These minor flaws notwithstanding, the editors of *Mars* have put together a well-balanced and thoughtful collection that acknowledges the existence of many unresolved questions concerning the formation and evolution of the planet. The reference list alone is an astonishing accomplishment and a valuable resource in its own right. A few chapters, for example, those on gravity and topography, present the current state of knowledge well but will soon become obsolete. With the U.S. Mars Observer and MESUR and the Russian Mars 94 and 96 missions we are poised for a new decade of discovery. Equipped with this important source book of current knowledge, I am looking forward to continuing evolution—and revolution—in our understanding of Mars.

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Messier 31

The Andromeda Galaxy. PAUL HODGE. Kluwer, Norwell, MA, 1992. x, 358 pp., illus. $79. Astrophysics and Space Science Library, vol. 176.

Many fields of knowledge, biology for example, have been opened by surveys and morphological classification. In others, ancient Egyptian hieroglyphics for example, the detailed study of a single object provides the basis for a major fraction of future work. The Rosetta Stone of extragalactic astronomy is the Andromeda Galaxy. Andromeda, a.k.a. Messier 31 and NGC 224, is the most luminous of the three galaxies (other than our own Milky Way) visible to the naked eye, and the only one visible from the Northern Hemisphere. Andromeda is also nearly a duplicate of our own galaxy. Whereas our own galaxy is difficult to study as a whole because the solar system is deeply embedded in its gas and dust, Andromeda is arrayed before us in the full glory of a giant spiral. If the Milky Way is the *Queen Mary* of galaxies, Andromeda is the *QE II*.

In *The Andromeda Galaxy* Paul Hodge presents a summary of almost all the work done on Andromeda since the beginning of written history. The first recorded mention of the nebula was made in the 10th century by al-Sufi. Although the nebula was observed and mentioned by numerous astronomers in the intervening years, serious work on it didn't begin until near the end of the 19th century. This attention was due to two events, the development of photography to record images through telescopes and the eruption of S Andromeda or SN1885a, the first extragalactic supernova observed by humankind. S Andromeda fueled both sides of the debate on the galactic or extragalactic nature of the nebulae. This debate finally was decided conclusively by Hubble's discovery of extragalactic Cepheids, also in the Andromeda galaxy, in the early 1920s.

Hodge collects and reviews work on Andromeda's dynamics, gas and dust content, stellar populations, and radio and x-ray observations. He is at his best describing the work on stellar populations in Andromeda, to which he has made many fundamental contributions. Particularly useful is the review of his own "population box" description of a galaxy's stellar content, which is the first quantitative conceptual attempt to view the stellar content of a galaxy as more than a one-parameter family.

This book is an excellent reference for the serious student of galaxies. Every classic paper on Andromeda is cited, and all the important results are well described and summarized. Hodge takes particular pains to compare and contrast Andromeda with the Milky Way. However, in covering all the observational bases, he spends little time on the deeper astrophysical implications of the observations—the importance of Andromeda and its stellar constituents as one of the first rungs of the extragalactic distance ladder, the importance of the measurement of its neutral hydrogen rotation curve and halo of globular clusters in the dark-matter–missing-mass debate. If the reader is interested in a description of the detailed physical processes that describe a galaxy, especially its internal kinematics and dynamics, a better book would be *The Milky Way as a Galaxy*, edited by Buser and King (University Science Books), which is, in many ways, complementary to *The Andromeda Galaxy*.

This is not a book for the general reader. The presentation is very dry and only a little of the author's own spirit and incisive interpretation is in it. There are several minor references given in the text but missing from the reference list. On the other hand, I'm sure glad I now have the book on *my* reference shelf.

