

Far from rejecting the work of previous authors of books on the solid state, Robert A. Levy candidly admits to having "cheerfully and eagerly looted the publications of everybody in the field . . ." His intention has been to emphasize physical principles, anticipate questions and remain mindful of the "needs of the less than brilliant student." Levy has succeeded in keeping the principles visible at all times. He seems to understand that learning first flowers best in the absence of weed-like details. The book, as intended, will be a good text for the undergraduate student in physics.

Levy, who is in the physics department of the University of Cincinnati, has borrowed heavily from John Ziman, Frederick Seitz, John Slater, Adrianus J. Dekker and others, but no author has been embraced more warmly than Charles Kittel and his book, *Introduction to Solid State Physics* (Wiley 1956). Every substantive chapter is laden with references to Kittel. Thus it is appropriate to compare the book under review with Kittel's *Elementary Solid State Physics* (Wiley 1962), a similar text for the undergraduate. The two books derive many of their physical explanations from Kittel's *Introduction to Solid State Physics*, but Levy is a bit kinder to the student in providing more words of explanation. Levy has included a useful chapter on the dynamics of the crystal lattice omitted by Kittel in his elementary text. Each book covers

lattice diffraction, thermal, electrical and magnetic properties of solids and band theory of solids and semiconductors. Notably in the discussion of semiconductors, Levy tends to stay with the basic principles and shy away from discussion of devices. He has also added a little spice in the form of a short section on superconductivity.

As a consequence Levy's book compares favorably with Kittel's *Elementary Solid State Physics*, maintains the primacy of basic principles and appears in a pleasant format.

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Terrestrial gravity

THE GRAVITY FIELD OF THE EARTH: FROM CLASSICAL AND MODERN METHODS. By Michele Caputo. 202 pp. Academic, New York, 1967. \$9.75

by JOSEPH GILLIS

If any single development can be said to have ushered in the age of science, it is surely that of Newtonian gravitation. It set a standard of universality to which laws of physics would henceforth have to match up. Little ad hoc formulae and explanations were from that moment condemned to a minor place in our scheme of thinking.

These reflections come to mind as one picks up Michele Caputo's mono-

graph on a particular aspect of the subject, that of terrestrial gravity. The fields due to spherical and ellipsoidal distributions of matter were favorite subjects for clever problems in the 19th century, and indeed some of this has survived to the present. In its time, this approach contributed much to the development of science and gave the impetus to the study of ellipsoidal coordinate systems and other devices—all useful in many other areas of theoretical physics. But if we have now passed the stage of weaving mathematical problems on the subject, we have come instead to very serious practical questions. The manifold problems attached to satellites and spaceships and to the inertial guidance of various "objects" make the detailed understanding of the earth's field a matter of prime importance.

The book under review expounds the theory necessary for tackling problems of this sort and also works out in detail a number of interesting applications. The basic tools used are fairly simple: ellipsoidal coordinates, Morera functions, and, for some special purposes, spherical harmonics and some very elementary integral equations. However, these suffice for the systematic study of a corpus of interesting problems. A large part of the book is devoted to the shape of the geoid, terrestrial density distribution, determination of the actual shape and dimension of the real earth from gravity measurements, ellipticity of the equator and, finally, some recently developed methods for the application to these purposes of unreduced terrestrial data. Moreover, before leaving the earth, the author finds time to examine the application of gravimetry to geophysics, including hydrostatic equilibrium of the earth and some problems related to stress distribution and to terrestrial heat flow.

Beyond the earth there is a study of what we can deduce about the moon from gravimetric considerations. The last part of the book is devoted to the computation of satellite orbits, including corrections up to the fourth order for noncentrality of the field, and to the gravimetric information that can be obtained from the motions of satellites.

Although the basic problems and methods dealt with in this monograph are essentially simple, the technical mathematics can become really complicated. However, it is all presented lucidly and well. To the best of my

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knowledge, it is the first English text that deals clearly and completely with the subject of terrestrial gravity. In view of the growing interest in the practical applications of the subject, the appearance of this book is particularly welcome.

