

BOOK REVIEWS

Temperature, Volume 3. Its Measurement and Control in Science and Industry. Charles M. Herzfeld, ed. Part 3 of *Biology and Medicine*, edited by James D. Hardy. 683 pp. (Chapman & Hall, London) Reinhold, New York, 1963. \$22.50.

Reviewed by **Joseph G. Hoffman**, State University of New York at Buffalo.

The creation of actual means for measuring heat or temperature in living systems is especially difficult. The 56 papers given in the seven chapters of this volume give a good survey of technical problems encountered. Moreover the reader is made aware that the complex techniques for measuring purely physical aspects of life are a source of new ideas about the mechanisms of life. Take for example, the problem on nonshivering thermogenesis. Shivering is a mechanical response of the musculature leading to the production of heat. There is however, in dogs, rats, and man also, a chemical response manifested in increased metabolic heat production in body cells to compensate for the drop in body temperature. J. P. Hannon points out that the extra chemical heat is an important factor in acclimatization to cold.

The response of a living organism to temperature changes is well described in Benzinger, Kitzinger, and Pratt's paper on the human thermostat. The theory is that the posterior hypothalamus is the highly temperature-sensitive nerve center at the base of the brain whence signals emanate to make the thermostat function. This would add another critical function to this important nerve center. A current theory in neurophysiology holds that the hypothalamus might contain an electric oscillator, not unlike that in the pacemaker cells in the heart, whose frequency provides our sense of time. In a state of fever the oscillator frequency is raised causing external time to seem longer.

The many diverse effects of heat and cold on living systems are pretty well surveyed in this symposium. Section 1 describes temperature measurement and calorimetry. There follow sections on temperature effects in biological systems, tissue heating and thermal

sensation, physiological responses to heat and to cold, hypothermia, and temperature regulation. The papers are consistently well written for the nonexpert as well as for the specialist. For example, the paper by Minard and Copman on elevation of body temperature in disease gives, among other things, a lucid and lengthy discussion of heat stroke. Examples include heat stroke in men in the boiler room of a battleship when the ventilation failed; in prisoners of war in a dungeon; and in laborers imbibing alcohol and working in the sun. These are well-documented examples of the consequences of failure of the human thermostat, especially as regards temperature control of the brain.

The symposium amounts to a thorough-going compendium of up-to-date work in the subject of temperature in biology and medicine because of the excellent documentation. Each paper has generous references; there is an author index and a subject index, as well as a table of contents. This is a highly commendable reference book for workers in the life sciences.

Alexander von Humboldt. By L. Kellner. 247 pp. Oxford University Press, New York, 1963. \$5.75.

Reviewed by **Norman Feather**, University of Edinburgh.

"Thus that scientific conspiracy of nations which is one of the noblest fruits of modern civilisation was by his exertions first successfully organised"—so Agnes Mary Clerk, indefatigable biographer of scientists, wrote of Alexander von Humboldt for the eleventh edition of the *Encyclopaedia Britannica* in 1910. Today, Dr. Lotte Kellner seeks warranty for her new biography in the larger "conspiracy" of recent times: "To recall in this period of a new International Geophysical Year the details of his life and his achievements is of timely importance. . . ."

Some warranty was perhaps needed, for the corpus of Humboldt literature is already considerable, but Dr. Kellner



Alexander von Humboldt: a self portrait. Frontispiece from the book *Alexander von Humboldt* by L. Kellner.

need not have sought justification in mere topicality. She has written a lively account which can stand on its own merits. It is not entirely satisfying in isolation—Humboldt's life was so long, and his achievements so varied—but the story is told attractively, with a wealth of detail based on sound scholarship. The reading of it may confuse at times, but it does not daunt; the reader is more likely to be sent scurrying to consult the more copious authorities, which are amply quoted, than dejected to find some less formidable subject of study.