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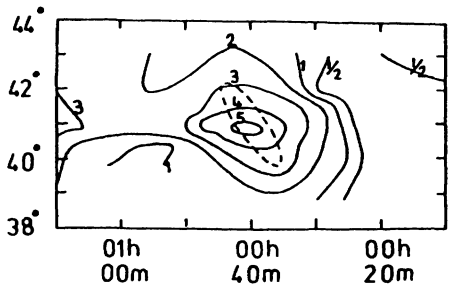
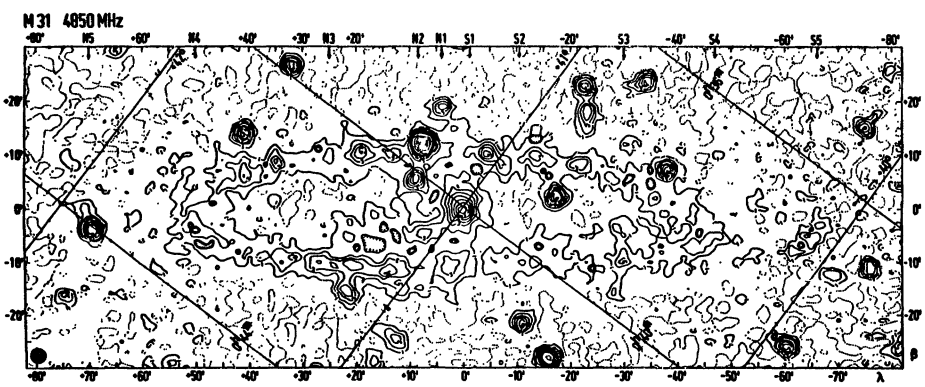


"The first radio continuum map of M31," made by R. Hanbury Brown and C. Hazard in 1950. M31 "was the first object that Hanbury Brown and Hazard turned to after getting the Jodrell Bank 218-foot transit telescope in final form for observing. . . . It took them 90 nights, working during the radio-quiet time around midnight, to map out the radio radiation" shown here. [Reproduced in *The Andromeda Galaxy* from W. Sullivan, Ed., *The Early Years of Radio Astronomy* (Cambridge University Press, 1984)]



"Contour map of M31 at 4850 MHz, clearly showing the 10 kpc ring structure. Arrows indicate positions of Baade's arms N5 to S5." [From *The Andromeda Galaxy*, E. Berkhuijsen *et al.*, *Astron. Astrophys.* **117**, 141 (1983)]

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Southerly Enterprises

A History of Antarctic Science. G. E. FOGG. Cambridge University Press, New York, 1992. xxii, 483 pp., illus. $89.95. Studies in Polar Research.

The canvas is vast—a continent of 13 million square kilometers averaging 1500 meters above sea level and covered over much of its area by more than a kilometer of ice and snow. Below its frozen surface the land is depressed hundreds of meters; where

it emerges it bears evidence of the geological and biological unity of the Earth 200 million years ago. Scattered around the margins of this icy wasteland are the research stations of a dozen or so nations, and in the interior a handful of human outposts occupy the South Pole, the Pole of Inaccessibility, and other awesome, remote spots.

The Antarctic conjures stories of Scott, Shackleton, Byrd, Drygalski and Borchgrevink, Mawson and Priestley, Gerlache and Bruce. But, as G. E. Fogg shows in this important new book, Antarctic science ranks equally with geographical discovery and adventure in the annals of Antarctic exploration. From the time of Edmond Halley's tentative foray south of the Antarctic Convergence in 1700 to the technologically sophisticated assaults on the continent following World War II, scientific studies in the Antarctic have given justification to exploration and, most recently, have proved to be of global significance.

Fogg does justice to the early sightings of Antarctica and to the heroic age (as he terms it) of discovery and exploration in the 19th century, following a chronological line until the International Geophysical Year of 1957–58, after which he deals with sciences such as oceanography, geology and geophysics, atmospheric sciences, biology, and medicine. He establishes a tripartite division of the development of science in Antarctica: the "heroic age," the period between about 1930 and the IGY, and the post-IGY era. Happily, the account that emerges within this framework is much more than a chronology. Fogg gives us a historically sophisticated account of how science that could only be big, requiring extensive financial, political, and logistic support, came about in remote locations with few physical or biological resources to merit the effort.

