more extensive than Jaki's, if less entertainingly or irritatingly iconoclastic.

Newton's law of gravity explained elliptical orbits, preserved a role for God as builder of the heavenly clockwork, and contradicted Descartes's theory of evolution of the planetary system from matter evenly distributed. Collision between a comet and the sun was a possible mechanism for planetary formation. Alternatively, gravity could act upon particles of different density.

Laplace's nebular hypothesis, combining gravitational contraction and the angular momentum of a large, rotating, gaseous nebula around the sun, was proposed in 1796 and held the field for a century. Jaki traces both the development of the theory through the five editions of Laplace's book and the facile overlooking of difficulties in the theory by several generations of scientists in France, Germany, England, and the United States. On the American reception of Laplace's theory in a more general intellectual context, especially the interfusing of scientific and religious thought, see Ronald Numbers's *Creation by Natural Law: Laplace's Nebular Hypothesis in American Thought*.

Most of the angular momentum of the solar system is in the planets, but most of the mass is in the sun. Thomas Chamberlin, a geologist, and Forest Moulton, an astronomer, at the University of Chicago showed that the division of angular momentum and mass poses an unsurmountable difficulty for the nebular hypothesis. They thought that the close approach of another star might have transferred angular momentum from the sun to the planets. Photographs of spiral nebulae encouraged belief in such a process. Jaki's account, here as elsewhere, is restricted to published sources. In a recent article in the *Journal for the History of Astronomy* (1978) Stephen Brush draws upon manuscript materials and presents a broader historical and philosophical discussion of the Chamberlin-Moulton hypothesis.

The Chamberlin-Moulton theory faltered because in satellite systems, in contrast to the planetary system, virtually all the angular momentum is in the central body. Nor were critics comfortable with a collisional theory in which planetary systems were a rare occurrence rather than a normal phenomenon. More recent theories, involving rotational fission, magnetohydrodynamical waves, turbulent motions, condensations, and the like have also met with what S. Chandrasekhar called "the usual fate of cosmogonical theories not to survive." Scientists have yet to explain satisfactorily the origin of the planetary system.

Jaki convincingly demonstrates that planetary theories often have initially been judged more on their potential frequency of action than on their fit with observation. One might then ask, granted that philosophical values are immensely important in science, whether observational considerations eventually doom an otherwise esthetic theory and whether a theory that satisfied observational criteria but was in conflict with fundamental human values could ever win general acceptance. And is the preference for a frequently employed planet-creating mechanism a manifestation of a more general philosophical insistence upon the uniformity of nature that appears also in geological uniformitarianism? Jaki also might have discussed more thoroughly the apparently continuing importance of the principle of plenitude; belief in planetarians (inhabitants of other planets) is mentioned but infrequently.

Jaki's critique is important, and should be extended. The book deserves a subject index and better integration of illustrations and text.

NORRISS S. HETHERINGTON
439 Beloit Avenue,
Kensington, California 94708

A History of Scripps

Scripps Institution of Oceanography. Probing the Oceans 1936 to 1976. ELIZABETH NOBLE SHOR. Tofua Press, San Diego, Calif., 1978. x, 502 pp., illus. Cloth, $17.95; paper, $8.95.

Of all the oceanographic laboratories in the United States only the Scripps Institution of Oceanography sees to it that its history is kept up to date. In 1967 *Scripps Institution of Oceanography: First Fifty Years* by Raitt and Moulton was published describing the Institution's growth from 1892 to 1942. Now Elizabeth Noble Shor has brought the account up to date with *Scripps Institution of Oceanography: Probing the Oceans 1936 to 1976*.

After a brief recapitulation of the Institution's beginnings as a peripatetic shore station and a biological association without special emphasis on "marine," Shor focuses on the years immediately prior to World War II when the famous Norwegian oceanographer Harald Sverdrup became the Institution's third director. By this time the Institution was a part of the University of California and had approximately 12 senior staff members, a half-dozen visiting scientists, and five graduate students. Within two months of Sverdrup's arrival, the fishing boat used as a research vessel burned and the Scripps oceanographers were shorebound —but not for long. Between Sverdrup with his admirable stubbornness and World War II with its sudden and imperative demand for oceanographic information, the Institution was soon in possession of four research vessels, a staff of 111, and a budget that had quintupled in a decade. At this point, 1946, Shor abandons a straight chronological presentation and divides the book into chapters on the Institution's major research units. Each of these accounts covers approximately the same years, 1946 to 1976.

As a commissioned history the book has a characteristic suite of advantages and disadvantages. On the positive side is the completeness of the account. With the cooperation of the Institution's administration the author has had access to the records of every research unit, institute, department, and subgroup. And there is an impressive number of these at Scripps—the Marine Life Research Program, the Marine Physical Laboratory, the Visibility Laboratory, and the Institute of Marine Resources, to mention only a third of the divisions covered. For each, information is included on its founding, evolution, objectives, and major successes. The book has many illustrations and is thoroughly documented.

On the negative side is the absence of any attempt to stand back from the Institution and study its growth in relation to the politics, economics, or scientific thinking going on in the rest of the country. Why did Scripps develop so slowly in the early years of this century? Why did its leaders assume that Naval support would be withdrawn after World War II? Why is it the largest oceanographic institution in the country today? Such questions aren't even raised, nor are questions concerning the internal dynamics of the Institution itself. Rather than write a historical account of how the Institution has evolved within a context at least as broad as the country itself, Shor has chosen to present an insider's affectionate view.

