voltaic effects, etc. (chapter 10). There are also 146 pages of tables, buttressed by 1505 references!

Like all first books in a rapidly developing subject, this book is doomed to rapid obsolesence. Nevertheless, I believe the Gutmann-Lyons monograph to be an extremely valuable addition to the literature. Although the student will have to refer elsewhere to complete his theoretical understanding, this book should stimulate interest in the subject and serve as a useful summary compendium. I can wholeheartedly recommend it to all students and researchers interested in the properties of molecular crystals, as well as to others who wish to see where the subject stands.

The monograph by Agranovitch and Ginzburg is of an entirely different nature. Beginning with the work of Frenkel (1931) and later of Davydov (1946), the Russians have been leaders in the study of the properties of crystals of aromatic compounds. Agranovitch has been in the forefront of one of the more recent theoretical developments: consideration of the effects of variation of the refractive index of the crystal with both wave vector and frequency. The Agranovitch-Ginzburg monograph, written for advanced students and research workers, is entirely devoted to this subject. It may be considered an amplification of the set of review articles which appeared in the *Uspekhi*. The approach used is that of macroscopic electrodynamics, that is, analysis of the dielectric function in terms of symmetry properties, Maxwell's equations, boundary conditions and the Kramers-Kronig transform. The microscopic theory is treated briefly, in chapter 4, from the point of view of calculating the dielectric function. Even a rapid reading of the text is rewarding because of the wealth of new results and for the ideas thereby generated. Unfortunately, the text is extremely difficult to read because the translation is so heavy-handed and, at times, ambiguous. With considerable effort the material can be understood. The publishers should be publicly chided for not providing better editorial control of the translation. Undoubtedly the appeal and utility of the book have been reduced from what they might be had the translation been better.

The Agronovitch-Ginzburg monograph is an important addition to the literature of crystal optics and related subjects. It will be useful to advanced students, but they must be prepared to work for the insights contained in the theoretical analysis.

* * *

The reviewer, director of the James Franck Institute of the University of Chicago, is known for his studies of the theories of liquids and solids.

An appropriate concept

THE CONCEPT OF ENERGY: ITS SIGNIFICANCE IN FUNDAMENTAL THEORY AND PRACTICE. By D. W. Theobald. 192 pp. Barnes & Noble, New York, 1966. $7.50

by R. Bruce Lindsay

The success of physics in achieving an understanding of human experience has depended largely on the appropriateness of the concepts invented for physical theories. Of all physical concepts, that which has shown itself adaptable to the widest range of phenomena is undoubtedly energy. Hence any new work that seeks to assess its role is worthy of attention. The purpose of the book under review, whose author is lecturer in chemistry and the history and philosophy of science in the Manchester College of Science and Technology of the University of Manchester, England, is to present an account of the part the concept of energy plays in the theoretical structure of the physical sciences. It is not intended to be a textbook but might be termed a philosophical or methodological examination of the concept. Its audience is presumably not only undergraduate physics students but also practicing scientists in general.

The author has thought it desirable to include a prefatory chapter on the nature of physical theorizing and concept construction. For the most part this follows conventional lines but may be helpful to the neophyte who is unacquainted with the philosophy of science. The energy idea proper is introduced in the second chapter in the guise of mechanical energy. Here the

Recent Conference Proceedings

Summer Institute in Nuclear and Particle Physics

Bernard Margolis
and
C. S. Lam
Editors
McGill University

Proceedings of the 1967 Summer Institute in Nuclear and Particle Physics held at McGill University, conducted by the Theoretical Physics Division of the Canadian Association of Physicists.

CONTRIBUTORS

K. Gottfried: Collision and Decay Phenomena
S. Kahana: Effective Interactions in Finite Nuclei
G. Källén: Radiative Corrections in Weak Interactions
D. Kurath: Nuclear Deformation in the Shell Model
B. W. Lee: Topics in Electromagnetic and Weak Interactions
H. Lipkin: Quark Models
B. Margolis: Nuclear Reaction Theory
M. Rho: Muon-Capture in Nuclei and Migdal Theory
J. Schwinger: Theory of Sources
C. Wilkin: High Energy Scattering from Nuclei

Theoretical Physics

David Feldman, Editor
Brown University

Proceedings of the Fifth Annual Eastern Theoretical Physics Conference held at Brown University in November 1966.

CONTRIBUTORS

Astrophysics
E. L. Schücking: Relativistic Cosmology
E. E. Salpeter: Molecules in Interstellar Space
M. A. Ruderman: States of Matter in Stars
P. Morrison: Thermal X-Rays and Radio Sources: Explosion Aftermath
High-Energy Physics: Symmetries and Current Algebras
B. W. Lee: Applications of Current Algebra
F. E. Low: Consistency of Current Algebras
J. J. Sakurai: Vector Meson Dominance and Current Algebra
T. D. Lee: Electromagnetic Currents and Vector Mesons
High-Energy Physics: Mostly Field Theory
A. S. Wightman: Existence of Solutions of Equations of Quantum Field Theory
Y.-S. Jin: Analyticity Properties and Asymptotic Behavior of Scattering Amplitudes
M. L. Goldberger: Recent Developments in Regge Pole Theory
J. Schwinger: New Foundation for Particle Theory
Solid-State Physics and the Many-Body Problem
P. W. Anderson: Theories of Magnetism in Metals
C. N. Yang: Quantum Lattice Gas and the Heisenberg Antiferromagnetic Chain
E. W. Montroll: Theory of Thermal Transport Coefficients
F. J. Dyson: Stability of Matter

Ninth Latin American School of Physics

Igor Saavedra, Editor
Universidad de Chile

Proceedings of the conference held in Santiago, Chile, in July 1967, dealing with particle physics and solid state physics.

