

From Leucippus to the AEC

Sourcebook on Atomic Energy. By Samuel Glasstone. Prepared under the direction of the Technical Information Service, Atomic Energy Commission. 546 pp. D. Van Nostrand Company, Inc., New York City, 1950. \$2.90.

Intended in the first instance as a sort of Baedeker for authors and editors of textbooks, this volume will unquestionably prove of immense value to persons, physicists or otherwise, who find need for immediate, reliable, and only moderately detailed information on any topic in the atomic energy field which one might readily bring to mind. While the Smyth Report has served reasonably well to satisfy this need in the past, it pretended to be little more than a terse history of the atomic energy project up to the summer of 1945. The present work, being longer, coming later, and having considerably more ambitious goals, is certain to be far more valuable as a general compendium of atomic energy lore than its predecessor or than any of the flood of How to Understand the Bomb books which have glutted the market since Hiroshima.

The author, British-born Samuel Glasstone, formerly professor of chemistry at Boston College and well known for his textbooks on physical chemistry, was employed as a special consultant and was persuaded to write the book by the Atomic Energy Commission, which previously had been persuaded by the American Textbook Publishers Institute that a comprehensive reference guide to atomic energy was sorely needed. Considering that the Sourcebook was a joint effort of the Publishers Institute and the Commission (and no doubt had to be examined, discussed, and approved by 10⁶ number of individuals, departments, and Offices) the final result must seem a pleasant one to all concerned.

It would be natural, and also quite correct, to describe the Sourcebook as a concise history of the atomic sciences. Within all reasonable limits, the story is told chronologically as a continuous intellectual struggle over centuries and decades to piece together bits of information and ideas to form a usable structure of knowledge about the smallest parts of the material and energetic universe. The history is detailed enough to provide information on significant ideas and factual discoveries (usually with quite adequate answers to who, how, why, and what) but never becomes sufficiently complex to frighten away persons having only a rudimentary scientific background. This is a great virtue, since it will make the volume useful to those popular science writers who have for the past several years had to struggle with the problem of explaining in some simple way to the public scientific complexities about which they themselves have had only the haziest conceptions. Many of them will think sadly back to the occasions during the past several years when they would have found great use for such a book, but they will no doubt find it valuable even at this late date.

It would not be surprising were teachers of high school and college science courses to find the volume ideally suited as a text or reference book. The low retail cost, which places the Sourcebook on about the same price level as

the average novel, will presumably be an encouragement.

Readers who are professional scientists will appreciate the Sourcebook as a sourcebook. The volume is well organized and integrated and the relative weighting of subject categories will be adequate for most reference purposes. The book is intelligently written and manages to capture a large share of the excitement of individual discoveries with a minimum of language. Definitions are crisp and to the point. The AEC, the Publishers Institute, the D. Van Nostrand Company, and especially the author are to be congratulated.

Light but Purposeful

Molecules in Motion. By T. G. Cowling. 183 pp. Hutchinson's University Library, London, and Longmans, Green and Company, Inc., New York, 1950. \$1.60.

T. G. Cowling, Professor of Applied Mathematics at the University of Leeds, has written a delightful account of the kinetic theory of gases in a relatively non-mathematical style. It is a pleasure to see how clearly a mathematician has portrayed the intricacies of a field which is often regarded as highly mathematical. This account of gases, wherein "nearly all of the volume is full of emptiness", is developed in a manner which lays emphasis upon physical concepts and processes and discloses the underlying reasoning that has provided the direction for mathematical analysis. Those who have labored through heavy treatises on kinetic theory would find pleasure, as your reviewer did, in resurveying from another point of vantage the ground so laboriously won. Those who have not yet ventured into the field because of its forbidding mathematical barriers may discover in Professor Cowling's refreshing monograph a simple Baedeker of Kinetic Theory.

The author lays stress on the continual interplay between theory and experiment. To him, "the proper line of approach is neither that of the mathematician working without contact with experiment, nor that of the experimenter carrying out measurements to a steadily increasing degree of accuracy without enlightenment as to their meaning, but a middle course in which theorist and experimenter cooperate in building up a fruitful conception of the way in which nature works". He treats of historical developments effectively, not pulling his punches over the clash between modernists and Aristotelians, nor giving more than just praise to some of those often credited with too much. His mathematical formulations rarely go beyond algebra and geometry, although the penetration of his arguments seems not to be seriously limited thereby. The account is timely and modern. If he uses such homely devices as "red and blue molecules" (otherwise completely similar) to describe the complex matter of self-diffusion, he should surely be excused! What physicist has not been tempted to endow his invisible particles with visible attributes to assist him in his thinking? Many of Cowling's physical pictures of molecular processes are beautifully drawn; but although he places considerable emphasis upon models, he warns the reader of the dangers and discrepancies that may easily arise if one follows models too slavishly.

