bers that have received major Russian effort. The figures are small and lack detail. Insufficient space is devoted to the design of bubble-chamber magnets, and superconductivity is only briefly mentioned. The problems of automatically processing bubble-chamber photographs are not discussed in any detail.

Although the book has an old-fashioned flavor, it contains many points that may be of reference value to bubble-chamber builders and users, students and those with a general interest in experimental technique. For a later and more comprehensive work on this subject, the reader is referred to *Bubble and Spark Chambers*, edited by R. P. Shutt (1967).

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Edward G. Pewitt is leader of the group building the 3.7-meter hydrogen bubble chamber at Argonne National Laboratory.

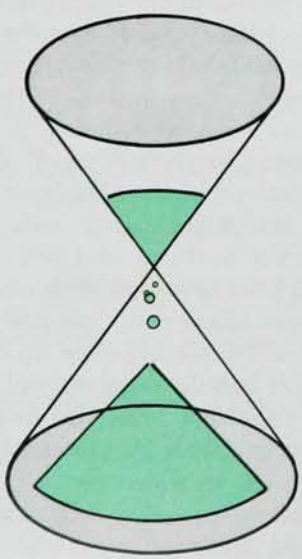
Fundamentals of time

LE TEMPS ET LA PENSEE PHYSIQUE CONTEMPORAINE. J. L. Rigal, ed. 149 pp. Dunod, Paris, 1968. Paper 16.50 F

by LADISLAUS MARTON

This book, entitled *Time and Contemporary Physical Thinking*, is part of the new series, *Realités de la Science*. The whole series attempts to present what the editor calls an "initiation into fundamental principles" and a "clarification of what these principles want to say and what they do not say."

Let us start by stating that the present volume succeeds in that preset task reasonably well. I say reasonably well because the 12 contributions by different authors vary considerably not only in presentation but also in scientific rigor. The contributions are separated into four parts of the book: "Time in Classical Physics," "Space and Time," "On Time and Information in Probability Physics" and "Idea of Time in Microphysics." Each of these parts is preceded by a lengthy introduction and discussion by the editor, J. L. Rigal, a professor at the University of Besançon. The editor mentions in his preface that it took about five years to gather the material for this relatively short book—which seems to be an excessive time for such a condensed publication.



The first part is divided into six contributions. These articles are on the sources of time measurements, time in classical mechanics, time in astronomy, atomic and molecular clocks, distributed time and the age of celestial bodies. The discussions center quite a bit on the precision attained with different devices. Surprisingly, although the precision is amply discussed, there is absolutely no indication about the lack of agreement or lack of accuracy in defining the epoch.

The second part of the book discusses some "old paradoxes, discovery of space–time, and the principle of relativity and equivalence between space and time." Rigal states that the time concept may vary with the physical circumstances and that the fourth dimension of space–time is not necessarily identical with ordinary classical time.

In the third part of the book there are two chapters entitled "The Second Principle of the Science of Time" and "Time and Information, Probability Concepts." The final chapter is "The Idea of Time in Modern Physics."

Some of these presentations are quite good. Others are on a rather elementary level, or they present a more literary than factual consideration of the topics. I have a few comments that are not quite favorable. First there are too many typographical errors. There are altogether too many errors to make comfortable reading for a reader who is not French. Another objection is the typographical setup. There are about 20 different typefaces used throughout the book.

Last but not least, there is a summary bibliography on the last page. About six items are listed with a remark indicating that all the other bibliographies are presented at the end of each chapter. However, out of 12 chapters, only three have bibliographies.

* * *

L. Marton is an electron physicist engaged in the international relations of the National Bureau of Standards.

Techniques for coherent sources

LASER PARAMETER MEASUREMENTS HANDBOOK. H. G. Heard, ed. 489 pp. Wiley, New York, 1968. $15.95

by RICHARD B. ZIPIN

The subject of this review is a laboratory reference on the measurement techniques peculiar to laser technology. It is the eighth book of the Wiley series in *Pure and Applied Optics*, and the fifth book of the series treating some aspect of lasers. 37 contributors are listed, in addition to the editor, Harry G. Heard, whose credentials are well known to workers in the field. It is a good book and, considering the difficult job it is to edit a volume such as this one, Heard is to be commended. A reader can detect the effects of multiple authorship, but he can also see the effects of a hard-working editor.

The contents include an introductory chapter, one on beam sampling techniques, and then chapters treating the measurement of beam parameters, energy and power, gain parameters, wavelength, bandwidth and temporal coherence and frequency stability. The final chapter discusses the measurement of noise and modulation of laser carriers for communication. The emphasis is on laboratory techniques, and there are many tables of data that will be useful in a laboratory. I expected to find data on lasers per se and perhaps some discussion on the design criteria used to achieve the various parameters whose measurements are treated; however, I was disappointed. It seems unfortunate, for example, that in a book about the measurement of laser parameters there is a 38-page chapter devoted to wavelength measurements in which there is no mention of the literature reporting such measurements. There is not even a list of some of the typical nominal wavelengths available from known laser materials.