CONTRIBUTORS

Particle Physics
Y. Ne'eman: Algebras in Hadron Physics
B. Jouvet: The Field Theoretical Approach to Composite Particles
K. Johnson: Recent Developments in Quantum Electrodynamics
M. Nauenberg: Current Algebras
C. Fronsdal: Infinite Component Field Theories
Solid State Physics
C. Kittel: Aspects of Magnetism
S. Rodriguez: Electrodynamics of Solids
M. Cardona: Electronic Optical Properties of Solids
R. F. Wood: Electronic Structure and Defects in Ionic Crystals
Nuclear Physics
I. Slaus: Some Problems in Fast Neutrons Physics

W. A. BENJAMIN, INC.
ONE PARK AVENUE • NEW YORK 10016

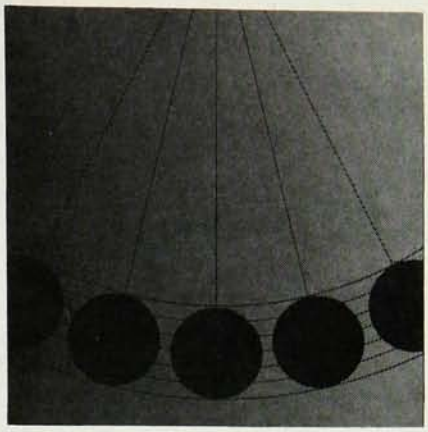
contributions of the Galilean and Newtonian schools to the evolution of the concept are discussed, though the historical treatment is inadequate; no attempt is made to trace the development of the idea from ancient times, as has been done fairly recently, for example, by Erwin N. Hiebert in *Historical Roots of the Principle of Conservation of Energy* (University of Wisconsin, 1962). It is difficult to establish a valid historical perspective without a study of this sort. The contributions of D'Alembert, Lagrange and Hamilton are reviewed briefly.

The next chapter moves on to thermal energy and the foundations of thermodynamics. The historical treatment of the development of the mechanical theory of heat is very scanty. For example, the significant contribution of Robert Mayer is dismissed with only a casual reference. For the most part the material here reduces to a didactic account of the well known principles of thermodynamics and their statistical interpretation.

Field energy is next introduced with the discussion largely confined to the electromagnetic field. No effort is made to inaugurate the treatment from the standpoint of the more readily grasped idea of energy in elastic material media. The effect of special relativity on the energy concept is indeed brought into the picture successfully.

The quantization of energy through the agency of the quantum theory has played an enormously important role in modern physics, and a chapter of some 30 pages is devoted to it. Here again the discussion tends at times to drift away from the energy concept proper to a review of the principles of quantum mechanics.

The chapter entitled "The Conservation of Energy" could have been more appropriately incorporated in the earlier historical discussion. Its chief contribution otherwise is an exposition of the relation between conservation and symmetry principles in mechanics. The final chapter is a purely philosophical investigation of the "reality" of energy. This problem, of obvious ontological interest to professional students of metaphysics, seems no longer to have relevance in the philosophy of science.



Since the treatment is confined to the physical sciences there is no reference to the very great role energy has recently begun to play in the life sciences, not to mention the problem of energy control in general, as treated in cybernetics. For the most part the style is clear and readable. There are a few careless lapses. For example, Hamilton's principle (page 43) is not stated with complete correctness, and on page 58 the statement of the relation between the first law of thermodynamics and perpetual motion is misleading.

The bibliography is relevant and rather generous in extent. The reader of this book will undoubtedly find himself stimulated to dig more deeply into the subject.

* * *

The reviewer is now engaged on a rather extensive project involving the concept of energy.

Public eavesdropping

THE WAY OF THE SCIENTIST: INTERVIEWS FROM THE WORLD OF SCIENCE AND TECHNOLOGY. Robert Colborn, ed. 382 pp. Simon and Schuster, New York, 1966. $8.95

by M. W. Friedlander

Interviews, when reprinted verbatim, often appear very unsatisfactory. Missing are the tones of voice that give emphasis and the expressions and hand movements so useful as further aids. In the volume under review, are transcribed interviews that have appeared over several years in *International Science and Technology*. This monthly journal is directed towards professional scientists and engineers in relatively senior positions, and its contents are invariably interesting. A regular feature has been the interview with prominently placed scientists and administrators. The intention with the present collection, is to "give the public a chance for the first time to eavesdrop on these intimate and thoughtful conversations taking place within the private world of the scientist." The list of men interviewed (no women are included in this group) is impressive: from scientists active in distinguished careers (Charles H. Townes, Abdus Salam, Victor Weisskopf) through those who have shifted their efforts to administration and on to presidential advisors, the rector of Moscow State University and a group of British emigrés now working in the United States.

The overall effect is somewhat disappointing. The collection is scrappy to read. For far too few of the interviews is it possible to assign a date and so place them in context. Much of the questioning is pedestrian, and the role of the editorial marginal notes is unclear. Some notes are surprisingly terse considering the topic (for example, bootstrap formalism on page 99) whereas some notes are surely needed for many of the more technical topics arising in the discussions that must be unfamiliar to many readers. Yet, on the other hand, it is thought necessary to have a note to define molecular weight (page 107).

Some (but far too few) of the men interviewed come to life—Leo Szilard, lamenting trends that these days get in the way of being able to undertake spur-of-the-moment checks on sudden ideas; Peter Debye, concerning students and education; Albert Szent-Gyorgyi the most alive of all. But these bright spots are few and too far apart. Too often the interview runs over familiar ground, exposing well-worn tracks but few personal or new views.

I must admit to having approached this review from a very different angle. Many of us are concerned with bringing to nonscientists some appreciation and understanding of some of the many facets now presented by science and technology. This is indeed one of the avowed aims of the present volume. Next semester, in a