

peal to students, and to persons not very familiar with the quantum theory. I am compelled to doubt whether readers of that type would get very much more out of it than the general impression that many different forms of theory were tried out, of which relatively few survived to form the quantum theory of today. Even this general view is useful, however. It is through such trial and modification that science always progresses.

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The Einstein Decade (1905–1915)

C. Lanczos

230 pp. Academic, New York, 1974.
\$12.50

Adam Smith once introduced the Impartial Spectator. He is a sympathetic being who is an alter ego to the author, and who views the world very much the same way the author does.

Cornelius Lanczos was the ideal Impartial Spectator to Einstein. His interest in Einstein's personal work goes back to the time when he was working with him, during 1928 and 1929. In his present and last book, he provides a charming manifestation of these sympathies and interests. The book itself is a throwback to earlier days in style, temper and content—Lanczos has revived a now forgotten form (causeries) and adapted it to the study of scientists. It has been often used for the study of literature and art (Sainte Beuve for example), but not for the study of science. In it one discusses the temperament of the author, its consequences on the choice of topics and on his accomplishments. Then, this information is used to study the individual pieces of work. It is a sort of Baedeker through the author's *oeuvre*; illumination is provided by the guide's personal knowledge of the author, his work, and the (supposed) motivation of the author.

This well produced book deals in this manner with the most fruitful ten years of Einstein's life (1905–15). Its first half discusses Einstein, his predilections outside science, and his basic motivation, according to Lanczos, in comprehending the external world. After that, the author gives us a brief outline of statistical mechanics and relativity; he does not, however, discuss quantum theory and electrodynamics to the same extent. This is followed by a delightful fictitious interview with the young Einstein.

The second half of the book deals with 67 memoirs—Einstein's output for



ten years. Each memoir carries the original title, its translation, the reference to the original and a discussion of the content. These discussions are excellent. They vary in length and give a full understanding of the aims and achievements. If necessary, a short remark is appended to give additional information such as references.

There is a large potential audience for the book. The technical details are not too difficult for an undergraduate, and a graduate student should study it to see the range and depth that is possible for a genius in physics to achieve. Finally all physicists will benefit from it: Those who love physics as a vocation will derive pleasure; those who exploit physics as a trade will, at least, gain a different point of view.

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Advice and Dissent— Scientists in the Political Arena

J. Primack, F. von Hippel

299 pp. Basic Books, New York, 1974.
\$12.95

The avalanche of events and revelations over the last few years has tended to crowd from our memories major national issues that occurred only five years ago. Yet with only the modest reminder of a few initials—DDT, ABM, SST—we easily recollect these intense

debates, exemplifying the class of political policy controversies over the past decade with a substantial scientific/technical component.

Joel Primack and Frank von Hippel lead us once again through these and other events of their kind. They also include in their roster nuclear-reactor safety, and the use of defoliants, nerve gas and cyclamates. For each there is a chronological recounting of history, told with the pace and fascination of good journalism, yet documented and referenced with scholarly precision. For each, as well, there are the human participants—heroes, villains and dupes—so that the nonfictional tales have elements of vivid melodrama.

But of course there are lessons, and pointing us at them is the underlying purpose of Primack and von Hippel. Scientists played key roles in each of the debates and these roles are examined carefully. Some instances involved scientist advisory panels to government agencies, usually being duped by their client; in others individual scientists came out of their laboratories into citizen advocacy roles, unanimously heroic; occasionally scientists were also government bureaucrats, typically on the losing team. The lesson is the inadequacy of the traditional mechanism for interaction between science and government—the advisory panel—into whose failures or absence individual, improvisatory scientists had to step.

Primack and von Hippel call for scientists and their community to strengthen their contributions to the resolution of government policies in two ways. They urge a new participation by the learned professional societies, as a forum for the study and debate of the technical aspects of public issues. This would tend to relieve many of the past difficulties they recount, such as with secrecy, conflicts of interest, non-objectivity and misuse. The other direction they encourage is the wider acceptance of public-interest science as a career activity legitimately within the profession itself. The role of scientifically trained public advocates becomes particularly vital for issues at the state or local level, for which professional societies have an inappropriately broad constituency and where advisory panels are rudimentary or nonexistent.

Government, for its part, is also trying to improve its capabilities for comprehending the technical questions within public issues. The Office of Technology Assessment, noted by Primack and von Hippel, is a new step in that direction by the Congress. The Executive branch at this date is seriously rethinking its organization for science and technology policy. State governments are trying to cope, but at a distinct disadvantage in resources.

Scientists, collectively and individu-

ally, have a responsibility to aid in this political process, which involves them both professionally and as citizens. Primack and von Hippel document compellingly the consequences from the recent past of not meeting this responsibility adequately.

