



Calibration of a medical betatron at the Anderson Hospital and Tumor Institute, Houston.

graduate schools have introduced professional degree programs to train people to accept responsibilities in this area.

This book should be very valuable for individuals trained primarily in the physical sciences who wish to work in clinical engineering. One of the major difficulties in this transition is the communications barrier caused by the technical language of medicine. And it is up to the engineer to learn to speak the language of the physician. This book addresses itself primarily to this problem and in some ways is a logically organized medical dictionary. The authors go far beyond this limited objective, however, giving the reader a very broad survey of nearly all aspects of the practice of medicine.

The book is organized according to the various departments and laboratories of a hospital; each one of these is accorded a chapter. First the laboratory-oriented aspects of medicine are treated (physical diagnosis, cardiopulmonary physiology, neurophysiology, clinical chemistry and hematology, clinical microbiology and immunology). Then the authors discuss the clinical departments (radiology, medicine and surgery). The general plan is first to summarize for the reader the appropriate science that is involved and then to give the clinical applications. Finally, specific examples of engineering and physics in the measurement and interpretation of data obtained in this area are presented. Thus the careful reader is led through introductory courses in, for example, anatomy, physiology, biochemistry and pharmacology.

The writing is concise and fluent, and the illustrations, particularly the block diagrams, are clear and easy to understand. The SI system of units is used throughout, though when these are un-

familiar, traditional units are also given. The book appears to be remarkably up to date, judging by the content of the two chapters in which I am professionally competent. It has an excellent index and is, as a whole, beautifully produced. An unusual feature, and I think a useful didactic one, is the device of including a short list of "fill-in-the-blank"-type questions at the end of each sub-section; this will enable students to test whether they have learned what the author thinks is significant in the preceding few paragraphs.

I have only two reservations about the book. I imagine that the next edition will give a considerably fuller treatment to the subject of electrical safety, a major area of concern for most clinical engineers. The references at the end of each chapter are mainly to standard textbooks; I think that the book would be more useful to beginning students if the authors had listed the papers in the periodical literature that they must have used in preparing the work.

In summary, I think that this book can be recommended to anyone interested in clinical engineering or medical physics and should be particularly valuable to beginning students in these fields.

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Fourier Transform NMR Techniques: A Practical Approach

K. Mullen, P. S. Pregosin
149 pp. Academic, London, 1977. \$14.75

Fourier Transform N.M.R. Spectroscopy

D. Shaw
357 pp. Elsevier, Amsterdam, 1976.
\$52.75

The continued growth of the field of pulsed Fourier-transform nuclear magnetic resonance has mandated the preparation of new texts to replace the important but brief initial text by Thomas C. Farrar and Edwin D. Becker (Academic Press, 1971). Both of the texts reviewed here will have an important place in filling this need. K. Mullen and Paul Pregosin of the ETH-Zürich have prepared an extremely useful, brief beginner's guide to the field, and Derek Shaw of Varian Ltd has written a longer text containing more theoretical material as well as some good practical advice on the obtaining of Fourier-transform spectra. Both volumes cover the literature

rather thoroughly through 1974, with some references from 1975 included as well.

The Mullen-Pregosin text includes frequency locking and selective population transfer and presents a good discussion of T_1 measurement by inversion-recovery, with a section on applications of T_1 measurement. The authors briefly deal with methods of solvent suppression, but they do not discuss the many methods for accomplishing this. Most of the last half of the book consists of chemical examples of applications of NMR, largely of structural determination by C^{13} nmr, but with some examples from N^{15} and P^{31} spectra. The book closes with a brief section on dynamic nmr and with an appendix on signal assignment in C^{13} nmr.

The book contains a few problems in the beginning sections, but these do not appear in the later sections; answers are provided for only six of the problems. Chapter 2 of the Mullen-Pregosin text deals with the role of the computer in the Fourier-transform nmr experiment, but the treatment is too brief to be of much help to the puzzled beginner and contains some errors regarding signal averaging, dynamic range and the definition of "dwell time," which is confused with ADC aperture time. The text treats quadrature-detection nmr as rather unusual, although it is now standard on several manufacturers' spectrometers.

