

as manuscript sources including personal letters, institutional records and in a few cases, interviews. The essays relate the development of concepts of electricity, the atom and energy to their intellectual and social contexts; they reveal the roles of personal, institutional and national style in the processes of scientific change. Furthermore, the writing and editing does not get in the way of the message, but helps to convey it.

The longest paper (80 pages) in the first volume is John Heilbron's and Thomas Kuhn's fascinating reconstruction of Niels Bohr's path from his 1911 doctoral thesis to his renowned quantized atom concept in 1913. It should be of great interest to physicists not only because of the events it describes but also as a fine example of how historians can use a variety of source materials to illuminate the complex factors involved in the development of a scientist and his ideas. In another long essay, Tetu Hirosige systematically analyzes the physics literature to show the formulation of H. A. Lorentz's theory of electrons and his view of the electromagnetic field. Martin Klein probes into forgotten concepts of early thermodynamics while showing how J. Willard Gibbs's deep admiration for the work of Rudolf Clausius revealed the nature of Gibbs's own scientific views.

These examples provide a glimpse of the rich contents of the first volume. The other essays are similarly valuable and their subjects reflect the scope and variety of this volume: Joseph Agassi on Sir John Herchel's philosophy, D. C. Goodman on Wollaston and the atomic theory of Dalton, Theodore Brown on the electric current in early 19th-century physics, S. G. Brush and C. W. F. Everitt on 19th-century physicists and the radiometer problem, and V. V. Raman and Paul Forman on Erwin Schrödinger's development of Louis de Broglie's ideas.

Three of the essays in the second volume relate to the development and response to Einstein's work. These lead to a discussion by the editor about how a consideration of Einstein's career and his relationship to the scientific and larger communities reveals aspects of scientific life that should be studied by those concerned with the history of very recent physics. Thus McCormmach's foreword to Volume 2 is a critical appraisal of the current state of scholarship in the history of physics and suggestions for the future. The studies on Einstein include Klein on the early phase of the Bohr-Einstein dialogue; McCormmach on Einstein, Lorentz and electron theory; and Stanley Goldberg on the British response to special relativity.

In other essays Romualdas Sviedrys explores the origins of the Cavendish

Laboratory; Yehuda Elkana focuses on the phases of conceptual change as illustrated by Hermann von Helmholtz's ideas of force and energy; Elizabeth Wolfe Garber shows the relation between Clausius and Maxwell's kinetic theory of gases; Edward Daub writes on the development of the concepts of entropy and dissipation of energy; and an 83-page essay by Paul Forman probes the genesis of Alfred Landé's work in 1919-21 on the anomalous Zeeman effect and its effects on the scientific community in which Landé functioned. Relevant correspondence from 1921 is appended to Forman's essay and the 15 letters provide valuable documentation of this episode.

The subject matter, quality of scholarship and intrinsic interest of the first two volumes of this annual series firmly establish *Historical Studies in the Physical Sciences* as a rich resource for physicists who desire to understand more about the roots of their intellectual tradition and professional discipline, and who want to convey this understanding to others.

Charles Weiner

American Institute of Physics

Biographical Memoirs Of Fellows of the Royal Society, Vol. 15

266 pp. The Royal Society, London, 1969. \$6.50

These biographical memoirs are always a welcome addition to the archives of scientific history, because they embody valuable resumés of the lives and accomplishments of some of the outstanding contributors to the world of science. But they are also of interest to students and scientists who may like to know a little bit more about persons whose names they come across in text books and journal articles.

The fifteenth volume includes 13 names from various disciplines. Although each one of the scientific biographical sketches is worth the perusal of anyone involved with the sciences, most physicists are likely to find four of the subjects especially interesting: Luitzen Brouwer, William Hume-Rothery, Lev Landau and Edmund Stoner.

The range of information offered by the volume is enormous: The reader runs into a good deal of fascinating details from Brouwer's controversies with Hilbert to the fact that Hume-Rothery was more than an amateur painter, to a background on the Landau-Lifshitz series of books on theoretical physics. The style is engaging throughout. The personal touches in the article on Stoner, which happily

responds to Stoner's own criticism of the "severely impersonal" form, is particularly enjoyable. The complete bibliographies on the 13 scientists constitute a valuable storehouse of references.

