faint disdain which underlies these Early Tales. The neglect of the interaction between the reporter and the system he describes—the want of sympathy, the failure to learn—here mars the work. The studious avoidance of any theorizing, of any abstract judgment, is only apparent; an unyielding set of concealed assumptions underlies the selection of every anecdote and the choice of each disarming detail. The New Yorker is of course far from dead homogeneity; its writing is among the best of our day, and Mr. Lang is a fair representative of its skills. But the mirror which he holds up here is no mirror at all; it is a beautifully and a somewhat cynically retouched photograph. The glass with which the elegant Eustace Tilley annually regaıds his butterfly is just not good enough for something that has to be made a little bigger. Maybe E. B. White will get to do a "Reporter" piece someday, and clothe the bones of technique with a little flesh and blood.

Philip Morrison
Cornell University

The Popular Atom

ATOMIC ENERGY. By Karl K. Darrow. 80 pp. John Wiley & Sons, Inc., New York City, 1948. $2.00.

Bowing to what he calls a "linguistic disaster," Karl K. Darrow permits his newest book, a collection of his Norman Wait Harris lectures at Northwestern University, to be published under the title, "Atomic Energy." It should, of course, be "nuclear energy," and Darrow makes it clear that if he were the professor in charge he would have given a very low mark to the culprit who first associated the word "atom" with the word "bomb." Being a realist, however, Darrow knows that the damage has been done and that to keep the subject properly identified for the public, if not for the physicist, he must perforce compound the felony by continuing to say "atom" where he very definitely means "nucleus."

This is the latest of the books that attempt to explain the atom (beg pardon, the nucleus) to the layman. Unlike some of the others, especially those that miraculously got into print only a few months after Hiroshima, this slim volume seems to have been conceived in leisure and delivered with precision. The style is rigorous but relaxed. All of Darrow's story could have been told two years ago, and most of it could have been told even before the war. The book, therefore, invites comparison with some of the earlier efforts at educating the public on the potency of an irritated heavy nucleus.

Ignoring, with charity aforethought, the immediate literary consequences of the Manhattan Project, we might recall a few volumes that have stood the test of reappraisal and still deserve a place on the supplementary reading lists. Among them the best received, probably, was the late Selig Hecht's "Explaining the Atom" (The Viking Press), with its somewhat surrealistic jacket and its end papers decorated by front and rear views of a three-dimensional periodic table of the elements. Its great merit lies in the fact that it retains the drama of the nuclear energy development while clearly and correctly relating the century and more of research that led to it.

Somewhat neglected, though of comparable merit, was O. R. Frisch's "Meet the Atoms" (A. A. Wyn, Inc.). Some reviewers objected to its tendency toward baby-talk popularization ("Do you still have that pocket magnifier? Then shake a little table salt onto a plate and look at it."). Actually, the book reads like the conversation of a very human professor with a youthful student, and it carries through that approach fairly consistently, and with some nice touches of humor.

A book that does suffer, in this reviewer's opinion, from an overdose of cuteness, is "Atomics for the Millions," by Eidinoff and Ruchlis (Whittlesey House). It is difficult to see where much is gained, for any student above the seventh grade, by a cartoon showing chlorine atoms as members of a stag line who, in the next strip, are seen jitterbugging with sodium atoms (female) as molecules of salt. And a cartoon of an atom bomb explosion, with homes and hospitals popping off into space from the point of impact, seems in outright bad taste. However, it must be said that the text is both comprehensive and comprehensible.

If humor is to be invoked as a leavener, I personally like it in the style dished out by George Gamow, whether in "Atomic Energy in Cosmic and Human Life" (The Macmillan Company), or in the compendious "One Two Three . . . Infinity" (The Viking Press). And if cartoons are to be explanatory as well as page-brighteners, it is a pity that more recent books have not followed the brilliant marginal illustrations presented some years ago by Max Born in "The Restless Universe" (Harper & Brothers). When the reader riffles the pages, the marginal cartoons blend into a sort of animated movie which shows the migrations of molecules or the spread of a radio wave against the dimension of time. Incidentally, Born's volume offered a better insight into quantum theory than Banesh Hoffmann's recent "The Strange Story of the Quantum" (Harper & Brothers). Hoffmann succeeds in building up a good deal of suspense about the mysteries of matrix mathematics and the like, but he never gets around to relieving it with some tangible explanation.

To return now to the book of the moment, let it be said that Darrow's "Atomic Energy" has a rather limited objective. It doesn't go off into the construction of synchrocyclotrons or the nature of cosmic rays, nor does it offer any colorful description of Oak Ridge's isotope-separation plant. Instead, this very concise account is restricted to the minimum number of examples necessary to explain the bomb- or pile-conversion of nuclear mass into kinetic and radiant energy. Since this can be most conveniently told in terms of the light elements with only a few elementary particles, Darrow devotes most of his discussion to them, virtually ignoring uranium and plutonium for the first half of the book.

