# Book Reviews

**Handbook of Physics.** Prepared by a staff of specialists. E. U. Condon and Hugh Odishaw, Eds. McGraw-Hill, New York, 1958. xxvi + 1504 pp. Illus. $25.

This work compresses into a single volume a tremendous wealth of information. Some idea of the scope of the book can be obtained from a listing of the nine parts into which it is divided. These parts are: "Mathematics," "Mechanics of particles and rigid bodies," "Mechanics of deformable bodies," "Electricity and magnetism," "Heat and thermodynamics," "Optics," "Atomic physics," "The solid state," and "Nuclear physics." Each part contains a series of chapters on the major topics pertaining to the main subject. For example, under "Mathematics" there are chapters on arithmetic, algebra, analysis, ordinary differential equations, partial differential equations, integral equations, operators, geometry, vector analysis, tensor calculus, calculus of variations, elements of probability, and statistical design of experiments, while under "The solid state" there are chapters on crystallography and x-ray diffraction, the energy-band theory of solids, ionic crystals, flow of electrons and holes in semiconductors, photoelectric effect, thermionic emission, glass, and phase transformations in solids. There is an average of ten chapters in each part. The various chapters are written by experts in the subjects discussed.

A notable feature of modern science is its rapid rate of advancement. As a result, written works on the newer aspects of a subject such as physics become out of date with dismaying rapidity. A reference work, in particular, runs into difficulties here, since those who consult the work will quite often be seeking information about the latest findings and concepts. The attempt to meet this demand must have posed difficult problems for the editors of the *Handbook of Physics,* since preparation of the work, from first planning to completion, took nearly 10 years. Nevertheless, the editors state that an effort was made to have the book as up to date as possible at the time of publication. They appear to have been reasonably successful in this effort.

I examined the *Handbook of Physics* from two points of view, evaluating it first as a reference book and second, as a text (or rather series of texts) for self-instruction. As a reference, this handbook should be very useful. It contains a wealth of material, including much that is recent. The organization of the material is excellent, and the writing is good. The typography is clear and pleasing.

One result of the effort to cover an extremely wide range of topics in a single volume is a compactness of treatment that makes reading difficult. Occasionally the treatment is so compact as to be uninformative. Because of the concise treatment, the *Handbook of Physics* appears to be designed more for the professional physicist than for use as a general reference work.

A most important part of a reference book or handbook is its index. It is here that I found the principal weakness in the *Handbook.* The indexing is incomplete. In making a sample check list of items, I found a tendency to omit the indexing of simple definitions. There is little cross-referencing or multiple-listing when several different terms or phrases are commonly used for the same subject.

To summarize, as a reference work, the *Handbook of Physics* is a useful and clearly but compactly written volume. It is reasonably up to date and covers a wide range of topics in classical and modern physics. It is intended more for the professional physicist than for general reference. Its index would be improved by enlargement and extensive cross-referencing.

Since the *Handbook* covers such a wide area in the field of physics, I found it of interest to consider whether or not it could be used as a text for self-instruction. The compactness of the writing appears to limit the book's usefulness for this purpose. On the other hand, the various chapters provide splendid summaries in their respective areas and can be used for self-instruction in conjunction with the texts and articles listed in the bibliographies at the ends of the chapters. Many of the individual chapters, expanded to book size, would make excellent texts. It might be worth while for individual authors to consider this possibility.

Finally, the *Handbook* is doubtless the best existing compromise between the brief type handbooks available and multivolume sets, such as the *Handbuch der Physik.*

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**The Way Things Are.** P. W. Bridgman. Harvard University Press, Cambridge, Mass., 1959. x + 333 pp. $5.75.

The readers of Bridgman's earlier writings will find in this, his latest book, a clearer and more systematic presentation of his "operational methodology." By this he means simply that an analysis of what we know in terms of doings or happenings is preferable to one in terms of objects or static abstractions. Three aspects of his position, heretofore more or less implicit, have now become abundantly clear.

First, analysis merely in terms of physical operations is insufficient; physiological operations must also be brought into the picture. "Not only should we never think of the microscopic world without thinking of microscopes, but we should never think of the microscopic world without thinking of ourselves using the microscope" (page 154). By "ourselves" he means "the nervous machinery in our heads." In the second place, to describe this physiological contribution of the knower in objective, behavioristic terms, as many psychologists do, is not adequate; introspectional language has a legitimate, though somewhat restricted, use. For example, the operation by which I determine that *I* have a toothache is quite different from the operation by which I determine that *you* have a toothache. This distinction, says Bridgman, is so sharp and spectacular that it must never be forgotten. Finally, the most desirable description of any analysis is one given in the first person;

for the investigator cannot get away from the fact that it is he himself who is knowing something, and *what* he knows is often in very significant ways determined by this fact.

