

readers and users of this book are the professionals of nuclear magnetic resonance who do not shrink from density matrix calculations, and who are at home in all rotating reference frames.

The author's major emphasis is on the behavior of spin systems in isolation from the lattice, and the book begins with a discussion of the establishment and evolution of spin temperature in an isolated system. After a brief chapter on the effects of spin lattice relaxation on spin temperature, Goldman presents the Provotorov technique of calculating the effects of a saturating rf field on the spin system.

Chapter 5, on the applications of the Provotorov theory, is one chapter whose contents should be known to all working in magnetic resonance in solids, even those not consciously interested in exploiting the techniques and theory of this book. Almost everyone uses lock-in detection, many use adiabatic fast passage, some use both simultaneously, and some do so without realizing it. If not the cure, then certainly the detailed diagnosis of the "spin temperature disease" is to be found here. Everyone using the standard experimental methods of nuclear magnetic resonance in solids will eventually encounter signals that behave strangely, or do not appear when they should, or are found with the "wrong" phase of the lock-in reference. Goldman uses the machinery of his earlier chapters to calculate many of the practical consequences of the spin-temperature hypothesis.

The remaining chapters are devoted to the establishment of spin temperature, particularly in the presence of more than one spin system (that is, problems involving cross-relaxation), and to dynamic polarization experiments. Throughout, the author cites and discusses with care the major experiments (many of them his own) that provide the justification of the spin-temperature hypothesis.

As I suppose must be true about any book, there are some disappointments. Some readers might feel more at home with the calculations if they were accompanied by more diagrams of the sort that aid the reader in keeping track of the various thermodynamic systems and the relaxation process between them. Qualitative previews of what to expect and what the results will be could have preceded many of the lengthier expositions. The figures from experimental papers cited are essential and were judiciously selected, however.

On questions of substance rather than style, there are two small areas of disappointment. One is the rather offhand treatment of the expansion of the density matrix in the high-temperature approximation. The reader with doubts should see Appendix E of the well known text by C. P. Slichter, *Principles*

of *Magnetic Resonance*. The other is the brevity of the discussion of the fundamental assumption, the spin-temperature hypothesis, which occupies barely half a page. In a book of this size on so narrow a subject the reader expects in general to find a careful and complete discussion of the foundations. Such a discussion would be useful (and not just as an academic exercise) in order to prepare the reader for recent experiments such as those by John Waugh and his group at MIT, which point out quite explicitly the need for care in the use of the spin-temperature concept.

In summary, this book is one for specialists in nuclear magnetic resonance working in solid-state physics. Detailed knowledge of its contents is essential for workers who want to play tricks with spin systems. Those who regard NMR in solids as mainly a branch of spectroscopy will ignore the material presented here at their own risk. The cure is probably not worse than the disease.

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Underwater Acoustics

By L. W. Camp

308 pp. Wiley, New York, 1970. \$17.50

Underwater acoustics as a branch of science and engineering implies many things to many people. To some it is marine bioacoustics, to others it is a tool in marine geology and oceanography, and to still others it is the oceanic eyes and ears of our naval forces. Common to all these facets of underwater acoustics is the topic of underwater-sound projectors and receivers. Basically, this is the subject matter of *Underwater Acoustics* by Leon Camp with contributions from Richard Stern and Bob M. Brown. The purpose of the book is to present those fundamentals and principles of underwater acoustics that bear on transducer design engineering. In doing this the principal author, who has had wide experience in transducer research and development, has brought together material that is not normally found under one cover.

This book, which is an outgrowth of a "short course" offered for many years at the University of California, Los Angeles, can be divided into three broad sections. The first four chapters contain review and summary material on vibrations, uniform bars, simple transmission problems, wave acoustics and ray acoustics. Most of this material can be found in the popular texts on acoustics such as *Fundamentals of Acoustics* by Lawrence E. Kinsler and Austin R. Frey.

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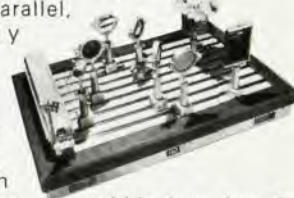
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edited by M. BALKANSKI, University of Paris VI

Proceedings of the 2nd International Conference, Paris, July 1971.

Sponsored by the International Union of Pure and Applied Physics.