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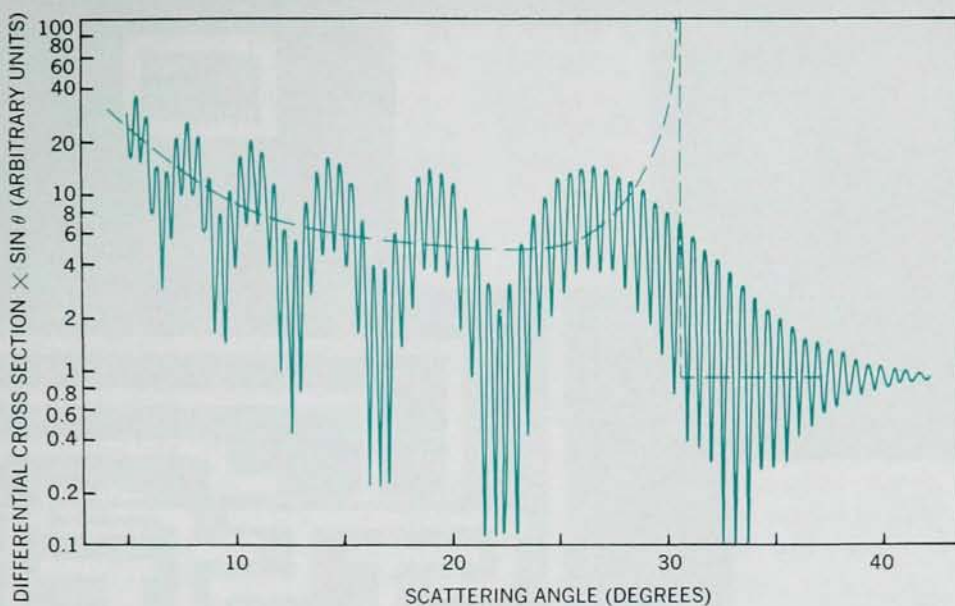
Techniques for collisionmen

METHODS OF EXPERIMENTAL PHYSICS, VOL. 7A: ATOMIC AND ELECTRON PHYSICS. Benjamin Bederson, Wade L. Fite, eds. 506 pp. Academic Press, New York, 1968. \$21.50

by JOHN B. HASTED

L. Marton, the editor in chief of this well known series, claims that the "mushrooming" of the atomic- and electron-physics text from two to four volumes is not his fault. Personally, I would have gone along with an even faster growth rate and tried to take some of the credit. Volume 7, Part A describes the crossed-beam and beam-gas techniques for elastic- and inelastic-collision study, whilst a further volume on collision processes in bulk matter, mostly plasma, is promised.

The subject lends itself to systematization; for example, one can enumerate the possible binary processes between photons, electrons, neutral atoms and molecules, positive ions, negative ions and excited species; one then searches for an expert in each of these processes and compels him to appease his conscience by writing a chapter. In many ways the variety of approach adopted by each expert is an attractive feature. Some authors prefer to go no further than to describe the actual techniques of beam production and detection, together with collision-chamber design—for example the excellent discussion of electron scattering by gases due to Chris E. Kuyatt. Others will question why the collision process is of interest in the first place—for instance the discussion by Hans Pauly and Peter Toennies of neutral-beam experiments at thermal energies is probably the outstanding article in the book, even though much of the material in it has appeared before. Again, other collision processes such as those of excited species with neutral atoms and mole-



CALCULATED DIFFERENTIAL SCATTERING cross section (weighted with $\sin \theta$) for a Lennard-Jones potential. The dashed curve shows the classical cross section for the same potential and energy. (From *Methods of Experimental Physics*, Vol. 7A.)

cules are unfortunately not included.

The contributors are ten Americans, four British, two Germans. The balance is not unsatisfactory, but I would have welcomed articles from the USSR and Holland. The days of "latitude effects" in collision cross sections are mercifully almost over. I don't suppose that more than one or two of the authors, if that many, would describe themselves as chemists. But this is a subject under extensive invasion from chemists, and one would like to see them represented; for example, photoelectron spectroscopy could have enjoyed a more generous discussion.

In general, this is a volume that is going to be of great value to the ever increasing tribe of "collisionmen," and the editors and contributors are to be congratulated.

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John Hasted, who is head of the physics department at Birkbeck College, University of London, was for 20 years a member of the atomic-collisions team of Sir Harrie Massey at University College, London, where Hasted studied both electron and heavy-particle collisions.

Light scattering

MOLECULAR SCATTERING OF LIGHT. By Immanuel L. Fabelinskii. (Trans. from Russian) 622 pp. Plenum Press, New York, 1968. \$32.00

by HOWARD B. LEVINE

The invention of the laser has opened the new field of nonlinear optics, and

in addition has renewed interest in linear light-scattering phenomena. It would be particularly convenient at this time to have on hand a comprehensive treatise in this field, which would review the existing literature and also provide a unified framework for understanding it. Immanuel L. Fabelinskii has been an active contributor to light-scattering research for many years, and I obtained the general impression from this book that he possesses the knowledge needed to provide the suggested treatise. This book represents the author's attempt to share his knowledge with other physicists.

The various sections of this book deal with Rayleigh and Mandel'shtam-Brillouin scattering from gases and condensed isotropic phases, the theory of the spectral shape of such scattering, experimental techniques, auxiliary measurement of macroscopic parameters (such as the adiabatic density dependence of the dielectric constant), depolarization of scattered light, scattering by glasses, the spectrum of the wing of the Rayleigh line, scattering by crystals and a number of other topics of linear scattering theory. The primary missing element is Raman scattering, but except for this deletion, the variety of subjects encompassed is large. The title states the approach to be molecular, but in fact the approach is probably better said to be hydrodynamic or thermodynamic or both, as the theories discussed for the most part are based upon empirical relaxation equations that utilize bulk properties such as sound velocity, vis-