tions, it seems safe to predict that this volume will also be much consulted by persons in industrial research who may have to brush up on some phase of the work which they heard about during their university days but have not followed since. No one person can today know all about gas discharges, and if he encounters new problems, it is important that he be able to familiarize himself with what has already been done in this new direction.

The truly international aspect of pure science is also to be noted in this work, for the seven authors are from several quite different parts of the world, Europe, America, and Africa, in which latter place much of Schonland's outstanding work was done. Each author has been quite impartial in referring to important contributions arising in other countries than his own. The attitude of true scholarship is well exemplified in this work.

To this reviewer, the volume seems an outstanding one. It was a pleasure to read it, not only to refresh my own recollection of many aspects, but to learn how far certain other investigations had been carried since the last time I had had occasion to look them up. The physics of the large, spectacular sparks found in nature which we call lightning is especially well handled, and has the greatest interest in connection with the recent discovery in radioastronomy of signals from such discharges on Jupiter. The volume maintains the usual high standards of typographic excellence and careful editing.

Electrical Conductivity I. Vol. 19 of Handbuch der Physik. Edited by S. Flügge. 411 pp. Springer-Verlag, Berlin, Germany, 1956. DM 82.00; if part of series DM 65.60. *Reviewed by R. Smoluchowski, Carnegie Institute of Technology.*

A year or two ago appeared the first volume of the new *Handbuch der Physik* under the editorship of Professor Flügge and since then several other volumes have been added. The latest to appear is the first of several volumes dealing with the electrical properties of matter. In appraising this new book it should be kept in mind that it is a part of a group of volumes dealing with subjects intimately related to conductivity and that the particular grouping of individual articles may not appeal to all readers. For instance the book here reviewed is primarily devoted to metallic conduction phenomena though such subjects as low-temperature conduction and superconductivity are either not included or rather briefly mentioned. The volume contains four articles: "The Electronic Structure of Solids" by J. C. Slater, "Metallic Conductivity, Experimental Part" by A. N. Gerritsen, "Theory of Electrical and Thermal Conductivity in Metals" by H. Jones, and "Photoconductivity" by G. F. Garlick.

The first of these articles is much the longest of the four and has a character of an excellent, up-to-date, and very complete introduction to or a review of the whole field of the electronic structure of solids, i.e. the sub-

ject matter is not treated exclusively from the conduction point of view. In keeping with the author's characteristic method of presentation the article is extremely readable and contains few formulae. It deals in separate sections with such subjects as periodic field and energy bands in metals and insulators, self-consistent fields, one-electron approximation, theory of impurity atoms and alloys, cohesive energy, elastic properties, covalent bonds, and magnetic properties. Of particular interest is the discussion of the relative merits of the augmented plane wave and similar methods in band calculation, the treatment of the electronic states when impurities and alloying elements are present, the plasma theory and the correlation energy, the relation of the metallic and covalent bonds, a critical survey of the present state of theory of ferromagnetism and antiferromagnetism, etc. Because of the necessarily limited size of the article some of these diverse subjects are treated rather briefly. Nearly 270 references to the most pertinent original papers are included.

The article by Gerritsen provides a very complete coverage of our experimental knowledge of the phenomena of electrical conduction in metals. It covers first the theory of various experimental techniques. This is followed by a description of conductivities of metals at normal temperatures in relation to atomic properties and the influence of temperature on conductivity. The influence of magnetic fields and of pressure is considered next and this is followed by an unfortunately brief treatment of the influence of defects on resistivity. A longer section on resistivity of alloys closes this article. The article is full of excellent diagrams and tables and is well documented with references.