Nationalism has never been absent from the exploration and occupation of Antarctica. The names of research stations, such as Byrd's Little America, France's Dumont d'Urville, the Polish Arctowski, and Australia's Mawson, indicate that national aspirations or national heroes are being used as symbols in nominally international terrain. Long before the Antarctic Treaty of 1961, which froze Antarctic territorial aspirations in time, the British government covertly set about claiming Antarctica. The *Discovery* investigations, beginning in 1925, were part of the scheme, as, later, in a more complex political setting, was the establishment of the Falkland Islands Dependencies Survey (now the British Antarctic Survey). A virtue of Fogg's account is that he shows how Antarctic science has been part of the larger picture of global international relationships during the 20th century.

No doubt the IGY has been the most significant event in Antarctica's scientific history, but even Scott and Wilson's pathetic, tragic attempt in 1912 to return geological specimens to their base camp resulted in the revelation that the fossil plant *Glossopteris*, known from the continents to the north, had also lived in Antarctica. During the past four decades (Byrd set the pattern in 1928–1930), Antarctic science has become bigger, more expensive, and certainly safer and has expanded to investigations of the whole continent, rather than its margins and nunataks alone. Most of the earlier, sketchy accounts of Antarctic science have been preoccupied with heroism or adventure, often nationalistically oriented. Fogg's account is refreshingly, but not exclusively, Anglocentric, showing, for example, that the United States has usually concentrated on large short-term expeditions and projects, while the long-term, less glorious, and certainly less glorified British Antarctic work at its handful of bases has contributed the solid backdrop of south polar atmospheric physics and biology—and the spectacular revelation of the ozone hole over Antarctica.

"Caricature of Alister Hardy singing 'Yip-i-addy-i-ay,' drawn at South Georgia, Christmas, 1926, by J. W. Ridley. . . . He is depicted with a tow-net in one hand and waving his plankton recorder (in miniature) with the other, with a cloud of krill above his head and a small winch for working nets in the background." [From *A History of Antarctic Science*; Hardy (1967), courtesy of M. Hardy]

Fogg's book is a splendid resource for the polar scientist, historian, and political scientist. I can envision it too in the collection of many Antarctic research stations, where it deserves to become dog-eared with use, not just for the abundant information it summarizes and interprets but for its humanistic values and its warning that the sorcerer's apprentice may come to dominate the basic science of the polar regions.

The human spirit expands in wilderness and we may hope that Antarctica's remote and hostile nature will ensure that most of it will remain unsullied and a place for contemplation. . . . In the past, Antarctic science has drawn much of its strength and unique character from the attitude of mind which the wilderness engenders but perhaps scientists may be becoming overweening in their confidence to extract information from this, the most unyielding and unfriendly environment on earth. Technological arrogance in the setting of some of the world's most sublime scenery seems a portent of the loss of humility and a separation from the natural environment which could lead to the decay of Antarctic science.

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The Human Scenario Beclouded

Evolutionary Ecology and Human Behavior. ERIC ALDEN SMITH and BRUCE WINTERHALDER, Eds. Aldine de Gruyter, Hawthorne, NY, 1992. xvi, 470 pp., illus. $59.95; paper, $29.95. Foundations of Human Behavior.

The revolution in animal behavior studies that started in the 1960s is echoed in anthropology by two main strains of research, one in which human psychology is understood as an outcome of Darwinian evolution and another in which human social interactions are modeled as the outcome of interactions among fitness-maximizing individuals. The latter theme is addressed by this examination of the way human subsistence practices affect relations of all kinds among individuals. The editors set about to create a high-level summary of the field by recruiting authors to prepare critical reviews to a common standard. They did it right—the volume is balanced and strong.