acoustics of sound production and wave propagation, through the physiology of the ear, to the psychology of the perception of musical form. At the perception end of its purview, the world of musical acoustics must diffuse into its image-world of musical esthetics, the two together forming the musical experience.

The part of musical acoustics concerned with perception has a poor experimental basis at this time. The acoustical literature refers only occasionally, for example, to the Jamesian theory of the perception of the psychological present or its alternatives, or to the ability of a listener to discriminate between major and minor triads, both of which subdivide the fifth into a major and minor third.

On somewhat surer grounds are the subareas of physical acoustics, namely the study of vibration and sound, of overtones and scales, of auditoriums and instruments. It is to these fields that Backus restricts his attention. In his view, the acoustical foundations of music are the phenomena that occur before the music strikes the ear. In most of the subareas, the focus is on the Western musical experience: the scales are Western scales and the instruments are, in the main, the instruments of the Western symphony orchestra. The tunings of Javanese patets and the complexities of Indian ragas, the construction and tone of the anklong and hichiriki are outside the scope of this book.

The book covers essentially the same topics as have been covered in earlier books on "acoustics of music," similarly restricted. It is directed to nonspecialists and should serve the nontechnical reader well, whether he be composer, performer, or listener. The prose style is easygoing and the presentation is eminently transparent.

After a presentation of the theory of wave motion, the book discusses all too briefly the structure of the ear. The discussion of intensity and loudness is excellent. The section on tone quality, scales, tuning, and other such topics is classical but most readable, and will be of interest to the nonspecialist.

The second half of the book is concerned with the nature of Western musical instruments, the area of the author's own research. It is a clear and absorbing presentation of a large amount of often little-known information concerning the properties of these instruments in the mode in which they produce sustained sound. The problems of attack and decay of instrumental sounds are not discussed significantly, although instrumental quality depends heavily on these properties. However, the discussion of the properties of sustained tones of Western instruments is fascinating and readable and will be of value to both the musical amateur and the professional.

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Nuclear Reactions

The Theory of Neutron Resonance Reactions. J. E. LYNN. Clarendon (Oxford University Press), New York, 1968. xiv + 504 pp., illus. $16. International Series of Monographs on Physics.

Resonance phenomena are observed in all branches of physics. Study of them has proven especially fruitful in nuclear physics, and the theory of low energy neutron resonances as presented by Lynn is a reasonably complete and self-consistent subject. This book meets well its goal of unifying the treatment for experimentalists working in the field.

The time-honored and tested *R*-matrix formalism developed by Wigner and his students is emphasized from the outset. A highly condensed outline of the essential features of this framework is presented first, and then follows an even briefer summary of the Humblet and Rosenfeld *S*-matrix theory. We are indebted to Lynn for a very clear discussion of the relationship between these two quite different formalistic approaches to reaction theory. However, one must still labor through the earlier excellent review article on *R*-matrix theory by Lane and Thomas before one obtains sufficient skill for application to real problems. The original papers must be consulted on *S*-matrix theory.

A detailed treatment of the spacing and distribution of neutron resonances is contained in this book. This is the heart of the subject, and Lynn rightly devotes his considerable knowledge and talents to providing what is the most complete exposition available in a single volume. Large quantities of experimental data are correlated in a fashion that reinforces the physical concepts.

Low energy neutron reactions proceed primarily through the elastic scattering, radiative capture, and fission channels. Each of these is covered rather completely in a highly sophisticated and up-to-date manner. Again, the material is not suitable as a textbook but functions best as a handbook for research. The sections on elastic scattering and capture are particularly good illustrations of the high density of information that can be assembled by a true expert.

Although neutron fission is a very specialized topic, it certainly is relevant to neutron resonance phenomena. The discussion in this book, limited by space restrictions, is unusually good. Many of the threads of present-day nuclear theory are woven together in a manner which gives a better understanding of this complex problem.

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Water and Aqueous Solutions

Hydrogen-Bonded Solvent Systems. Proceedings of a symposium, Newcastle upon Tyne, England, Jan. 1968. A. K. COVINGTON and P. JONES, Eds. Taylor and Francis, London, 1968. xvi + 356 pp., illus. $14.50.

This volume comprises the papers presented at a symposium held to mark the retirement of Lord Wynne-Jones of Abergele as professor of physical chemistry at the University of Newcastle upon Tyne ("a sort of funeral ceremony," Wynne-Jones lightly remarks). The papers are grouped loosely around themes representing the research interests pursued by Wynne-Jones throughout his career, and by and large they fall within the scope of the title chosen for the collection as a whole.

The first 100 pages are taken up by five review papers, and these are followed by 18 shorter papers dealing with current work of their authors. Appropriately, the first and outstanding review is Walrafen's description of his investigations of the structure of water by Raman spectroscopy. Vibrational spectroscopy has long been considered crucial in deciding the fundamental and deceptively simple question of whether water is a homogeneous medium or a mixture of hydrogen-bonded molecular clusters in various states of aggregation. Walrafen's demonstration