Varadaraja V. Raman
Rochester Institute of Technology

Radio Astrophysics: Nonthermal Processes in Galactic and Extragalactic Sources

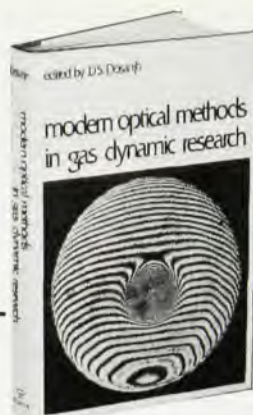
By A. G. Pacholczyk

269 pp. Freeman, San Francisco, 1970. \$13.00

There is certainly a need for a book on radio astrophysics, and so it was with a good deal of anticipation that I opened the covers of this, the first book so titled. I was somewhat disappointed. This is not a book that infuses the whole sweep of the subject with new understanding—rather it consists of a few chapters covering topics with which A. G. Pacholczyk is very familiar, patched together with rather brief superficial treatments of some other topics. Nevertheless, it does collect together in one place material widely scattered in the literature. For this reason I think it will find its way on to the shelves of many radio astronomers and be widely used by those teaching the subject.

After an introductory chapter on radio-astronomical measurements, the book attempts to cover the physics involved in the generation and propagation of radio waves in some types of astronomical sources. It treats the propagation of waves in plasmas, synchrotron radiation, (inverse) Compton scattering, processes affecting the distribution of energy in an assembly of relativistic electrons, the spectra of continuum radio sources and radio-line emission. Each chapter is followed by extensive bibliographical notes, which should stimulate the student to read the original literature. There are also four appendices, which range from a summary on the radiation field (which deserves a place in Chapter 1) to tables, nomograms and listings of radio-source catalogs that Pacholczyk has presumably found useful in his own research. For each of the topics treated the mathematical description is developed from fundamentals, but unfortunately the reader is given little insight into the physics of the processes. It would help considerably just to include more discussion of the results of the calculations and of the predictions for special cases.

The book provides a very uneven coverage of what I regard as radio astrophysics. For example, the synchrotron radiation of extremely relativistic electrons (a subject to which Pacholczyk has



MODERN OPTICAL METHODS IN GAS DYNAMIC RESEARCH

Edited by **Darshan S. Dosanjh**,
Syracuse University

This book brings together in one volume detailed reviews of many aspects of current optical methods in the study of high-speed and high-temperature gaseous flow. The emphasis on existing and potential uses of lasers should make this an exceptionally useful reference work. Proceedings of an International Symposium held at Syracuse University, Syracuse, New York, May 25-26, 1970, supported by The New York State Science and Technology Foundation.

CONTRIBUTORS: A. J. Alcock • S. J. Arnold • Daniel Bershader • R. O. Berthel • Terrill A. Cool • C. Forbes Dewey, Jr. • K. D. Foster • Edmund J. Gion • Martin C. E. Huber • T. V. Jacobson • Franz C. Jahoda • George H. Kimball • David W. Koopman • Ralph H. Lovberg • Thomas J. McIlrath • Ralph W. Nicholls • Joseph H. Spurr • R. D. Stuart • Gordon W. Wares • S. J. Wolnik • Walter H. Wurster.
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Compiled by **T. F. Connolly**, *Oak Ridge National Laboratory, Tennessee*

This volume is primarily a bibliography on the preparation and crystal growth of semiconductors, containing references to the properties of the compounds. The main section of the bibliography is arranged according to the chemical groups of materials and also by individual compounds or elements. There are separate sections covering amorphous semiconductors and the ion-implantation doping of semiconductors. Preceding the main section are lists of information centers and other services, major journals, reviews on crystal growth in general, and a list of reviews and bibliographies on semiconductors.

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contributed) is treated fairly extensively, but there is no treatment of the synchrotron emission of barely relativistic electrons, of coherent plasma processes, of maser amplification of line radiation or of radio emission from solid surfaces or planetary atmospheres. The burgeoning field of radio-line emission is covered in 19 pages.

I was also disappointed to find some contentious matter in the elementary definitions. Thus the generally accepted definition of flux density would not require the $\cos \theta$ in equation 1.6. Nor does it seem desirable to replace the "equivalence" definitions of antenna temperature and brightness temperature by equations 1.24 and 1.25, which restrict the concept to the region of validity of the Rayleigh-Jeans approximation. The statement on page 13 that "the physical meaning of the brightness temperature is very limited . . ." surely obscures some great physical truths, including the fact that for incoherent processes the radiating particles must have energies $\geq kT_B$. Finally, I react against the use of "flux" for "flux density," "beam area" for "beam solid angle," "apparent flux" for a quantity that involves the properties of the antenna and other similar usages.

