book, as well as its organization, makes it possible for a student with a basic knowledge of quantum mechanics, or for a research worker, to utilize it readily and effectively. For example, there is the particularly clear and interesting section fairly late in the book on the Van Hove correlation function, complete with a particular example of scattering by liquids, which was illustrated earlier with several pieces of experimental data and a qualitative discussion.

There are, however, several omissions which are unfortunate because the authors' style and ability are so excellent. Except for a brief mention of nuclear resonance scattering early in the book none of the studies of these data and their implications in nuclear and fission physics are discussed. It is also regrettable that there is no discussion of neutron polarizability and its implications for the structure of the neutron. To dwell on these or other omissions would, however, be a disservice to an excellent book.

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Effects of Impurities

Localized Excitations in Solids. Proceedings of the first international conference, Irvine, Calif., 1967. R. F. WALLIS, Ed. Plenum, New York, 1968. xvi + 782 pp., illus. $22.50.

Over the past decade physicists have become very much interested in the effects of impurities on the excitations of otherwise pure materials. The impurity can be considered to act as a microscopic probe in the host material, and it is hoped that by measurement of its behavior information about the host can be obtained. However, most impurities produce large changes in the parameters defining the excitations in the host, and rather exact calculations with good models are required. When the changes are localized in the immediate vicinity of the impurity, the possibility of carrying out exact calculations does arise. The book under review contains the proceedings of the first international conference in which, predominantly, the properties of such impurities in a variety of systems are discussed.

The systems covered are drawn from lattice dynamics, magnetism, and semiconductor physics. As most work has been done on the impurity modifications of the vibrational modes of a crystal, the conference was dominated largely by papers on these effects. In this system the changes in the host crystal parameters are due to the different mass of the impurity and the different force constants coupling it to the motion of neighboring atoms. These changes can lead to resonant modes in the host crystal pass band or to localized modes in the band gaps. These two kinds of behavior are characteristic of all the impurity systems discussed here. As the impurity also removes translational invariance, radiation can couple with modes of all wavelengths, and optical absorption yields more information than usual. A variety of detailed calculations and experiments, both optical and thermal, are presented and reviewed, and it is noted that good agreement between them is becoming possible.

Discussion of the magnetic impurity problem is complicated by the lack of an exact solution for either a pure ferro- or antiferromagnet. Except at very low temperatures the necessary approximations lead to effective parameter changes throughout the crystal, in addition to the different impurity spin magnitude and associated Heisenberg exchange constants. Hence only rather simple model calculations are reviewed. However, a considerable amount of optical work in magnetic systems is presented, particularly on the sidebands induced in the electronic spectra of an impurity.

The study of electron-hole pairs bound to isoelectronic impurities in semiconductors forms the remaining major topic. Here it is the impurity potential that is of short range. Detailed calculations of fair accuracy are described, but probably more useful is a discussion of a very simple model illustrating the many complications of this system. Again a large quantity of optical data is presented and discussed.

Probably owing to the fact that the various topics are drawn from different fields, most of the reviews are quite accessible. In any case, this book is one of the very few places where these topics are brought together and is thus of interest to anyone wishing to be informed of this branch of impurity physics.

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All about Some Instruments

Magnetic Compasses and Magnetometers. ALFRED HINE. University of Toronto Press, Toronto, 1968. viii + 386 pp., illus. $30.

As I read this book, I was reminded of the Admiralty Manuals. For those who have not encountered them, it should be explained that Admiralty Manuals are series of monographs on topics of immediate concern to H.M. Royal Navy. They are models of exposition, full of precise and elegant descriptions in simple, clear English. Somewhere in the literary Valhalla there must be a reward for those who write them. Like the Admiralty Manuals, this book contains a mass of detailed knowledge for the specialist and is so well written that the general reader can enjoy it.

After a brief and interesting historical introduction, the author considers the basic principles of pivoted-needle and inductor instruments. The treatment is very thorough. For example, several pages are devoted to the important problem of the behavior of pivoted-needle compasses in a moving vehicle. This permits analysis of the effect of acceleration of the pivot or suspension arising when the vehicle changes speed, turns, pitches, rolls, or yaws. In particular, a detailed analysis of the northerly turning error is given. The development of what we now call flux gates, the best-known form of a saturable inductor, is traced from the simplest rotating coil devices. The flux gate itself is introduced as follows:

> The most common forms are single-core and twin-core inductors depending for their operation on a.c. excitation of such magnitude that the cores are periodically driven into saturation on either side of the unmagnetized or zero field state. The application of an ambient magnetic field along the axis of the core or cores alters the relative positions in the magnetizing cycle where saturation is reached in either direction of magnetization. The corresponding distortion of the flux can be detected as an e.m.f. in the excitation windings (or, better still, in a separate secondary winding), this e.m.f. being in certain conditions proportional to the axially applied field.

The four basic forms of saturable inductors are discussed, as are aspects of the design of cores and the behavior of inductors in moving vehicles.

Having established the basic principles of the detector systems, the author describes the various compasses