Shaw's longer text on Fourier-transform spectroscopy covers much the same ground as the Mullen-Pregosin book, but with a much more mathematical description of nearly all elements of the nmr experiment. Its coverage includes the Bloch equations, the basic physics of the nmr experiment, the mathematics of various excitation techniques, multiple-resonance experiments, relaxation experiments and an entire chapter on the mathematics of the Fourier transform. Shaw's book contains hardware discussions of the lock, probe, amplifier, transmitter, receiver, pulse programmer and computer. Not until Chapter 8, halfway through the book, does the author begin to discuss the fundamentals of experimental nmr, but this long chapter contains a good review of chemical nmr applications. The practical discussions also include pulse power and width effects, decoupling and multiple-resonance experiments, spin tickling, Overhauser effects and J spectra. Virtually every known nmr experiment is given some discussion in this text.

The organization of the book usually introduces topics with mathematical discussions and then proceeds later to the practical details. Thus in some cases the experimental information is buried among derivations, where the novice looking for help might miss it. In other cases, the topics are covered several times in different chapters, once abstractly and again with more concrete examples. For

example, the Fourier transform is covered in Chapters 3 and 6 and exponential weighting in Chapters 6 and 7. In spite of the large amount of space devoted to the transform itself, it is not explained as clearly as it has been in other places, notably by E. Oran Brigham (Prentice-Hall, 1974). Further, in spite of the general mathematical bent of the section on data handling, the limits of signal averaging are never set forth clearly.

The layout of Shaw's book is generally excellent, although running heads throughout the chapters would have been helpful. The price of the book, however, does seem excessive.

In summary, both are useful and needed texts that should find wide application in the nmr community. They both contain practical experimental advice and discussions of the utility of a number of nmr techniques.

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book notes

Infrasound and Low Frequency Vibration. W. Tempest, ed. 364 pp. Academic, London, 1977. £13.50

It was not until the early 1960's that jet engines and other sources of new, improved noise introduced high levels of infrasound ("airborne sound in the frequency range below 20 Hz") into the human environment, according to the editor; infrasound studies before that time were academic in character and relatively few. This volume, with 15 contributors, is intended to set forth the "state of the art" in such studies. Its contents emphasize the effects, some of them serious, of infrasound and vibration on *people*, with chapters on motion sickness, noise-induced annoyance and physiological and psychological effects of exposure. Areas of concern that are more physically oriented include the detection and analysis of infrasound and low-frequency vibration, particularly in various transportation systems. The book is addressed to professionals in acoustics, audiology and psychophysics.

Evolution of the Solar System. H. Alfvén, G. Arrhenius. 599 pp. National Aeronautics and Space Administration, Washington, D.C., 1976. \$11.00

This thick volume represents a fusion of the authors' two initially independent approaches to the study of the solar system's origin and evolution. Chapters grouped in five sections (present state and basic laws; the accretion of celestial bodies; plasma and condensation; physical and chemical structure, and "special problems"—which include the Earth-

Moon system and origin of Earth's ocean and atmosphere) carry the story from the formation of the Sun to the evolution of planets, satellites and asteroids. Hannes Alfvén and Gustaf Arrhenius claim that they have tried "to make the physics understandable to chemists and the chemistry understandable to physicists," in this book designed to be useful to upper-level undergraduates as well as to "experts in space physics, meteoritics, Earth science, astronomy and cosmochemistry."