The theory of electrical and thermal conductivity in metals is the subject of an excellent article by Jones. This article is only about 90 pages long but it contains an up-to-date coverage of the field. Various calculations and quantitative arguments are often reconstructed in detail. Many recent advances are included and the whole is presented as a systematic development. After a brief description of the properties of conduction electrons and the Boltzmann equation, two longer sections deal with the quantum mechanical aspects of the scattering of electrons in pure metals and in alloys. This is followed by a discussion of conduction in the presence of a thermal gradient, conduction at low temperatures and in the presence of magnetic field. A short section on the anomalous skin effect closes the article. Of particular interest are the sections devoted to low-temperature conductivity, thermoelectric phenomena, Umklapp-Prozesse, etc. including many recent contributions by the author.

The last article in the volume, by Garlick, deals with photoconductivity. It covers both theory and experiment and is quite self-contained. In about 20 pages the author summarizes briefly with the current theories of photoconductivity and its spectral dependence. This is followed by a description of photoconductivity phenomena in monatomic solids. The longest and most exhaustive chapter deals with photoconductivity of binary compounds. Three short sections on photoconductivity

in organic systems, on the photodielectric effect, and on some experimental techniques close the article. In the theoretical section the treatment of "glow curves" is particularly detailed. In keeping with the tremendous amount of recent experimental work in this field, the article is strongly slanted towards a good coverage of the descriptive material. It is amply illustrated with diagrams and energy level schemes whenever available.

It is to be hoped that the forthcoming volumes dealing with related subjects will cover satisfactorily other aspects of conductivity. For instance in no place did the reviewer find a theoretical discussion of the effective mass of the electrons. Perhaps this could be taken up in detail in connection with semiconductors. To sum up, this latest addition to the *Encyclopedia of Physics* is a very valuable book. As mentioned above it is difficult to judge a book like this out of context with the other volumes but it is certainly worth-while having.

Books Received

L'Origine des Planètes: Essai de Cosmogonie. By Alexandre Dauvillier. 221 pp. U. of France Press, Paris, France, 1956. Paperbound 800 fr.

Changes of State: A Mathematical-Physical Assessment. By H. N. V. Temperley. 324 pp. (Cleaver-Hume Press, England) Interscience Publishers, Inc., New York, 1956. $7.50.

Science and Economic Development: New Patterns of Living. By Richard L. Meier. 266 pp. Technology Press of MIT & John Wiley & Sons, Inc., New York, 1956. $6.00.

Lectures on Rock Magnetism. (2nd Weizmann Memorial Lectures, Dec. 1954). By P. M. S. Blackett. 131 pp. The Weizmann Science Press of Israel, Jerusalem, Israel, 1956. $5.00.

The Future of Arid Lands. Edited by Gilbert F. White. 464 pp. American Association for the Advancement of Science, Washington, D. C., 1956. $6.75.

Technology and Engineering, Vol. 1. Series IV of Progress in Nuclear Energy. Edited by R. Hurst and S. McLain. 420 pp. McGraw-Hill Book Co., Inc., New York, 1956. $12.00.

General Relativity and Cosmology. Vol. 4 of The International Astrophysics Series. By G. C. McVittie. 198 pp. John Wiley & Sons, Inc., New York, 1956. $9.00.

The Scientific Revolution 1500–1800: The Formation of the Modern Scientific Attitude. By A. R. Hall. 390 pp. The Beacon Press, Boston, Mass., 1956. Paperbound $1.75.

Introduction to Solid State Physics (2nd Revised Edition). By Charles Kittel. 617 pp. John Wiley & Sons, Inc., New York, 1956. $12.00.

Reports on Progress in Physics. Vol. 19, 1956. Editor, A. C. Stickland. 367 pp. The Physical Society, London, England, 1956. £2 10s.

Polymer Solutions. By H. Tompa. 325 pp. (Butterworths, England) Academic Press Inc., New York, 1956. $8.50.

Photoconductivity Conference (Atlantic City, Nov. 1954). Edited by R. G. Breckenridge, B. R. Russell, E. E. Hahn. 653 pp. John Wiley & Sons, Inc., New York, 1956. $13.50.

Atomic Energy. By A. Radcliffe and E. C. Roberson. 142 pp. The Philosophical Library, New York, 1956. $4.75.