As scientist and explorer, Humboldt accepted the whole world as his laboratory; as archaeologist and humanitarian, the whole race of man for enquiry. He ranged over most of the continent of Europe as diplomat-extraordinary, representing, or in company of, his royal masters. A biography of such a man which has no maps of reference to offer—maps of the physical features of distant lands, or political maps of the Germanic states between the great revolutions—cannot be entirely satisfying in isolation, and Dr. Kellner's biography has none. But the text is full of background information; the scene is forever crowded with people. All the time there is a brisk

FUNDAMENTALS OF MICROWAVE TUBES

By *MARVIN CHODOROW*, Stanford University; and *CHARLES SUSSKIND*, University of California at Berkeley. *International Series in Pure and Applied Physics*. Available in February.

Designed for graduate students in physics and electronic engineering and workers in the microwave field, this new text evolved from a series of courses given at the Microwave Laboratory at Stanford University. The text is general in scope, with an emphasis on fundamentals.

PHYSICS OF SOLIDS

By *CHARLES WERT* and *ROBB THOMSON*, both of the University of Illinois. *McGraw-Hill Materials Science and Engineering Series*. Available in February.

Designed for the introductory course in the physics of solids for engineering students. Also useful as a self study book. The outstanding feature is the coverage of the main properties of solids at a uniform intellectual level. The electrical, dielectric, and magnetic properties of solids are emphasized.

INTRODUCTION TO THE QUANTUM THEORY

By *DAVID PARK*, Williams College. Available in April.

A new textbook on quantum mechanics designed for use in advanced undergraduate or beginning graduate courses. The first half develops the general formalism of the quantum theory; the second part gives extensive applications to atomic and nuclear and solid state theory and to statistical mechanics. A course on the fundamentals of atomic physics is a prerequisite.

VECTOR MECHANICS, Second Edition

By *DAN EDWIN CHRISTIE*, Bowdoin College. 638 pages, \$10.75.

Using the language of vector algebra and vector calculus, this self-contained text for sophomore-junior physicists and engineers presents systematically the elements of mechanics. Vectors are used in ample detail. Concepts of mechanics are introduced gradually, with dimensional analysis as a chapter on Introduction to Methods of Lagrange and Hamilton has been added.

ELECTROMAGNETIC FIELDS

By *J. VAN BLADEL*, University of Wisconsin. *McGraw-Hill Electrical and Electronic Engineering Series*. Off Press.

A graduate level text which applies certain mathematical methods to the calculation of electromagnetic fields. The book utilizes systematically mathematical techniques such as eigenfunction methods, variational methods, formulation of problems in terms of integral equations, etc., techniques well-known to the mathematical physicist but have only recently become familiar to electrical engineers.

PHYSICS FOR TEACHERS: A Modern Review

By *ROBERT L. WEBER*, Pennsylvania State University. 320 pages, \$6.50.

An intensive examination of two areas of special importance in modern physics: space and the atom. The fundamental physical principles are discussed in the light of the reader's interest in contemporary achievement in physics. A knowledge of calculus is not required.

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sense of reality, almost all the time a sense of conviction. Almost all the time—for it has to be admitted that doubts occasionally assert themselves. There are various, rather trivial, discrepancies regarding dates (p. 34; pp. 44 and 50; pp. 66 and 78), and discrepancies regarding the height of the Chimborazo climb (pp. 54 and 57), the surveys of the level of the Caspian (pp. 137 and 151), and the number of volumes in the English translation of *Personal Narrative of Travels to the Equinoctial Regions . . .* (pp. 33, 96, and 236); there is a misstatement concerning Thomas Young (p. 11) and at least one incorrect reference (p. 98). In so complex a tapestry, it is almost inevitable that certain loose ends remain. Did Humboldt eventually meet Baudin in Lima (pp. 51, 53, and 59)? We are never told. But these are minor blemishes. Zelter wrote to Goethe concerning Humboldt "Even when he is wrong, it is a pleasure to believe him" (p. 117). Dr. Kellner's biography can be accepted with a like tolerance.

Analysis and Synthesis of Sampled-Data Control Systems. By Benjamin C. Kuo. 528 pp. Prentice-Hall, Englewood Cliffs, N. J., 1963. \$16.00.
Reviewed by T. Teichmann, General Atomic Division, General Dynamics Corp., San Diego, Calif.

