the proceedings volume, *Geophysics: The Earth's Environment* (Gordon and Breach, 1963), edited by DeWitt, Hieblot, and LeBeau.

The monograph is a brief, but clear, exposition of the basic background physics necessary for understanding the motions of energetic charged particles in the earth's magnetic field. The first 12 pages are devoted to Størmer's exact theory of charged-particle motion in a dipole field; here the treatment differs little from that given by Størmer and included in his book *The Polar Aurora*. The second section (15 pp.) covers Alfven's guiding-center approximation and its development in terms of the adiabatic invariants of motion which are so useful in describing motions of particles in the earth's radiation belts. The third section (3 pp.) gives the briefest of introductions to the application of the continuous-fluid relations of hydromagnetics to particle drifts.

On the whole the book will be useful to workers in the field, since only the most pertinent material is included, and the side issues that tend to befog the issue in more detailed treatments are not included. One could have wished for some mention of the conditions under which the longitudinal and transverse invariants break down, since this may be of major importance in geophysics; I also failed to detect any discussion of the third adiabatic invariant (the flux invariant) whose nonconservation leads to inward diffusion of trapped particles, and is of great importance.

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Astronomy

Reference Catalogue of Bright Galaxies. Being the Harvard Survey of galaxies brighter than the 13th magnitude of H. Shapley and A. M. Ames, revised and enlarged. Gerard de Vaucouleurs and Antoinette de Vaucouleurs. University of Texas Press, Austin 1964. viii + 268 pp. Illus. $12.50.

This monumental volume provides the long-needed and long-awaited revision and extension of the classical catalog by Shapley and Ames. Comparison of the new *Reference Catalog* with its predecessor shows impressively the progress of extragalactic research. In fact, very little remains from the older catalog which gives a few basic data—Hubble type, estimated photographic magnitudes, and apparent diameters—for 1249 galaxies. The new catalog tabulates for 2599 galaxies a wealth of information on types, diameters, magnitudes, colors, radial velocities, and published photographs. Complete references are given. Many of the tabulated values are averages of observed data corrected to a uniform system. To quote the observed data for diameters would not have been practical; to find these data, the references must be used. The observed data on magnitudes and colors are given in appendices. Much information is in an appendix that gives coded descriptions of the galaxies and references to detailed investigations.

To collect the data, to reduce them to uniform systems, and to organize them properly was a tremendous task. The authors must be admired for having undertaken it and for having, on the whole, successfully finished it. One problem with which the authors were faced was that of deciding what was to be tabulated, what was to be placed in the appendices, and what was to be omitted. Such decisions are difficult and cannot be expected to please everybody. One might ask, for instance, whether it was really necessary to include the old galactic coordinates, which can be obtained easily from available conversion tables, and whether it would not have been more useful to include data such as magnitudes corrected for absorption, which are needed to obtain ratios of mass or radio emission to optical brightness. Only colors corrected for absorption are tabulated. The complete suppression of spectral types and the exclusive use of the not yet generally accepted "supergalactic" coordinates for displays of the distribution of galaxies in the sky seem to indicate a tendency to let predilections influence the content. The degree of satisfaction with this catalog will depend somewhat on the specialized interests of the user. But nobody should deny that the *Reference Catalog* is a magnificent source of information and promises to be an indispensable tool for extragalactic research.

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New Books

Mathematics, Physical Sciences, and Engineering

Investigations into Electrical Discharges in Gases. B. N. Klyarfel'd, Ed. Translated from the Russian edition (Moscow, 1958) by D. Cossutta. T. R. Foord, Translation Ed. Pergamon, London; Macmillan, New York, 1964. 295 pp. Illus. $12. Contains 12 papers by L. G. Guseva; I. V. Krapivina; B. M. Aleshkov; A. V. Rubchinskii; V. M. Mantrov; Ya. Ya. Udris; F. S. Kovelev; A. A. Timofeev and N. A. Neretina.

Lines and Surfaces in Three-Dimensional Affine Space. L. K. Tutaev. Translated from the Russian edition (Minsk, 1962). Israel Program for Scientific Translations, Jerusalem; Davey, New York, 1964. 102 pp. Illus. $3.75.

Low Temperature Techniques. The use of liquid helium in the laboratory. A. C. Rose-Innes. Van Nostrand, Princeton, N.J., 1964. 176 pp. Illus. $4.75.

Lunar Missions and Exploration. C. T. Leondes and R. W. Vance, Eds. Wiley, New York, 1964. 689 pp. Illus. $17.50. Lectures presented at the University of California, Los Angeles, in cooperation with the Department of Engineering during the spring of 1963. Contributors: W. R. Laidlaw, M. Eimer, G. P. Sutton, G. H. Stoner, M. S. Agbabian, C. G. Pfeiffer, R. K. Cheng, G. C. Szego, E. Rechtin, R. A. Fischer, H. M. Schurmeier, C. W. Frick, E. G. Cole, and H. Hornby.

Maintainability: A Major Element of System Effectiveness. A. S. Goldman and T. B. Slattery. With contributions by S. Firstman and J. Rigney. Wiley, New York, 1964. 298 pp. Illus. $12.50.

Mechanical Working of Metals. F. A. A. Crane. Macmillan, London; St. Martin's Press, New York, 1965. 91 pp. Illus. Paper, 13s. 6d.

Mechanics of Solids. Grover L. Rogers. Wiley, New York, 1964. 266 pp. Illus. $8.95.

Methods in Polyphenol Chemistry. Proceedings, Plant Phenolics Group symposium (Oxford), 1963. J. B. Pridham, Ed. Pergamon, London; Macmillan, New York, 1964. 156 pp. Illus. $7.50. Twelve papers, by B. R. Brown; J. B. Harborne; H. Wagner; R. J. Abraham; J. W. Bridges; E. C. Bate-Smith; V. Thaller; L. Hörhammer; H. Weigel; J. B. Pridham; R. O. C. Norman, J. R. Lindsay Smith, and G. K. Radda; and T. Swain and J. L. Goldstein.

Modern Pure Solid Geometry. Nathan Altshiller-Court. Chelsea, New York, ed. 2, 1964. 369 pp. Illus. $6.

Molecular Complexes in Organic Chemistry. Lawrence J. Andrews and Raymond M. Keefer. Holden-Day, San Francisco, 1964. 204 pp. Illus. $8.75.

Motion of Charged Particles in the Earth's Magnetic Field. Joseph W. Chamberlain. Gordon and Breach, New York, 1964. 43 pp. Illus. Paper, $1.95; cloth, $3.95.

Nuclear Energy in Space. Erik S. Pedersen. Prentice-Hall, Englewood Cliffs, N.J., 1964. 528 pp. Illus. $19.95.

Periodic Differential Equations. An in-

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