Each chapter contains an extensive list of references and a table of the

nomenclature. The table is an excellent feature as it allows each contributor to use the usual nomenclature of his subject while preventing reader confusion. An author index is lacking, and the five-page subject index is inadequate for a reference work. Reviewers can play a game with themselves and try to find a word they consider significant that does not appear in the index. I should say that my own work has been only with gas lasers, but I was surprised that the subject index does not contain the terms gas laser, Lamb dip, He–Ne, ruby and continuous wave. There are also other terms I looked for but could not find.

I feel that the title is misleading. The book deals with measurement techniques applicable to lasers, but the stress is on the techniques rather than on lasers. A better title might be *Modern Optical Measurements*. Nevertheless, it is a useful book on optical measurements, and I will henceforth keep my copy near at hand in my own laboratory.

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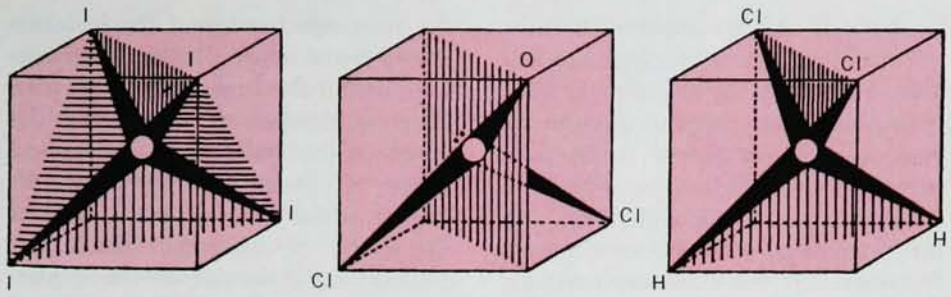
The reviewer, who spent a year as a research associate in the Engineering Metrology Section of The National Bureau of Standards working on the application of lasers to length measurement, is responsible for optical development at the Automation and Measurement Division of The Bendix Corporation in Dayton, Ohio.



SYMMETRY PLANES of molecules. The HgI_4^{2-} molecular ion has six planes of symmetry, four of which are shown in the drawing on the left. The $SOCl_2$ molecule (center) has one plane of symmetry and the CH_2Cl_2 molecule two such planes. (From *Inorganic Electronic Spectroscopy* by A. B. P. Lever, reviewed on this page.)

For inorganic chemists

INORGANIC ELECTRONIC SPECTROSCOPY. By A. B. P. Lever. 420 pp. American Elsevier, New York, 1968. $31.50

by STUART A. RICE

During the last decade, a number of books have dealt with crystal and ligand field theory and its applications to the inorganic chemistry of transition-metal complexes. Is there still need for another text? Does this text by A. B. P. Lever provide a unique point of view, method of presentation or breadth of coverage? The answers to all these questions are simultaneously no and yes.

Comparison of Lever's text with those of Leslie Orgel, of Thomas Dunn, Donald McClure and Ralph Pearson and of Carl Ballhausen is revealing. It is not as elementary as the beautiful presentation by Orgel, is more detailed and treats the theory more clearly than does Dunn, McClure and Pearson (but omits discussion of the nonspectroscopic parts of complex chemistry that they cover) and in turn is not as detailed and is less advanced than Ballhausen's text. As an intermediate level text, its principal virtue is a modest level of coverage of almost all of the relevant physical phenomena and integration of the theory with many experimental data. The text should, therefore, be very useful to students of inoranic chemistry who wish to use ligand field theory in the interpretation of experiments. It will not be very useful to the theoretical chemist.

As to details, the treatment is standard in format but clearly done. The book is illustrated with many diagrams, a number of which are quite helpful in illustrating textual material. There are also numerous helpful tables. Occasionally advanced material is slipped in without adequate explanation (for example, Condon and Racah parameters are not really interpreted for the student). Although the student may accept such material, the text does not prepare him to understand the "whys and hows."

The book should be a very useful text for inorganic chemists and also for others who want a moderately detailed summary of ligand and crystal field theory.

* * *

Stuart Rice is the Louis Block Professor of Physical Sciences at the James Franck Institute, University of Chicago. He has done a broad range of theoretical and experimental studies on electronic states of atoms and molecules in crystals, liquids and gases.

Mechanical concepts and theories

GENERAL MECHANICS. By Henri Cabannes. Trans. from the 2nd French edition. 426 pp. Blaisdell, Waltham, Mass., 1968. $11.50

by JACQUES E. ROMAIN

The difference between French and US general-mechanics textbooks is often that the former are more an exercise in applied mathematics and the latter are more physics in a mathematical form. By this criterion, Henri Cabannes's book would rather be classified among US texts, for it is a genuine theoretical physics book. The way new concepts are introduced is not abstractly axiomatic but discloses an earnest operational preoccupation. This careful approach clarifies, right from the beginning, the actual purport of each concept and its limitations.

Other special features single out this book among existing textbooks on general mechanics. The first is the grouping of mathematical tools and general properties pertaining to a category of problems. Therefore the discussion of particular problems, relieved of the burden of considerations that are not relevant, becomes more compact and straightforward and the physics more apparent. A characteristic example of this approach is the exposition, at the beginning of the chapter dealing with oscillations, of the essentials of differential equations (including the classification of singu-