

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.

Richard M. Sutton
Haverford College

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.

Rogers B. Finch
Massachusetts Institute of Technology

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.

Sergio De Benedetti
Carnegie Institute of Technology