From this choice stems a second disadvantage. Because of the author's loyalty to the extended Scripps "family," each one of the score of scientists, students, and technicians whom we meet come across as honest, intelligent, energetic, and enthusiastic. No one fails. No one steps on anyone else's toes. We are given biographical vignettes of dozens of

important oceanographers—Roger Revelle, Sir Edward Bullard, Carl Hubbs, and John Isaacs, to name a few—but we are not told how they work (or argue) together.

In sum, Scripps has itself a record-book—clear, accurate, and complete. Friends and associates of the Institution will enjoy reading about the people they have worked with, and historians of science will find the book a useful source of information.

SUSAN SCHLEE
147 Sippewissett Road,
Falmouth, Massachusetts 02540

Malaria

Mosquitoes, Malaria and Man. A History of the Hostilities since 1880. GORDON HARRISON. Dutton, New York, 1978. xii, 314 pp., illus. $15.

The statement was made by Napier in the 1930's that malaria probably had killed more of mankind than all other diseases combined, and it is not surprising that the relationship between the disease, its extraordinary vector, and the human victim is intriguing.

October 1980 will mark the centenary of the discovery of the malaria parasite by Laveran in North Africa. Even before Romanowsky's stain (1891) made the study of parasites in the peripheral blood relatively simple, a group of intensely competitive Italian scientists (especially Golgi, Marchiafava, and Celli) led by Grassi correlated the stage of the parasite with clinical symptoms and made significant contributions in distinguishing the morphologic features of its three species. But it was Manson and his disciple Ross who elucidated the role of the mosquito as the vector despite the hostilities of their Italian "colleagues."

The first part of Gordon Harrison's book describes this vitriolic competition in an exciting fashion and includes the historical background prior to Laveran's discovery.

The second major theme of the book relates to the effort to eliminate the vector by mechanical and chemical means, especially in Panama and Italy. Finally, there is consideration of the major effort to eradicate the parasite by the use of DDT on a global basis, with work ending on the proper note of failure.

A reviewer must not write an author's book, but I missed several aspects of the malarial plague that might have been included. Nowhere is there a consideration of the clinical aspects of malaria, with a physician's appreciation of what the disease does to a village and its inhabitants. With the exception of quinine, drugs used in treatment, prevention, and eradication are not mentioned, and drug resistance is disregarded. Quinine is the only drug included in the text or index. The Ethiopian epidemic of 1963 is not mentioned, nor is there any consideration of the extraordinary problem of malaria control and therapy encountered during and since the Vietnam war.

The most recent significant reference in the book is dated 1974; the few dated 1976 and 1977 are inconsequential. The block of major information seems to have terminated about 1971.

There are a few errors. For example, Paul Mueller did not synthesize DDT (this was accomplished by Ziedler in 1874), though he certainly was responsible for appreciating its insecticidal properties.

The book is well written. Some parts will be especially exciting to old malaria "war-horses." It contains a large body of information accurately reported, with considerable anecdotal and scientific material known by few.

B. H. KEAN
Tropical Medicine Unit,
Department of Medicine,
New York Hospital-Cornell Medical Center, New York, New York 10021

Small Bodies in Space

Cosmic Dust. J. A. M. MCDONNELL, Ed. Wiley-Interscience, New York, 1978. xx, 694 pp., illus. $67.

The study of cosmic dust is very old and very new. Some phenomena, such as comets and shooting stars, are visible to the naked eye and have been observed for millennia. Others, such as the interplanetary dust in the region of Jupiter and beyond, can be seen only with the aid of the most sophisticated space technology and thus have only recently been observed.

Fashions too play a role in the study of cosmic dust. We could now do much more in the study of meteors in the earth's atmosphere than was possible in the 1940's, but we are actually doing less. The emergence or retirement of one scientist (or a change in the pattern of government grants) can change the whole tone of research on such a subject.

This book is in part a response to the uneven state of the field. McDonnell has solicited a series of complementary review articles that effectively span it, with the aim of bringing science students and other scientifically literate persons up to date.

To a remarkable degree he has succeeded. The quality of the papers ranges from pretty good to outstanding. There is generally a commendable willingness to grapple with controversial matters. There is some overlap, but, with few exceptions, no more than is needed to make each chapter reasonably self-contained.

A pedant might have excluded Fred Whipple's opening paper on comets, or insisted that it be confined to the role of comets as the main source of interplanetary dust. Actually the paper, which is a gem, ranges over a wide span of cometary phenomena. It brings out the many new insights obtained from the study of Comet Kohoutek and others, with the use of ultraviolet spectra and other new observational data obtained by space missions. We do not understand comets yet, but we are certainly closer to doing so.

Another first-rate paper is Donald Brownlee's on the collection of extraterrestrial dust in the stratosphere and the early studies of this material. Brownlee and his colleagues appear at last to have made an old dream a reality, for it seems highly probable that true cometary debris now exists in the laboratory. Its study is a major challenge to experimentalists.

McDonnell has contributed a scholarly review of our present state of knowledge of interplanetary dust, particularly the mass distribution, as derived from satellite studies. This is the only recent critical review of this subject of which I am aware. The traditional log-log plot, covering 26 (or more) orders of magnitude, which allows flux discrepancies of a factor of 10^4 to appear minor, may perhaps finally be discarded.

There are as always some flaws. One or two authors have chosen to include in their broad coverage some topics to which their expertise does not quite extend. Occasionally the writer's model of a process becomes a little confused with reality. These lapses are, however, remarkable for their rarity. Less excusable is a standard of proofreading well below that to be expected of a major technical publisher.

This book will be a valuable reference work, and a stimulus to new activities, for quite a few years to come.

JAMES R. ARNOLD
Department of Chemistry,
University of California,
La Jolla 92093