

Pauli Lectures on Physics

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Volume 1. Electrodynamics

Volume 2. Optics and the Theory of Electrons

Volume 3. Thermodynamics and the Kinetic Theory of Gases

Volume 4. Statistical Mechanics

Volume 5. Wave Mechanics

Volume 6. Selected Topics in Field Quantization

by Wolfgang Pauli

edited by C. P. Enz

Foreword by Victor F. Weisskopf

These lectures covering topics basic to classical and modern physics were given by Pauli at the Zurich Federal Institute, where they were transcribed by his collaborators. They have now been translated and edited for English publication, and are introduced by Victor Weisskopf, who writes as follows:

"It is often said that scientific texts quickly become obsolete. Why are the Pauli lectures brought to the public today, when some of them were given as long as twenty years ago? The reason is simple: Pauli's way of presenting physics is never out of date. His famous article on the foundations of quantum mechanics appeared in 1933 in the German encyclopedia *Handbuch der Physik*. Twenty-five years later it reappeared practically unchanged in a new edition, whereas most other contributions to this encyclopedia had to be completely rewritten. The reason for this remarkable fact lies in Pauli's style, which is commensurate to the greatness of its subject in its clarity and impact.... Pauli's lectures show how physical ideas can be presented clearly and in good mathematical form, without being hidden in formalistic expertise."

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portant. As these techniques are more difficult experimentally, they naturally developed somewhat later, having been perfected after the book was written.

It is unfortunate that Cardona did not see fit to include in this volume the work that has been performed on defect centers in crystals. These same techniques have been applied with great success in the case of color centers, for example, and the extra chapter or two required would not have needed to be excessively long. A further criticism can be made as regards the presentation of experimental methods. Almost all of the techniques are described in a way that would lead one to believe modulation spectroscopy is an afternoon's work; there is, however, passing mention of some of the pitfalls.

An examination of the experimental data sections on electroreflectance and a comparison with current journals demonstrates amply the difficulty of obtaining good quantitative data; the easy experiments are the qualitative ones, but the step from qualitative to quantitative is a large one, both experimentally and theoretically, as Cardona well knows.

RICHARD A. FORMAN

National Bureau of Standards

Washington, DC

The Construction of Modern Science: Mechanisms and Mechanics

R. S. Westfall

171 pp. Wiley,

New York, 1971.

\$7.50, cloth; \$3.95, paper

The development in scientific thought that culminated in Newton's *Principia* in 1687—a development that Alfred North Whitehead once described as perhaps "the greatest single intellectual success which mankind has achieved"—constitutes the scientific revolution of the seventeenth century. This revolution in ideas is the subject matter of Richard S. Westfall's new book, written as one of a series that aims at bringing the results of recent scholarship in the history of science to a general audience. Writing a book for the general reader that deals effectively with such a richly diversified subject in a brief format may have been attempting the impossible. Westfall is certainly well qualified to try, however, because of his experience in teaching the history of science at Indiana University, and because of his previous writings—which include a book on science and religion in the seventeenth century, a series of papers on Newton's optical researches, and a major new

book on mechanical concepts in this period: *Force in Newton's Physics*.

Westfall sees the scientific revolution as the interweaving of two principal themes—the spread of the mechanical philosophy and the growing success of the search for mathematical order in the world. At the beginning of the century William Gilbert, for example, could still use the language of Renaissance naturalism to describe his experimental results on magnetism; he saw magnetic phenomena as the effects of an active principle that gave rise to sympathies and antipathies between bodies. The mechanical philosophy, expressed most powerfully by Descartes, decisively rejected such explanations in terms of active principles or occult virtues, and demanded that all natural phenomena be explained solely as the effects of matter in motion. Nature became a great machine. Westfall describes a variety of the hidden mechanisms proposed during the seventeenth century as causal explanations in fields as diverse as astronomy, chemistry, and embryology. These proposed mechanisms often strike us as fanciful or absurd, but Westfall emphasizes that they were very much a part of the thinking of a skillful experimenter like Robert Boyle, and that they deeply influenced even so profound and cautious a scientist as Christiaan Huygens.

The search for mathematical order proved most successful in the study of motion, both terrestrial motions and those of the heavenly bodies. Westfall traces some of the major steps in this search starting with Galileo's analysis of free fall and projectile motion, and Kepler's struggle with the orbit of Mars. He points out Descartes's statement of the principle of inertia and indicates the problem of understanding circular motion to which it led. Westfall properly emphasizes the central role of the problem of collisions in leading to Newton's formulation of the critical concept of force, and he sketches the development of Newton's mechanical ideas.