The reader is likely to give a hearty cheer from time to time while reading *Molecules in Motion*, not only for the adroitness of Cowling's presentation of physical and mathematical ideas, but for the interpretative twist which he gives to his subject matter, and for his illuminating expressions about the growth of our knowledge in the field of

kinetic theory. For example, in answering the rhetorical question of why Hooke and Newton did not jump immediately to ideas that came only 175 years later, he remarks: "Indeed, if science were what it is often conceived to be, the work of great masters proceeding majestically by a predetermined plan to an inevitable goal, there would be real point to such a query. But the pathway of science is littered with discarded ideas—ideas which had to be worked out and tested before the true could be known from the false".

Mr. Cowling's book contains virtually nothing in the way of physical and mathematical ideas that cannot be found elsewhere, but rarely does one encounter these ideas organized with such clarity, grace, and charm, in so readable a manner, and with such valid assurance that, as far they go, they are well founded upon a carefully considered development. The reviewer would recommend its pages to any trained physicist as "light but purposeful reading", and even more would he recommend it to those who, through the integrated study of the Physical Sciences, are in these days being guided into gathering ideas on *how* the various bodies of scientific knowledge grow and advance.

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Textile Science

Physiology of Heat Regulation and the Science of Clothing. By L. H. Newburgh. 457 pp. W. B. Saunders Company, Philadelphia and London, 1949. \$7.50.

Turning points in history have been ascribed to the personal comfort of individuals under various types of climatic conditions. Probably no single matter is of greater universal interest than one's personal climate. Man has developed clothing quite intuitively for the purpose of giving him control over his personal climate. Despite his practical nature, he has gradually compromised some of his comfort for greater fashionability. As a result, what we wear today is often quite uncomfortable, though stylish.

The study of the quantitative principles underlying the physiology of comfort has been greatly accelerated in recent times by the desire on the part of the military services to provide men with clothing which is appropriate to the weather in which they are expected to operate. Such a study is not limited by style compromises, as military requirements are basically functional.

The book under review represents the approach made by the military services during and since World War II to the fundamental problem of man's physiology and the control of the factors which make him operationally efficient. The fundamental nature of this field of study is best illustrated by the inclusion of a most interesting survey of the shelter and clothing customs of various groups living under extreme environmental conditions throughout the world. Within such groups lie clues as to the universal principles governing man's adaptation to a wide range of environmental stresses.

In order to make a quantitative approach to a subject embracing such a range of dependent sciences, the military services found it necessary to utilize the coordinating abilities of a group with the scientific stature and breadth of the Division of Medical Sciences of the National Research Council. The scope of the problem is best illustrated by examining the composition of the group of contributors to the book, edited by Dr. Newburgh. Contained in it are sections contributed by distinguished physiologists, hygienists, military geographers, textile technologists, physicists, sociolo-

gists, and anthropologists. Their well-edited sections represent the first truly consolidated study of this subject and are very complete in their literature coverage as well as in their report of original work specifically devoted to the basic problem of the military services.

It might be said that the theme of the book is the maximal capacity of the human body to preserve itself under the most adverse conditions and the degree to which it is possible to cope with unfavorable environments through the use of scientifically designed protective clothing assemblies. The generation and regulation of heat are discussed in sections on thermometry, heat transfer, regulation of body temperatures, physiological adjustments to heat and cold, regional heat loss, range of physiological response to climatic heat and cold, and indices of comfort. These sections are an outstanding presentation of the principles underlying the design of functional clothing. They are followed by a section on the study of clothing as a thermal barrier, supplemented by an analysis of laboratory and field studies of clothing assemblies on actual subjects. The book is concluded by an analysis of the performance of these assemblies under the wide range of climatic conditions to which man may be expected to be exposed.

The contributors are frank to admit that they are not providing final answers but rather are defining areas in which further investigation must continue. These areas present a challenge to the applied physicist as well as to those in other fields related to the problem. Many avenues have been left unexplored by reason of lack either of adequate micro-instrumentation or of sound theory in the field of heat and moisture flow under the control of engineered clothing assemblies.

It is too much to hope that this book can be directly used by the designer of clothing assemblies in improving the comfort of the general public. The materials engineer must interpret it for him before such benefits may be realized. Nevertheless, for the first time, a truly quantitative basis is provided upon which the textile industry may build sound principles of clothing design, within the limitations imposed by style and fashion.

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Righi Centennial

Selection of Writings by Augusto Righi (Scelta di scritti di Augusto Righi), edited by G. C. Dalla Noce and G. Valle. 374 pp. Nicola Zanichelli, Bologna, Italy, 1950. Lire 4000.

This volume, printed on the occasion of the 100th anniversary of Righi's birth, will be of particular interest to the student of the history of physics. It contains a selection of original papers by this author, including some of his works in electricity, optics, and acoustics. The greatest single contribution of Righi consists probably of his beautiful experiments on the optics of electrical oscillators which insure to him a prominent place in the development of the theory of electromagnetism and in its applications, as the man who perfected the work of Hertz, and paved the way for that of Marconi. Fifty years before the development of radar, Righi produced electromagnetic waves as short as 2.6 cm, and with these performed those experiments of reflection, diffraction, and interference on which the electromagnetic theory of light finds its unshakable experimental foundations.

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