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 reference to the general safety technologist not completely familiar with the problems of laboratory safety. It fills a void of which every laboratory supervisor has been acutely aware at one time or another.

The publication represents yet another discipline in the series inaugurated by the publisher 60 years ago with the now-familiar *Handbook of Chemistry and Physics*. However, this modern compilation adopts a format enjoying current popularity in this era of technical specialization. Editor Steere has invited 40 contemporaries in the field of safety to contribute chapters on specific subjects in which they are particularly qualified. Unfortunately the contributions too frequently are articles previously written for a periodical, and the result is a decided lack of editorial uniformity which sometimes yields obvious redundancies. This is not objectionable to the casual reader, but is distracting to the student seeking an overall comprehension of laboratory safety.

Each of the chapters has a list of pertinent references appended, and there are numerous tables. The most unusual, from the standpoint of content, is the large one which covers 110 pages at the back of the book. It is a compilation of health- and fire-hazard and related properties for more than a thousand laboratory chemicals. This feature is reason enough in itself for having the handbook available in many laboratories. Let us hope that the editor is diligent in expanding and updating this table in future editions.

The volume is not without editorial oversights and typographic errors. Typographic errors in text are usually inoffensive, but when they appear in diagrams, as in figure 13, page 378, or result in the mislabeling of components as in figure 1, page 83, they become annoying. Negative feelings were also aroused by a chapter on deleterious effects of electric shock and another discussing the physical qualities and giving a complete description of all types of glass. In a handbook on laboratory safety guidelines, they create an impression of padding. In direct contrast, many of the chapters, notably the one on compressed gas cylinders and cylinder regulations, present exactly the safety information a laboratory man would be seeking in a handy reference.

In concept and content the handbook, from an overall viewpoint, is an exceptionally fine fulfillment of a long-standing need. Scanning the volume should be a revelation of unrecognized or previously learned but forgotten hazards for the laboratory supervisor. The professional safety technician will find the reference source an excellent point of departure for more comprehensive study of laboratory safety problems.

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Viral Oncology

Subviral Carcinogenesis. First International Symposium on Tumor Viruses, Nagoya, Japan, Oct.–Nov. 1966. YOHEI ITO, Ed. Aichi Cancer Center, Chikusa-Ku, Nagoya, 1967. xvi + 441 pp., illus. $18.

After the ninth International Cancer Congress held in Tokyo in October 1966, a group of virologists and scientists in related fields continued their discussion in Nagoya. This volume is a record of their conference. As is often the case in a rapidly moving field in which productive scientists are asked repeatedly to write reviews, many of the data had already appeared elsewhere. Although progress has been made since the conference, it is convenient to have the material assembled in a volume which accurately reflects the state of knowledge of viral oncology in the fall of 1966.

The reader of this volume will be exposed to the widely diverse experimental techniques and methodology devised and used by tumor virologists. The techniques encompass physical, chemical, and immunological methods. Various laboratory tumor-virus-host model systems were reported in the hopes of finding clues to the understanding of human malignancies.

Several participants emphasized that evidence for the persistence of virus genes in cells transformed to malignancy is conclusive; this view is based on the discovery of viral induced antigens and virus-specific messenger RNA in virus-induced tumors. Equally conclusive is the ability of defective virus genomes to effect transformation and to persist in the transformed cells. Transmission of the defective viral genome from cells transformed by RNA viruses to susceptible cells can apparently occur by cell-to-cell contact. There remains the question of how the viral genes impart the properties that lead to oncogenesis.

Cells doubly transformed by two papovaviruses, SV40 and polyoma, contain both transplantation antigens; this report is similar to the finding that a murine leukemia cell which continually produces an RNA leukemia virus can be further transformed by polyoma virus and then contains additional transplantation antigens induced by the DNA virus.

The RNA of Rous sarcoma virus and that of avian myeloblastosis virus were reported to have molecular weights of 12×10^6 daltons, similar to those of the murine leukemia and mammary-tumor viruses. The continuous participation of cellular DNA was found to be required for the growth of Rous virus. In cells transformed by the Rous sarcoma virus, persistence of the virus genome was observed; particles from the nonproducing cells contain substances with the same high molecular weight as that of the virus RNA. However, infective RNA could not be isolated from the particles or from the tumor cell.

Studies on the adenovirus-SV40 hybrid population were reported. Laboratory-induced transcapsidants were obtained that contained an SV40 defective genome in a type 2 adenovirus capsid. This for the first time conferred oncogenic potential on the type 2 adenovirus.

Human tumor viruses and human leukemia virus remained elusive. Progress being made at the cellular and molecular level is heading towards a resolution of many of the complex problems concerned with the transformation of cells by viruses. Much hope is riding on the work in hybridization, specifically on the search for specific homology between transformed-cell messenger RNA (mRNA) and the DNA of the adenovirus that might have caused the tumor. This methodology, which works for virus-induced animal tumors, lends itself to exploitation in determining whether human cancers contain genetic information specified by known viruses. However, there must be a note of caution; even if virus-specific mRNA should be found in human cancer cells, this by itself would not be rigorous proof that the virus coding for the resident mRNA was the etiologic agent of human cancer.

In order that the reader profit most from this specialized volume he should have a background knowledge both of the nature of viruses and of the basic concepts of immunology.

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