The result is an account which, within its limited scope, is consistent and complete. It can be guaranteed that a moderately intelligent and patient reader, within a few hours, will attain a correct understanding of the relation between mass and Mev—or, at least, about as good an understanding as physics itself can be said to have at this stage of the game. Having gotten a solid foundation on this basic principle, the reader may well be inspired to look up some of the other volumes herein cited for a broader view of its practical applications and human implications.

Harry M. Davis
Newsweek

Heat Conduction

Conduction of Heat in Solids. By Horatio Scott Carslaw and J. C. Jaeger. 420 pp. Oxford University Press, New York City, 1947. $8.00.

Heat Conduction. By Leonard Rose Ingersoll, Otto J. Zobel, and Alfred C. Ingersoll. McGraw-Hill Book Company, New York City, 1948. $4.00.

The subject of heat conduction is apt to be overlooked in the contemporary emphasis on atomic physics, and books on it bulk small in comparison with the field's basic importance and interest. Irrespective of questions of heat flow arising in innumerable physical experiments and engineering projects, the study of heat conduction is valuable as perhaps the simplest and most vivid introduction to the boundary value problems of mathematical physics. It was, in fact, the investigation of heat conduction in a taurus which led Fourier to the discovery of his celebrated series. It is thus often profitable to center an introductory course in the partial differential equations of mathematical physics around the subject of heat conduction. In recent years these books, two of the leading texts in the field, have been out of print, and their reappearance in improved and enlarged form is most welcome.

The two volumes differ in emphasis and approach. The Carslaw and Jaeger book, the more advanced of the two, has the approach of an applied mathematician; the book by Ingersoll and collaborators uses the approach of an experimental physicist. For example, one of the important appendices in the Carslaw and Jaeger treatise is a table of Fourier transforms. Ingersoll and collaborators include instead an appendix tabulating experimental values of heat conductivities and diffusivities. It should not, however, be inferred that physical applications are wanting in the Carslaw book, or that mathematical analysis is lacking in Ingersoll's. The latter uses Fourier series and integrals extensively, and assumes no previous knowledge of these subjects. Carslaw includes many illustrative physical problems, notably, as an innovation, the theory of automatic temperature control. Still the flavor of the two volumes is quite different, and it is for this reason they complement each other so nicely.

The treatise by Carslaw and Jaeger is the successor to Carslaw's "Introduction to the Mathematical Theory of the Conduction of Heat in Solids," which appeared in 1921 and which in turn replaced the second half of the still earlier "Introduction to the Theory of Fourier's Series and Integrals and the Mathematical Theory of the Conduction of Heat," written by Carslaw in 1906. At the end of the preface of the new book, Carslaw adds a personal note that Jaeger has been its principal author. One could only wish that all collaborators were equally generous! The authors appropriately say in the preface, "In the last twenty-five years so many developments have been made, both in the theory and applications of the subject [of heat conduction], that a new book embodying these advances seemed called for rather than a new and revised edition of the old one." One of the most notable changes compared to the 1921 volume is that four chapters have been added which are devoted to the method of Laplace transforms. This material replaces the two chapters on the method of contour integrals in the earlier volume. The two procedures are basically related, but the Laplace one is "much simpler, more direct and powerful." The most outstanding characteristic of the book is the great completeness with which the different boundary value problems are treated, without impairment of lucidity. The physicist or engineer with some specific problem in heat conduction to solve will do well to thumb through the volume to see whether somewhere the proper mathematical analysis is not included.

"The Mathematical Theory of Heat Conduction," published by Ingersoll and Zobel in 1913, has been out of print so long that it is wanting from many libraries, and not so well known as it deserves to be. The new title, "Heat Conduction with Engineering and Geological Applications," is a more descriptive one. The volume has been expanded to almost double its previous size, and Professor Ingersoll's son has been added as the third author. The literature of heat conduction has grown considerably since the original volume, and about three-fourths of the references are to articles subsequent to 1913. Among the new material is a chapter on approximation methods, including graphical procedures and the relaxation method of Southwell. The great strength of the book is in the richness of its physical applications. Instructors employing it as a text can make good use of the numerical problems at the chapter ends on such subjects as the conduction of firebrick walls, hardening of steel, and electric welding. These tend to give the student more physical feeling for the mathematical analyses than if orthogonal functions are presented in a purely abstract way. Discussion of the timely subject of the heat pump is included. Especially interesting are the geophysical applications scattered throughout the volume—such subjects as geysers, the cooling of a lacolith, and attempts to deduce information concerning the history of Wisconsin glaciation from the geothermal curves in the Calumet and Hecla mines. The mathematical theory of heat conduction is indeed a useful tool for the geologist or geophysicist!

J. H. Van Vleck
Harvard University

Luminescence

Some Aspects of the Luminescence of Solids. By F. A. Kröger. 310 pp. Elsevier Publishing Company, Inc., New York City, 1948. $5.50.

This is one of a series of publications reporting scientific work done in Holland during the war. The first part of the book contains a broad theoretical discussion of the phenomena of luminescence in solids, followed by four chapters presenting mainly experimental results on the luminescence of a large number of oxygen-containing phosphors, such as various tungstates, molybdates, titan-