Despite the brevity of his book, Westfall has been able to suggest the variety of viewpoints from which the history of science can be treated. These range from studies of science as an organized social activity, through studies of the connections between scientific ideas and the general intellectual climate of opinion, particularly its philosophical aspects, to studies of the development of science as "determined partly by the intrinsic nature of the discipline, partly by the special role which that discipline's past always plays in its current evolution," as Thomas Kuhn recently put it.

Physicists will find Westfall's book to be a readable and interesting sketch of some of the main features of the

transformation of science that took place during the seventeenth century. They may regret that limitations imposed by lack of space and the intended general audience kept the author from giving more of the details of the science of the period, those details that constitute so much of its real interest. A number of the illustrations may tantalize the physicist reader enough to make him read more deeply elsewhere in order to find out, for example, how Huygens was able to solve the problem of the physical pendulum when Newton was still a schoolboy. But if Westfall's book stimulates such further study it will have fulfilled its purpose.

MARTIN J. KLEIN
Yale University

Theory of Experiments in Paramagnetic Resonance, Vol. 33 of International Series of Monographs in Natural Philosophy

J. Talpe
260 pp. Pergamon,
New York 1971. \$12.00

This monograph by Jan Talpe presents the field of electron spin resonance from a somewhat unconventional perspective, and as a result it constitutes good supplementary reading for workers in the field. The potential audience is graduate students and research workers in physics and chemistry.

The book begins by presenting high-frequency magnetic susceptibility as a particular example of a complex transfer function. This is discussed in terms of a derived relaxation function, which is analogous to Ryogo Kubo and Kazuhisa Tomita's transposed relaxation function. The author provides an insight into the nature of the magnetic resonance phenomenon by comparing the behavior of the susceptibility with the role played by the admittance in an electrical circuit. Nonresonance relaxation or "drag" is treated briefly.

The various characteristics of the paramagnetic resonance line are treated in great detail, including relaxation, resolved and unresolved structure, high and low field limits, shape functions, folding, inhomogeneous broadening and anisotropic broadening. Various aspects of Lorentzian and Gaussian line-shapes are discussed in a manner that supplements the treatments found in other books.

The first half of chapter 3 treats electromagnetic field configurations. It would have helped if the discussion in the text had been supplemented by more figures. The second half of the chapter discusses microwave components and spectrometer operation in

terms of the Smith diagram, and thereby provides a good physical insight into their functions.

The last chapter on signal enhancement discusses general background material first and then takes up the principles of lock-in-detector operation. It ends with a short qualitative section on noise suppression and signal accumulation. No mention is made of resolution enhancement techniques.

The book has a very short subject index and no author index. It employs SI units, which is a good trend for the future and magnetic susceptibilities are defined in relation to the B-field rather than the H-field. These unconventional features should not present any inconvenience to the reader.

CHARLES P. POOLE JR
Department of Physics
University of South Carolina
Columbia

new books

Conference Proceedings

Fourth Symposium on the Structure of Low-Medium Mass Nuclei (Conf. proc. The Nuclear Structure Laboratory, Univ. of Kansas). J. P. Davidson, ed. 266 pp. Univ. Press of Kansas, New York, 1972. \$12.50

Auxiliary Instrumentation for Large Telescopes (Conf. proc. ESO/CERN, Geneva, 2-5 May 1972). S. Laustsen and A. Reiz, ed. CERN, Geneva, Switzerland, 1972

Elementary Particles (Conf. proc. of the Amsterdam International Conference, Amsterdam, The Netherlands, 30 June-6 July 1971). A. G. Tenner and M. J. G. Veltman, ed. 472 pp. American Elsevier, New York, 1972

The Physics of Electronic and Atomic Collisions: invited papers and progress reports (Conf. proc. VII ICPEAC, Amsterdam, The Netherlands, 26-30 July 1971). T. R. Govers and F. J. De Heer, ed. 496 pp. American Elsevier, New York, 1972. \$39.50

Proceedings of the Frequency Standards and Metrology Seminar (Conf. proc. Quebec, Canada, 30 August-1 Sept). 493 pp. Laval University, Quebec, Canada, 1971. \$10.00

Adsorption-Desorption Phenomena (Conf. proc. II International Conf., Florence, April 1971). F. Ricca, ed. 462 pp. Academic, New York, 1972. \$20.50; £6.50

Mesospheric Models and Related Experiments (Conf. proc. Fourth Esrin-Eslab Symposium, Frascati, Italy, 6-10 July 1970). Vol. 25. G. Fiocco, ed. 298 pp. Springer-Verlag, New York, 1971.

External Galaxies and Quasi-Stellar Objects (Conf. proc. International Astronomical Union, Symposium No. 44, Uppsala, Sweden, 10-14 August 1970). D. S.

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