The development of digital computers of great versatility, speed, and accuracy, has changed the complexion of control-systems technology in recent times. While continuous controls using properties of the physical loop, itself, or analog electronic circuits are by far most practical for relatively small systems, digital systems are becoming more and more common, and indeed necessary in large systems. By their very nature such controls involve sampled data and discrete processes, and, while such techniques are often required in nondigital systems (e.g., radar tracking, telemetry), it is the advent of the digital-control system which has most stimulated the study of sampled-data systems.

While linear sampled-data systems can be treated essentially by the same methods as continuous systems, the practical differences in behavior warrant a treatment on their own merit. In particular, the greater simplicity

of synthesis and compensation makes it necessary to deal with such systems more extensively than simply as a direct application of continuous system methods.

After discussing the sampling process, and the reconstruction of signals, Kuo gives a detailed description of the Z-transform method. He then describes its basic application to circuits, and goes on to deal with the temporal response of discrete systems, with special reference to stability analysis, both in the frequency and the time domain. All these notions then find their logical culmination in the two major chapters on the utilization of continuous and digital elements, in the design, synthesis, and compensation of sampled-data systems. The remaining chapters deal with important supplementary questions such as skip-rate and multirate sampling (and nonsynchronous systems), the statistical analysis of such systems and some relevant optimization problems, and the analysis of nonlinear systems using phase-plane and describing-function techniques.

There are many examples (worked out) distributed through the text and a number left as exercises for the reader at the end of the book. Each chapter has its own bibliography, and a general list of references is also included. There are tables of the most important Laplace transforms, z-transforms, modified z-transforms, and also of block and flow diagrams. The general style and format are attractive and the book should provide a most satisfactory text and reference.

The Scientist Speculates. An Anthology of Partly-Baked Ideas. Irving John Good, general ed. 413 pp. Basic Books, New York, 1962. \$6.95.
Reviewed by Robert L. Weber, The Pennsylvania State University.

In such a book as A. S. Bishop's *Project Sherwood—the U. S. Program in Controlled Fusion* we are permitted to share the views and disciplined speculations of scientists working together on a problem whose solution they feel is imminent. In Editor Good's book we can have the even rarer privilege of sharing the almost undisciplined "Saturday afternoon" speculations of some seventy scientists on an even larger number of topics.

I think that many a reader will share my feeling that in this collection he too often encounters affectation, preening, and triviality, but that he is also delighted to find certain speculations that appeal to him. Some he will consider funny; others he will respect as views of persons competent in his own field; and still others will give stimulating insight in unfamiliar fields. My own nominations in each of these classes are: "Technical Glossary," by McClimont and Grshamjun; "Remarks on the Mind-Body Question," by Eugene Wigner; and "Analogies of Language to Life," by Hans Kalmus.

Etudes d'Histoire et de Philosophie des Sciences. Edited by l'Académie de la République Populaire Roumaine. 311 pp. L'Académie de la République Populaire Roumaine, Bucarest, 1962.
Reviewed by R. Bruce Lindsay, Brown University.

Those who are interested in the attempt to accommodate the aims and the ideals of science, its history and philosophy, to the tenets of dialectical materialism will find the reading of this book an illuminating experience. It consists of a series of articles by Roumanian philosophers and scientists in all fields published under the auspices of the Roumanian Academy. Since there is no preface or foreword, it is impossible to tell whether the papers were originally published in journals or whether they were first written for this volume. In any case almost every article leans heavily on the ideas, if not the actual writings, of Marx, Engels, and Lenin.

The wide variety of topics treated includes mathematics, physics, chemistry, technology, biology, medicine, psychology, economics, history of philosophy, logic, and linguistics. A. Joja, president of the Roumanian Academy, contributes two papers, the opening one on the value of science and a second and rather more scholarly one on the philosophy of Parmenides and the Eleatic School in general. The first paper in a sense sets the tone for the whole volume in its insistence on materialistic philosophy. The basic assumption is that science arose not at all from human curiosity but from a sense of human need, and that the purpose of science is not primarily to provide understanding of human