The purpose of this conference has been to bring together specialists interested in studying the fundamental behaviour of interacting systems via light scattering. The conference is focused on the field of solid matter, its phase transformations and elementary excitations. The main progress in this field in recent years has come by the use of laser techniques. Since the first conference on this subject held in New York University in 1968 many dozens of papers have appeared reporting new effects and more laboratories are initiating work on light scattering now.

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The central portion of *Underwater Acoustics* is devoted to electroacoustic transduction, magnetostrictive and piezoelectric systems, radiation patterns of various sources, transducer evaluation, and the principles of active and passive sonars. Because of the widespread use of explosives as underwater sound sources, it is disappointing to find them omitted.

The last section presents a discussion of sonar signal processing including incoherent and coherent processors. A brief discussion of nonideal signals in an ocean medium is also included.

Although this book is not suitable as a text on underwater acoustics, it could be used for a course on transducer design for underwater sound applications at the upper undergraduate or graduate level. Each chapter (except two) contains appropriate problems, and answers to these problems are provided at the end of the book. An instructor, however, will have to cope with numerous editorial errors ranging from mistakes on a curve (page 19) to mistakenly attributing P. M. Morse's book, *Vibration and Sound*, to W. P. Mason (page 36). It is unfortunate that a book that brings so much information together should be subject to errors that reflect a disregard for careful editing by the authors and the publisher.

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Physics: A Modern Approach

By Walter Thumm and Donald E. Tilley
344 pp. Cummings, Menlo Park, Calif.,
1970. \$8.95

Physics: an ebb and flow of ideas

By Stuart J. Inglis
424 pp. Wiley, New York, 1970. \$9.95

Both books reviewed here were written for one-semester liberal-arts physics courses, can be used for one-year courses, and cover much the same physics topics in a reasonable number of pages, using only high-school algebra. The results, however, are poles apart. Walter Thumm and Donald E. Tilley, who teach at Canadian colleges, wrote theirs for "college students who do not necessarily intend to pursue a major in the field of Physics," emphasizing the technical and applied aspects. The book by Stuart J. Inglis is designed "to introduce the concepts of physics," relying almost entirely on an historical approach.

Thumm and Tilley cover Newtonian mechanics, electromagnetism, special relativity and quantum physics. They include sizable chapters on nuclear physics and on circuit theory and a tiny

chapter on the ideal gas law and kinetic theory. The writing, exposition, and references to applications for each piece of physics are very good and totally honest. The one- or two-page historical introductions beginning each chapter are interesting and informative, and have a definite Anglophilic accent.

What is absent is the story line. Neither the overall picture of our understanding of the physical universe nor the view of science as an exploration of the ways of physical universe emerge from the separate pieces of physics explicated in the text. Astronomy, and cosmology are not mentioned. The space-time world view explorations from Aristotle to Copernicus to Galileo to Newton to Einstein are not discussed. Thermodynamics, the properties of matter in bulk, and the drive towards equilibrium are not treated; so they lose the opportunity to discuss entropy, the arrow of time, and the relation between macro and microphysics, surely fascinating topics at every level of discussion.

There is ample material for a full year's work and more, if the teacher is willing to add the story line or other aspects to the course. But the book is very difficult. It is pitched at a high sophistication level, intellectually, scientifically and mathematically, in spite of using only algebra. The density of information is also high, leading frequently to a handbook style of presentation.

In my opinion (I have been teaching physics to nonscience majors for several years) Thumm and Tilley's book should be used only for students who have an understanding of the grammar of science and already have facility with quantitative reasoning. The book is almost certainly too difficult for most nonscience majors at most American colleges, and even for many beginning science majors.

In Inglis's book, the physics concepts are generally introduced by describing the experiments and considerations of original workers in the field. Biographical sketches and excerpts from original publications are used very liberally throughout, from Aristotle through the middle ages to Galileo, Newton and up to Carl Anderson and the positron. Logical and pedagogical exposition and development of the concepts is used only incidentally. The topics covered are Aristotelian physics, Newtonian physics, electromagnetism, special relativity, quantum physics, nuclear physics, and temperature and heat.

The approach used succeeds in demonstrating Man's historic drive to explore and understand the ways of nature. The excitement of the exploration is clearly evident in some of the excerpts from the original works.

On the other hand, the concepts are not generally developed to the point

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