modynamic entropy can be exchanged for information and vice versa. Claude Shannon transformed the rather vague concept of thermodynamic probability into a precisely defined measure of information and made it the basis of a mathematical theory of communication. Other authors have found important applications of the concept of information in the theory of statistical inference. Recently E. T. Jaynes has completed the cycle of transmigration in his attempt, using the arsenal of information-theory concepts, to outflank the unresolved difficulties at the basis of statistical mechanics.

In his introductory textbook *The Principles of Statistical Mechanics: The Information Theory Approach,* Amnon Katz has chosen to use Jaynes's approach to the foundations of statistical mechanics. He has written a lively book in which the important questions of principle are clearly brought out and which provides the student with a well-defined rationale for formulas which he must eventually use to relate the properties and behavior of bulk matter to the properties of atom and molecules.

The "information theory approach" is expressed through an extensive discussion of Shannon's measure of information and the use of the principle of maximum missing information to assign a probability distribution for all observables when information about some observables is known. The latter principle is illustrated in equilibrium theory by the derivation of the laws of thermostatics and a discussion of quantum ideal gases and the ionization of hydrogen, and in nonequilibrium theory by the derivation of correlation formulas for transport properties and an elementary discussion of the Boltzmann and master equations.

The book contains a number of interesting theoretical discussions which might find their place in any text on statistical mechanical principles from whatever approach. Especially interesting are the discussions of the adiabatic compression of a slightly imperfect nondegenerate quantum gas and the classical and quantum mechanical adiabatic theorems, as well as a short remark explaining why local integrals of motion cannot in general be extended to global measurable integrals.

Introductory books in statistical mechanics are difficult to write, not primarily because we lack appropriate philosophical concepts but rather because we lack sufficiently detailed mathematical knowledge about the trajectories of dynamical systems. It is possible that recent Russian work on ergodic theory, especially that of Ya. Sinai, will soon fill the lack. In the absence of this knowledge, Katz's book is a concise and attractive introduction to statistical mechanics which may, perhaps, serve to initiate a generation of graduate students, educated to expect an intimate connection between knowledge and physics, into the mysteries of statistical mechanics.

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Measuring Gravitation

The Gravity Field of the Earth from Classical and Modern Methods. MICHELE CAPUTO. Academic Press, New York, 1967. xiv + 202 pp., illus. $9.75. International Geophysics Series, vol. 10.

Compared with, say, its electromagnetic counterpart, a gravity field may seem simple: no effects of media, no conductivities, no retarded potentials, no waves as far as we know today; and even if some such phenomena are discovered later, they will be far too small to affect our geodetic results.

But this impression is erroneous. The simplicities are more than outweighed by three inconspicuous complications seldom encountered in electromagnetism. First, the gravity field tends to influence the boundaries, thus affect the distribution of sources, thus modify the inertial parameters, thus again modify the field, and so on. Second, adjustments may proceed at such a slow pace that equilibrium may not be reached for eons. And finally, there is no direct way to measure the very quantity that satisfies the comparatively simple partial differential equations, namely the gravitational potential; instead, we measured various directional derivatives of that potential—usually different components with different techniques and different accuracies—and perturbations of the orbits of other bodies in the gravitational field.

To derive the gravity potential and, as far as possible, the mass distribution within the earth from such data is not a simple task. In fact, some of the problems involved in this operation taxed the ingenuity of the brightest minds of recent centuries and were thus responsible for the development of some of the most elegant mathematical methods.

Those are the problems that Caputo is treating. As is to be expected from this author, the book leans more toward the mathematical than toward the observational aspects. It may be for this reason that the reader will not find any reference to such authors as Woollard, Bowie, or Vening Meinesz. More surprising is the absence of quotation of work of men like Jardetzky, Liapunov, or Lichtenstein.

In a sense, the title of the book is misleading. The reader will find only three pages devoted to the "actual field." But he is more than compensated by a thorough account of the theory of gravity potentials in rotating ellipsoidal systems, Morera's functions, the density distribution in the interior of the earth and the moon, the theory of the geoid, and implications and applications of the results to satellite orbits. The text is clear and the amount of mathematical derivation is just right.

Question may be raised as to whom the book is addressed to. It is definitely not for the prospecting geophysicist, nor is it for the geologist who uses gravity information to help him understand the subsurface mass distributions. But it will be invaluable for anybody interested in higher geodesy and can be highly recommended to students of theoretical physics and applied mathematics. It may be used as a textbook in geophysics by students who have already acquired the necessary background in mathematical methods, particularly the theory of potential. And it is a good guide for those who want to be directed to the original publications. A book of this sort has long been wanting.

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Hazards and Preventives

CRC Handbook of Laboratory Safety. NORMAN V. STEERE, Ed. Chemical Rubber Company, Cleveland, Ohio, 1967. xii + 568 pp., illus. $19.00.

Fortunate indeed is the laboratory worker whose supervisor, despite the pressures and demands of today's research or testing operations, has found the time to make himself not only cognizant of all the safety hazards in his operation but also knowledgeable in the best methods for minimizing or eliminating them. The *CRC Handbook of Laboratory Safety* should prove to be an immediate source of information to the harried supervisor and also a handy