Within this framework Bridgman presents interesting, and often very penetrating, analyses of logic, physics, psychology, and the social sciences. Perhaps the most important point which he uncovers by these considerations is that as we pass from the abstractions of logic to the value judgments of the social sciences, the role of the individual knower becomes increasingly important. Although it is true that when I utter a proposition of Euclid I must consider the fact that I am uttering it as part of the total picture, this is not nearly so significant as when I state a truth about society. For here I must recognize that there are no "values" (without qualification) but only "values-for-someone"—in this case, myself.

It may be worth while to point out that two of the most important of the recent schools of philosophy—the Existentialists and the Linguistic Analysts—also take their departure from the concrete individual. The former considers him as a creature experiencing anguish and dread; the latter, as a symbol-using animal endeavoring to communicate the simple truths of his experience. I hesitate to present Bridgman with such ill-deserved bedfellows. But there may be significance in the fact that intelligent people in widely different areas are deploring the modern overemphasis on abstraction, togetherness, and the "public interest," on the grounds that this may lead us, as individuals, unwittingly to commit suicide.

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**The Great Decision.** The secret history of the atomic bomb. Michael Amrine. Putnam's, New York, 1959. 251 pp. $3.95.

This is a valuable and interestingly written contribution to a particular chapter of the history of atomic energy for military purposes. It begins with the afternoon of 12 April 1945, when Vice-President Harry Truman was informed by Eleanor Roosevelt of the death of the President.

That evening Harry Truman was sworn in as President of the United States. Later there was a brief cabinet meeting, and Secretary of War Henry L. Stimson lingered for a private word with the President. That was Truman's first official knowledge of the atomic bomb project, which at that moment had about 100,000 persons working in secret laboratories and factories. The great bulk of these persons were unaware of the over-all objective of the factories in which they worked.

This was just 116 days before the whole character of war was changed by Americans when they dropped one atomic bomb on Hiroshima, Japan. This was followed three days later, 9 August 1945, by the dropping of another bomb on Nagasaki, Japan. During the afternoon of 14 August the Emperor of Japan announced his acceptance of the terms for ending the war contained in the Potsdam Declaration, and World War II was at an end.

Michael Amrine has given a brilliant synthesis of the peculiar circumstances of those less-than-four momentous months in history. He has searched carefully and told the story as well as anyone could in view of the fact that not all of the essential information has been made public. He is aware of the incompleteness of his narrative, for he says in the concluding chapter: "We look back, with troubling questions, at these events, which helped so much to set new limits and choices for man. Were the atomic bombings necessary for an early end to the Pacific war? Were the atomic bombs used in haste, without proper thought of the consequences?

"This book was written to help people answer these questions for themselves. There is also a hope that if the available record is set down, as far as it can be, other people who have not yet spoken may tell the full story of their participation. There are official records that should be opened now. Some contain no official secrets. Others contain technical secrets now outmoded. It is time for these records to be opened, but, so far, the doors have remained shut to journalists, historians, and sometimes to former officials, even to famous American officials who lived through these events. A nation, like a man, cannot fully understand its future if it does not understand some of the secrets of the past."

As we begin to appreciate the vastness of the consequences of atomic energy with its million-fold multiplication of war's horrors which now threaten humanity, one of the most important tasks of scholarship becomes the writing of a really definitive history of atomic energy. This is not a project to be undertaken by one or two men: it calls for the coordinated efforts of a major group of physical scientists, social scientists, and historians. These scholars should subject the stories of the various groups to searching critical analysis so that men may know what a great change atomic energy has worked in every facet of their lives.

My part of the project was finished by February 1945 and, in any case, since I was never associated with it at a level that could influence policy, I have little first-hand knowledge of the story that Amrine gives us. But what I do know confirms the essential accuracy of the story as he tells it. It may be useful to point up some comments on the parts of the story which seem most significant.

A complete history would tell how the project was born in complete and equal cooperation between the United States and Great Britain. We did very little on the project between 1939 and the fall of 1941 while the British accomplished a great deal in spite of the distractions caused by the disaster at Dunkirk and the Germans' mass-bombing of English cities.

Our scientists were indecisive and ineffectual in this early period. It was mainly the push afforded by the British scientists which led to the organization of a major project in the late fall of 1941. At that time it was agreed that the British would shift their work to this country and that we and they would work together on the project as equal partners.

In 1942 General Leslie Groves was put in charge of the project. The full story has not yet been told of how he worked to hobble and frustrate this cooperation. Amrine mentions it briefly (pages 121–2). He tells how, by February 1943, Sir Winston Churchill's irritation reached such a point that he cabled Harry Hopkins the following message: "I should be very grateful for some news about this, as at present the American War Department is asking us to keep them informed of our experiments while refusing altogether any information about theirs."

By August 1943 this had become a major issue and was discussed at the Quebec Conference between Churchill and Roosevelt. After this it was no longer possible for Groves to frustrate cooperation with the British. It was not until that time—but it happened with great speed immediately thereafter—that a