Science and Government Report International Almanac 1977. D. S. Greenberg, ed. 305 pp. Science and Government Report, Washington, D.C., 1977. \$54.00

Reviews of recent science-policy developments in more than 30 advanced and developing nations constitute the bulk of this readable and informative almanac. One learns, for example, that Party Chairman Hua Kuo-Feng and other new leaders in the People's Republic of China appear to be following "policies that will lead to an increased interest in technology acquisition . . ." and that 1976 was a great year for science and technology in Brazil. After the 30-nation survey the book features a 25-page directory of scientific organizations and personnel and a collection of science-policy documents (the US National Science and Technology Act of 1976, some of President Jimmy Carter's campaign statements, a Japanese White Paper on Science and Technology and others). The almanac's editor, Daniel S. Greenberg, says this is the first of an intended series; he hopes it will prove useful for "persons concerned with science and technology," including administrators and political leaders.

Laser Applications in Medicine and Biology, Vol. 3. M. L. Wolbarsht, ed. 348 pp. Plenum, New York, 1977. \$27.50

The five contributors of this volume's four papers survey recent theoretical and practical advances in life-science applications for lasers. Nikolai F. Gamaleya reviews Soviet laser biomedical research, including some quite novel developments. S. F. Cleary writes about "Laser Pulses and the Generation of Acoustic Transients in Biological Material," and Paul R. Wedendal and Hans I. Bjelkhagen discuss "Holography in Dentistry." "Otolological Applications of Lasers" is the subject of Chester R. Wilpizeski's contribution. Practitioners of laser R&D and researchers in medicine and biology may find the book useful.

Zirconium: Physico-chemical Properties of Its Compounds and Alloys. C. B. Alcock, K. T. Jacob, S. Zador, O. Kubaschewski-von Goldbeck, H. Nowotny, K. Seifert, O. Kubaschewski. 268 pp. International Atomic Energy Agency, Vienna, 1976. \$16.00

The sixth in a series of special issues of *Atomic Energy Review* devoted to the physico-chemical properties of metals

important in reactor techniques does for zirconium what earlier issues have already done for plutonium, niobium, tantalum, beryllium and thorium. Critically evaluated data are provided for thermodynamic properties, densities, crystallographic structures, phase diagrams and diffusion rates for the metal, its compounds and alloys. Appropriately for a reference work of this type, the book is packed with tables, diagrams and lists of references to the work cited. Although the copyright date is 1976, references appear to be nearly all earlier than 1972.

—FCB and JTS

new books

Particles, Nuclei and High-Energy Physics

Neutron Physics (Springer Tracts in Modern Physics, Vol. 80). L. Koester, A. Steyerl. 135 pp. Springer-Verlag, New York, 1977. \$28.20

Atomic, Molecular and Chemical Physics

The Hartree-Fock Method For Atoms: A Numerical Approach. C. F. Fischer. 308 pp. Wiley-Interscience, New York, 1977. \$22.95

Optics and Acoustics

Architectural Acoustics (Benchmark Papers in Acoustics, Vol. 10). T. D. Northwood, ed. 428 pp. Dowden, Hutchinson and Ross, Stroudsburg, Penna. (Distributor: Halsted, New York), 1977. \$30.00

Quantum Electronics and Lasers

Introduction to Optical Electronics, 2nd edition. A. Yariv. 438 pp. Holt, Rinehart and Winston, New York, 1976. \$20.95

Fluids and Plasmas

Numerical Methods in Fluid Dynamics (Springer Series in Computational Physics, Vol. 1). M. Holt. 253 pp. Springer-Verlag, New York, 1977. \$31.70

Crystallography, Low-Temperature and Solid-State Physics

Magnetic Ions in Metals: A Review of Their Study by Electron Spin Resonance. R. H. Taylor. 118 pp. Halsted, New York, 1977. \$14.00

The Plastic Deformation of Simple Ionic Crystals. M. T. Sprackling. 242 pp. Academic, London, 1977. £9.20

Kristallisation und Entmischung amorpher Germanium-Legierungen. U. Köster. 89 pp. Westdeutscher Verlag, Wiesbaden, German Federal Republic, 1976. DM 28.00

Preparation and Properties of Solid State Materials, Vol. 3: III-V Alloys, Convective Instabilities, and Nucleation. W. R. Wilcox,