J. A. Roberts

Australian Commonwealth Scientific and Industrial Research Organization

new books

CONFERENCE PROCEEDINGS

Accurate Characterization of the High-Pressure Environment (Conf. proc. National Bureau of Standards, Gaithersburg, Md., 14-18 Oct. 1968). E. C. Lloyd, ed. 343 pp. US Department of Commerce, National Bureau of Standards, Washington, D. C., 1971. \$4.50

Interstellar Gas Dynamics (Conf. proc. No. 39, International Astronomical Union, Yalta, The Crimea, USSR, 8-18 Sept. 1969). H. J. Habing, ed. 388 pp. Springer-Verlag, New York, 1971. \$25.00

Lecture Notes in Physics, Vol. 7: Lectures in Statistical Physics (Conf. proc. Advanced School for Statistical Mechanics and Thermodynamics, Austin, Texas). By R. Balescu, J. L. Lebowitz, I. Prigogine, P. Résibois, Z. W. Salsburg. 181 pp. Springer-Verlag, New York, 1971. \$5.00

Nuclear Techniques in Environmental Pollution (Conf. proc. 26-30 Oct. 1970, Salzburg, Germany, IAEA). 810 pp. UNIPUB, New York, 1971. \$22.00

Physics in India—Challenges and Opportunities (Conf. proc. Conference on Physics Education and Research, 21-30 June 1970, Srinagar, India). 323 pp. INSDOC, Delhi,

India, 1970. \$4.00

Physics, Logic and History (Conf. proc. First International Colloquium, Denver, Colo., 16-20 May 1966). W. Yourgrau, A. D. Breck, eds. 336 pp. Plenum, New York, 1970. \$12.50

The Physics Problems of Reactor Shielding (Conf. proc. ENEA/IAEA Specialist Meeting, Paris, Dec. 1970). ENEA, Paris, France, 1971.

Planetary Atmospheres (Conf. proc. Symposium No. 40, Marfa, Texas, 26-31 Oct. 1969). C. Sagan, T. C. Owen, H. J. Smith, eds. 408 pp. Springer-Verlag, New York, 1971. \$25.00

Polarization Phenomena in Nuclear Reactions (Conf. proc. Madison, Wisconsin, 31 Aug.-4 Sept. 1970). H. H. Barschall, W. Haerberli, eds. 930 pp. The University of Wisconsin Press, Madison, Wisconsin, 1971. \$15.00

Proceedings of the 1970 CERN Computing and Data Processing School (Villa Monastero, Varenna, Italy, 30 Aug.-12 Sept. 1970). 469 pp. Geneva, Switzerland, 1971.

Proceedings of the 1970 CERN School of Physics (Loma-Koli, Finland, 21 June-5 July 1970). 358 pp. CERN, Geneva, Switzerland, 1971.

Proceedings of the Symposium on Submillimeter Waves (Conf. proc. New York, 31 Mar.-2 April 1970). J. Fox, ed. 726 pp. Wiley, New York, 1971. \$25.00

Reaktortagung (Conf. proc. 20-22 April 1970, Kongresshalle, Tagungsbericht). 713 pp. Atomic Energy Documentation Service, Larchmont, N. Y., 1970. DM 48

Relativity and Gravity (Conf. proc. International Seminar on Relativity and Gravitation, Einstein Institute of Physics, Technion City, Israel, July 1969). C. G. Kuper, A. Peres, eds. 324 pp. Gordon and Breach, New York, 1971. \$24.50

Safeguards Techniques, Vol. 1, 2 (6-10 July 1970), Karlsruhe, IAEA). 1116 pp. UNIPUB, New York, 1971. \$30.00

Science and the Future of Man (Conf. proc. Boston College, American Association for the Advancement of Science, 28, 29 Dec. 1969). R. L. Carovillano, J. W. Skehan, eds. 196 pp. MIT Press, Cambridge, Mass., 1971. \$10.00

Scientific Manpower: A Dilemma for Graduate Education (Conf. proc. The Supply, Need and Utilization of Graduate Students and Engineers, MIT, 12, 13 May 1970). S. C. Brown, B. S. Schwartz, eds. 180 pp. MIT Press, Cambridge, Mass., 1971. \$6.95

Statistical Mechanics at the Turn of the Decade. E. G. D. Cohen, ed. 235 pp. Marcel Dekker, New York, 1971. \$12.50

Trunk Telecommunications by Guided Waves (Conf. proc. 29 Sept.-2 Oct. 1970, IEE). 364 pp. Institute of Electrical Engineers, London, UK, 1970. £8.60

ATOMS AND MOLECULES

Electronic and Ionic Impact Phenomena, Vol. 3: Slow Collisions of Heavy Particles. By H. S. W. Massey. 819 pp. Oxford U.P., New York, 1971. \$38.50

Theory of Intermolecular Forces, 2nd ed. By H. Margenau, N. R. Kestner. 400 pp. Pergamon, New York, 1971. \$18.75