-angular-resolution radio astronomy through ground and space very-long-baseline interferometry.

As a historical account of a major scientific instrument and its supporting team of scientists, *Beyond Southern Skies* has been held to high standards of readability and accuracy. Peter Robertson has managed to keep the development story flowing smoothly while going into more depth on a number of closely related matters. His narrative provides interesting insight into the personalities of many of the central characters in the story: They really were human! This book is a most worthy tribute to two of the most important figures, Taffy Bowen and John Bolton (the first director of the Parkes Observatory), both of whom have died in the last year.

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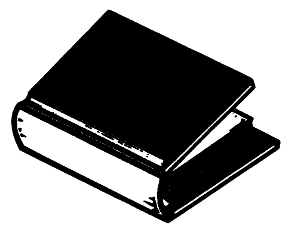

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The Activation of Dioxygen and Homogeneous Catalytic Oxidation. Derek H. R. Barton, Arthur E. Martell, and Donald T. Sawyer, Eds. Plenum, New York, 1993. xvi, 497 pp., illus. $125. From a symposium, College Station, TX, March 1993.

Aerospace Agencies and Organizations. A Guide for Business and Government. George V. d'Angelo. Quorum (Greenwood), Westport, CT, 1993. xxii, 167 pp. $49.95.

Biological Bases of Brain Function and Disease. Alan Frazer, Perry B. Molinoff, and Andrew Winokur, Eds. Raven, New York, 1993. xx, 459 pp., illus. $69; paper, $39.

Burying Uncertainty. Risk and the Case Against Geological Disposal of Nuclear Waste. K. S. Shrader-Frechette. University of California Press, Berkeley, 1993. xiv, 346 pp. $40; paper, $15.

Changing Trends in Antarctic Research. Aant Elzinga, Ed. Kluwer, Norwell, MA, 1993. xii, 161 pp., illus. $55.50. Environment and Assessment, vol. 3. From a symposium, Göteborg, Sweden, Sept. 1991.

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Darwinism. Peter J. Bowler. Twayne, New York, 1993. xii, 118 pp., illus. $24.95; paper, $14.95. Twayne's Studies in Intellectual and Cultural History, no. 6.

Distributed Cognitions. Psychological and Educational Considerations. Gavriel Salomon, Ed. Cambridge University Press, New York, 1993. xxii, 275 pp., illus. $49.95. Learning in Doing. Based on a symposium, Boston, 1990.

Efficient and Adaptive Estimation for Semiparametric Models. Peter J. Bickel *et al.* Johns Hopkins University Press, Baltimore, MD, 1993. xxii, 560 pp. $95. Johns Hopkins Series in the Mathematical Sciences.

Electrode Kinetics for Chemists, Chemical Engineers, and Materials Scientists. Eliezer Gileadi. VCH, New York, 1993. xviii, 597 pp., illus. $115; paper, $49.50.

Electronics via Waveform Analysis. Edwin C.