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Particle Diffusion in the Radiation Belts

M. Schulz, L. J. Lanzerotti
215 pp. Springer-Verlag, New York, 1974.
\$32.00

The subject of charged-particle behavior in the radiation belts has been one of some considerable interest in plasma astrophysics. It provides an observational testing ground for many of our theoretical ideas, which we then apply to other astrophysical situations where it is difficult, or impossible, to make *in situ* observations. Also, of course, it is of interest in its own right. This book attempts to pull together a wide variety of phenomena which can, and do, cause particle diffusion in the radiation belts. It would appear that the book divides into two parts. First (in chapters 1 through 3) we are treated to about 100 pages outlining the theory of adiabatic invariants in the radiation belts (magnetic moment, longitudinal and flux invariants) together with the theory of particle diffusion (both in pitch-angle and coordinate space) caused by violations of the adiabatic approximation. Second we are given about 100 tersely written pages concerning "prototype observations" and methods of empirical analysis.

The first half of the book is a valuable, but dangerous, compendium and brief outline of the theories of adiabatic invariants and diffusion—the word "dangerous" is used here advisedly. It is very difficult to discern the limits of theoretical validity of the formulas given. For example, the argument given on pages 79 and 80 even admits to ambiguity, and chooses custom as a way of defining the weak diffusion limit—hardly an objective scientific approach. Thus, if the reader knows, or thinks he knows, the validity of various physical processes and their mathematical statements then no harm is done in using this book as an *aide-memoire*. But if one does not, then extreme caution is the watchword.

The second half is a very useful summary of general categories of observations together with practical ways of obtaining such parameters as diffusion coefficients using the data. I found this

half of the book tougher going than the first half but more worthwhile. It seemed to me that the authors have put considerable effort into outlining the sort of errors that can arise in deducing, say, diffusion coefficients from data. The same level of effort is not so apparent in the first half of the book.

All in all then, a general statement concerning this book is best taken from its preface: "the book will be of value primarily to those who have professional interest in the subject." The book would not meet criteria for a graduate-course textbook (and in fairness I must point out that the authors admit this). I recommend this book as a useful handbook for the professional. It is well written, with few typographical errors but unfortunately the price is astronomical.

IAN LERCHE
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Vacuum Manual

L. Holland, W. Steckelmacher,
J. Yarwood, eds.
427 pp. E. & F. N. Spon, London, 1974.
£ 10.75

The design and assembly of reliable vacuum equipment is a necessity for many industrial and research applications, but no comprehensive vacuum handbook is available. The present volume is directed towards this need, and the three editors have long and distinguished association with vacuum science and technology—two of them with a major equipment manufacturer and the third with university teaching and research.

The book opens with a section devoted to basic data, such as outgassing rates, conductance calculations and the properties of pump fluids. Extensive tables of data are provided. There is a great deal of interest to novice and expert, but the editors largely omit examples and critical guidance on component selection and system design.

About half the book is a collection of abbreviated specifications for vacuum equipment and systems, supplied by over 150 manufacturers. The data are relatively up-to-date and can be useful, but frequent revision will be necessary. Because the average user will need to refer to the complete manufacturer's data, a much briefer listing with better subdivision, to facilitate comparisons, might have been more useful. However, this is only a listing of manufacturer's specifications, and can give no guidance as to the validity of claims or to the reliability of the equipment, a serious limitation to those who have no experience in the field.

NEW

Problems of Vibrational Nuclei

Proceedings of the Topical Conference on Problems of Vibrational Nuclei, Zagreb, Croatia, Yugoslavia, September 24 - 27, 1974

edited by G. Alaga, V. Paar and L. Sips

1975. 468 pages.
US \$ 41.75/Dfl. 100.00

This volume contains the invited papers presented at the conference, whose aim was to discuss and compare the different theoretical and experimental approaches in order to clarify the present status of vibrational nuclei and to bridge the existing communicational gaps. The programme covered: RPA, quasiboson expansions, collective Hamiltonian and particle-vibration coupling, approach to nuclear vibrations in Migdal theory, relation between particle-rotation and particle-vibration coupling; main results (spectra, electromagnetic transitions, static moments, inelastic scattering, transfer reactions, high-spin states), difficulties and common features with special emphasis on nuclei around double and single closed shell nuclei; renormalizations, effective charges, coupling strength, selection and intensity rules; effective interactions, effective operators, multistep processes, interference effects, etc.

Claude Bloch - Scientific Works

edited by R. Balian, C. De Dominicis, V. Gillet and A. Messiah.

1975. about 1600 pages. (in 2 vols.).
US \$ 187.50/Dfl. 450.00.

During his lifetime, Claude Bloch exerted a considerable influence on several areas of modern physics, including nuclear structure and reactions, statistical mechanics, the many-body problem and perturbation theory. His lectures, presenting ideas far in advance of his time, helped to shape a whole generation of young scientists. These volumes comprise his published articles, reports and lecture notes, and reflect Bloch's depth of insight, clarity of ideas and complete mastery over the tools of mathematics.

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