should be useful to planetary scientists engaged in spacecraft-based observations. The chapter on microwaves forms a good background for those not familiar with the techniques of radio astronomy, and that on miscellaneous electronic dedevices contains a useful description of photoelectric detectors. (This description is best supplemented by the article in Volume 12 of this series, Photomultipliers: Their Cause and Cure, written by A. T. Young.) The television systems that have recently gained a position of prominence in astronomy are also described under miscellaneous devices, but the solid-state chargecoupled devices (CCD) that are supplanting the television systems for many astronomical applications are described only in terms of their internal operation (in the chapter on semiconductor circuit elements), and not as image detectors.

The chapter on feedback control systems is a fairly comprehensive review of linear and nonlinear systems as of the end of the 1960's. It contains some of the useful descriptions of operational amplifier applications that are unfortunately scattered throughout the volume, but the use of operational amplifiers in the compensation of control systems is never really developed.

The final chapter, on noise in electronic devices, is intended, and serves well, as a complement to the earlier chapter on amplifiers. It contains generally clear and useful discussions of noise sources and models, and noise in amplifiers and photodetectors.

In summary, this volume of *Methods of Experimental Physics* will serve to guide the scientist through the electronics literature, and will also provide him with several useful overviews. It cannot be considered a complete summary of modern electronics, however, and at the considerable cost involved will probably not find its way into many personal libraries.

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The Origin of the Planets. I. P. Williams, Adam Hilger, Ltd., London, 1975, Price \$8.00.

The origin of the planets is perhaps the most fundamental and difficult question which faces us in solar system studies. Conjecture in some sense scientific on this topic goes back to the time of Descartes, a generation before Newton, who believed that planets formed from vortices in the primordial matter. The hereditary line through von Weizsäcker and Kuiper to modern solar nebula theories is easy to trace.

This book, by I. P. Williams, Reader in Applied Mathematics at the University of London, has a very ambitious objective: to describe in rough quantitative form the essential physical ideas of all modern theories of the origin of the solar system and to make a preliminary assessment of their validity in 97 pages of text. After an introductory chapter on the systematics of the solar system Williams devotes chapters to tidal theories and their kin, accretion theories, and solar nebula theories essentially of the Kant/ Laplace variety. A final chapter attempts an assessment of the theories, and volunteers philosophical advice to the reader.

The virtues of this book are twofold: Some of the essential physical ideas are pleasingly set out in simple form; and a range of theories relatively unfamiliar to American workers in this field are outlined in some detail. One of the more interesting of these is the theory of Woolfson in which the planets arise from an encounter of the Sun with a protostar of radius 20 AU. (Despite copious references to Sir James Jeans, however, Williams neglects to quote Jeans' 1942 paper in Nature in which he first set forth the idea of tidal encounters among extended protostars.) However, not all the derivations are edifying; as, for example, when after several pages of power law manipulation of the physics of stellar structure (involving radii raised to the power 97/31), the grand result is revealed that the Kelvin-Helmholtz time scale is of order GM<sup>2</sup>/RL.

The choice of topics is idiosyncratically Anglophile: The most abundant references are, in order of prevalence, to the following authors: Williams (15 references), McCrea (9 references). Hoyle (9 references), Lyttleton (7 references). Woolfson (6 references). By accident all are British. There are no references to Kuiper's attempt at a grand synthesis in the Journal of the Royal Astronomical Society of Canada; no reference to Goldreich and Ward's paper; no reference to Clayton's discovery of anomalous oxygen isotopes (the book was published in September 1975); and, oddly enough, no reference to James Clerk Maxwell's classic demonstration that if the present planetary mass were uniformly distributed between the orbits of Mercury and Neptune the tidal field of the Sun would prevent planetary formation. Diamonds in meteorites are used to argue for the masses of meteorite parent bodies, although this is now widely recognized as an insecure argument. Readers interested in the Hayashi contraction of Jupiter are referred to a paper by the author of the book. while no mention is made of the detailed calculations by Bodenheimer, Pollack, and their colleagues. Williams essentially ignores the results of the last 20 years of research by A. G. W. Cameron, John Lewis, V. S. Safronov, and others; as well as the important early paper by Fred Hoyle on hierarchies of condensations.

There are many signs of carelessness in the preparation of the text, as when the possible existence of atmospheres on the large satellites in the outer solar system is postulated for the Galilean satellites but Titan is not mentioned; or when we are informed that "Hyperon" is in orbit about Saturn. There may, for all I know, be hyperons (briefly) in orbit around Saturn, but I do not think they have masses of  $10^{20}$ kg. The elephant that was killed by the first bomb dropped on a certain city in the second World War lived in Leningrad, not, as Williams has it,

in Berlin. The book is also replete with such stylistic infelicities as "such a phenomena" and "the two amounts of angular momenta."

The choice of topics makes this book of some interest to the possibly overly ingrown schools of planetarycosmogonyin the United States and the Soviet Union, but its sketchiness and occasional unreliability do not permit the book to be commended to students. However, an attempt to discuss such a field at such a level at our current state of ignorance in only 97 pages at least implies that Dr. Williams should receive a commendation for courage.

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