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Huyghen's Principle (curiously called Huyghen's Premise). There is a short section on finite difference schemes for numerical solutions of partial differential equations. If there is any criticism to be made of this book, it is that more could have been done with that important topic. The treatment of Green's functions is exemplary, as is the chapter on the general theory of eigenvalues and eigenfunctions problems. All told, this book can be unreservedly recommended as an introduction to partial differential equations.

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Nuclear excited states

ANGULAR CORRELATION METHODS IN GAMMA-RAY SPECTROSCOPY. By A. J. Ferguson. 214 pp. (North-Holland, Amsterdam) Wiley, New York, 1965. \$8.50.

by G. K. Wertheim

Our knowledge of nuclear excited states is derived from the observation of radiation resulting from the transition between nuclear levels. The fundamental attributes of a nuclear state—its energy, spin, and parity—are obtainable from measurements some of which require considerable experimental sophistication. To interpret these measurements, it is necessary to apply a theory which, while simple in concept, presents computational complexities.

In his book A. J. Ferguson gives a concise summary of the pertinent theory, treating first the general case of successive nuclear radiation and then specific cases such as particle-gamma reactions, gamma-gamma angular correlations, and Coulomb excitation. A particularly valuable feature of the book is his treatment of the whole field of angular correlations according to a consistent set of conventions. Early in the volume he discusses the problem of the relative phases of reduced matrix elements and explains his choice of sign. He also chooses to use emission matrix elements for all gamma transitions. These conventions run counter to those of the standard reference in the field of

angular correlations—Biedenharn and Rose's 1953 article. His reasons for this controversial choice (as well as a rebuttal by Biedenharn and Rose) are included in the text.

The rest of the volume includes chapters on apparatus and numerical methods as well as on the coefficients and functions used in angular correlation analysis. The final part contains tables of Z , G_γ , and α coefficients which permit the evaluation of angular correlation functions up to spin 6 for dipole and quadrupole radiations. Tabulations of the more fundamental Clebsch-Gordon, Racah, and 9-j coefficients are not given but, as the author points out, these are readily available elsewhere. In any case, since data analysis is usually carried out by computers which can rapidly calculate the needed coefficients, such tables are no longer essential.

It is perhaps worth noting that the author's point of view is that of a nuclear physicist. That angular correlations may be perturbed is mentioned but excluded from further discussions. As a result, such topics as time-dependent correlations (currently gaining importance in solid state physics) and the attenuation of the correlation by fluctuating fields are not mentioned.

The level of treatment is such that anyone familiar with the quantum theory of angular momentum should have no difficulty in working through the book. It should prove useful to anyone who plans to enter the field of angular correlations.

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Measuring plasmas

PLASMA DIAGNOSTIC TECHNIQUES. Richard H. Huddleston and Stanley L. Leonard, eds. 627 pp. Academic Press, New York, 1965. \$19.50

by Harold P. Furth

In his introduction, Richard Huddleston makes an interesting point about the recent development of plasma physics. As a mere "application" of classical mechanics and electromagnetic theory, plasma physics might

have been expected to reach maturity at a much earlier time, as was indeed the case with ordinary fluid dynamics. Huddleston suggests that the maturing of plasma physics awaited the development of sophisticated diagnostic technology during and after World War II.

The eleven technical chapters in this book cover the entire spectrum from gamma rays to quasistatic magnetic fields, and from the introductory to the erudite. The subject matter of several individual chapters has been treated more exhaustively in other books and review articles. *Plasma Diagnostic Techniques*, however, provides by far the greatest concentration of useful material available today in a general review. It will prove a valuable asset to experimental plasma physicists in all aspects of the field, and thus is likely to enhance the process of evolution-by-diagnosis envisaged by Huddleston.

A chapter on basic macroscopic measurements by coeditor Stanley Leonard covers a miscellany of elementary techniques. R. H. Lovberg's discussion of magnetic probes will prove useful to experimentalists. Francis F. Chen provides a uniquely broad and penetrating analysis of Langmuir-probe theory. One fears, however, that the average nonmathematically inclined experimentalist may become discouraged from ever using them.

Seven chapters on radiation diagnostics lead off with R. W. P. McWhirter's authoritative discussion of theoretical plasma models and spectral intensities. W. L. Wiese's chapter on the broadening of spectral lines leaves most of the theory to its references, but provides a valuable comparison of various calculations and experimental results. Eugene B. Turner discusses the hardware of optical and

ultraviolet spectroscopy. T. F. Stratton's chapter on x-ray spectroscopy reflects the invigorating influence of high-temperature controlled-fusion experiments (the inverse Huddleston effect?), which indeed is evident throughout this book. Far-infrared techniques are covered by M. F. Kimmitt, A. C. Prior and V. Roberts; optical interferometry by Ralph A. Alpher and Ronald R. White; and microwave techniques by Charles B. Wharton.

J. E. Osher's chapter on particle measurements ranges from direct analysis of energetic plasma constituents

to neutron diagnostics for fusible plasmas. The appearance of a brief section on laser-scattering diagnostics at the end of the book serves to remind the reader of how quickly even an authoritative review of current techniques is outstripped by fresh developments.

Very extensive lists of references are given in all the chapters, and constitute a treasury of information in themselves.

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Harold P. Furth heads one of the groups doing controlled-fusion research at the Lawrence Radiation Laboratory, Livermore.

A thorough compendium

HIGH SPEED PULSE TECHNOLOGY. Vol. 1, Capacitor Discharge, Magnetohydrodynamics, X-Rays, Ultrasonics. By Frank Frungel. 620 pp. Academic Press, New York, 1965. \$24.00.

by *Herbert Malamud*

This book reminds your reviewer of the well known joke which ends, "But who wants to know that much about the red-banded woods warbler?" The difference is of course, that many people indeed will be interested in this red-banded woods warbler.

Frungel's book was first published in German in 1960. It is, judging from volume 1 here under review, encyclopedic in scope, details, accurate, and above all, useful in choice of subject.

The first chapter covers the use of capacitors in discharge circuits, discussing construction of capacitors, the materials used, possible troubles or faults which can occur, as well as the equivalent circuit and capacitor capabilities.

The second chapter covers pulse-switching means, including ignitions, thyratrons, various spark gaps, and magnetic contactors. Frungel couldn't have known of one useful high power spark gap configuration, the inverse pinch switch (U.S. Patent No. 3 046 436, July 1962, C. Cavalconté; *Rev. Sci. Instr.* **34**, 1439 (1963), R. G. Jahn, et al.), which deserves inclusion in his discussion.

Chapter III discusses various power transmission lines, and includes a discussion of impedance of the line as well as construction and capabilities.

Following are chapters on conversion of capacitor energy into current impulses, direct and through transformers, conversion into voltage pulses (by transformer as well as cascade circuits), the use of pulse forming lines and cyclic operation including high efficiency charging through inductors. Descriptions are given of several applications, such as Kerr-cell

