Astronomy for the Space Scientist

Billions of dollars are earmarked for space research, but few of the people involved can agree on the basic purpose. **Solar System Astrophysics** (McGraw-Hill, New York, 1964. 465 pp. $12.50), by John C. Brandt and Paul W. Hodge, shows most of the reasons for space probing as these reasons are conceived by astronomers and physicists. That is, it shows several frontiers of our knowledge where extra-atmospheric experiments will almost certainly lead to significant advances in astrophysics.

I do not mean to imply that this is a popular book; the authors write in a terse, business-like style, listing the numerical values of constants, specifying units, referring to the most authoritative books and research papers (in a bibliography at the end of each chapter), and getting to the point by identifying dominant parameters in a manner that will endear them to space engineers. By using the words "It can be shown that . . . ," they get through a great deal of astrophysics, with conceptual rigor, in remarkably few pages. For instance, in chapter 2, celestial mechanics and its applications to satellites, moon probes, and comet tails (the 3-body problem) are disposed of in less than 10 pages, in which most of the basic equations are given. Three additional pages are used to treat the advance of perihelion and the stability of planetary orbits.

The next five chapters deal with the sun: the interior, photosphere, atmosphere and corona, magnetic field, and spectrum. In less than 180 pages, the authors cover all types of observations and outline the theories concerning them: luminosity, internal conditions, and nuclear reaction rates; opacity, line strengths, and chemical abundances; convective instability, granulation and magnetohydrodynamic waves; and so on. Tables of important data, such as abundances of the elements in the sun, show differences in the results obtained by different investigators. Recent work on the x-ray and extreme-ultraviolet spectrum, as well as that on the infrared and radio spectrum, is summarized.

Later chapters treat interplanetary gas and dust, comets, meteoroids, asteroids, the moon, and planets and their interiors and atmospheres, including the earth's. Most of the illustrations are diagrams or graphs, but there are several well selected photographs of instruments, solar phenomena, meteors, comets, and the lunar surface (not including this year's Ranger-7 close-ups, however). Tables of data on planets, satellites, the important asteroids, the largest meteorites, meteorite craters, atmospheric escape times, and the like add to the book's value as a reference source.

The coverage of present astrophysical research interest is very near complete. More could be said about disturbances of the earth's magnetic field due to solar wind, and there is nothing about the speculations of Dicke, Weber, and others concerning possible changes in the gravitational constant, possible effects of gravity waves on the earth and moon, use of a laser illuminating a corner reflector on the moon, neutrino detectors, or modifications of the general theory of relativity. Although chapter 1 contains an excellent, abbreviated list of theories of the origin of the solar system (from Decartes's theory to that of Kuiper), no mention is made of theories of the origin of comets.

Solar System Astrophysics partly fills a need long felt by university astronomers for an up-to-date, intermediate-level textbook showing how astronomy hangs together as a subject, defining the core of astronomical knowledge, and showing where the interesting problems of current research lie. In this respect it matches Russell, Dugan, and Stewart's classic two-volume *Astronomy*, first published by Ginn in 1926 but not up-dated since 1945. But to fill this need completely, we must have a similar volume on stellar astronomy, galactic structure, and cosmology.

The rapid developments in astronomy have put severe strains on the unity of the subject and the organization of the profession. Forty years ago spectroscopy tended to split off astrophysicists, 10 years ago it was radio telescopes splitting off the radio astronomers, and now space technology tends to segregate space scientists. The recent National Academy of Sciences–National Research Council report, *Ground-Based Astronomy*, with its joint recommendations for a national effort to provide optical and radio telescopes, demonstrates that astronomy encompasses both astrophysics and radio studies, but that it has not yet made a place for space research. At a recent meeting of the American Astronomical Society's Committee on Education, it was noted that few universities offer a curriculum suitable for students interested in space science—that is, the combination of astronomy, electronics, structural engineering, and biophysics needed to recognize the problems involved in space research. *Solar System Astrophysics* covers almost all of the astronomy needed in such a curriculum.

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Industrial Science

Encyclopedia of Polymer Science and Technology. vol. 1, *Ablative Polymers to Amino Acids*. Herman F. Mark, Norman G. Gaylord, and Norbert M. Bikales, Eds. Interscience (Wiley), New York, 1964. xviii + 893 pp. Illus. $50 (subscription price, $40 per volume).

This encyclopedia is being launched at a particularly propitious time since, in the view of the editors, "a sufficiently secure foundation has now been laid to permit a comprehensive presentation of the basic principles of polymer science and technology." The encyclopedia is not intended to supplant monographs or reviews but rather to present a series of about 450 authoritative articles by specialists from all over the world, which will serve as a unique source of reference in the field. This first volume includes 31 such articles, and the complete encyclopedia is expected to comprise 10 volumes issued during a period of about 5 years.