plastics. Although specific materials are mentioned throughout the text, the traditional chapters on single materials are not to be found.

The illustrations are excellent, and there are many problems and an annotated bibliography with each chapter. The book is not intended for the physicist, and further study would be required by the engineer specializing in materials. Most engineering materials courses would need revision to use the book, but it is highly recommended for this purpose.

**The Logic of Scientific Discovery.** By Karl R. Popper. Translated by author from 1934 German ed. 480 pp. Basic Books, Inc., New York, 1959. $7.50. *Reviewed by George Weiss, Institute for Fluid Dynamics and Applied Mathematics, University of Maryland.*

MOST practicing physicists are likely to equate the usefulness of their research with the power to predict, however localized this may be. Yet few, I think, would be willing to give more than a guarded reply to the question of "why" their theories or experiments are able to predict further physical phenomena. This diffidence regarding the implications of scientific research has not always been the case; few physicists from Newton to Einstein doubted that an external world would impose an ultimate form on scientific theories, and that the mysteriously efficacious principle of induction could be explained by a deeper understanding of the physical world. One of the more interesting assertions made by Karl Popper in *The Logic of Scientific Discovery* is that we should not expect an ultimate form for physical theory, and, by implication, that the technologic and esthetic rewards of research are sufficient justification for its pursuit.

This book contains two points which are of interest because they run counter to the more usual concepts of epistemology. At the very beginning Popper rejects entirely arguments based on the principle of induction (not the mathematical principle, of course), claiming that it is not provable in any form. Popper's second somewhat novel point is that the value of a theory of the external world should be related to its falsifiability rather than its verifiability. That is to say, a theory which can more easily be refuted says more about the real world. These points are indeed quite plausible, but just as in Popper's justification for the pursuit of scientific research, we may say that such questions are likely never to be resolved in any ultimate way but they can profitably be discussed for purely esthetic reasons.

The present edition of the work consists of a translation of the 1934 edition together with many appendices containing additional material, changes of opinion, and detailed discussions of points in the text. Not the least interesting of these appendices is a letter written by Einstein clarifying the main points raised in the famous Einstein-Podolsky-Rosen paper. Popper does not dismiss these authors' objections to quantum theory but discusses the questions further in the light of his own axiomatic theory of probability.

It is difficult to either adequately appreciate, or adequately object to, any of Popper's more detailed arguments in so short a space. The book can, nevertheless, be strongly recommended to those researchers who are interested in the wider implications of their work as contributions to our knowledge of an external world. Although at times the book makes difficult reading because of the philosophic jargon, its many provocative points make the effort worthwhile.

**A Dictionary of Named Effects and Laws in Chemistry, Physics and Mathematics.** By D. W. G. Ballentyne and L. E. Q. Walker. 205 pp. The Macmillan Co., New York, 1959. $6.00. *Reviewed by L. Marton, National Bureau of Standards.*

UNTIL I had seen this volume, it never occurred to me that a dictionary of this kind would be of any use to anybody. Now I have changed my mind definitely, and I think that it is not only an amusing volume, in some respects, but also a very useful one. The word "amusing" needs, of course, some qualifications. It is amusing in the sense that it helps those who are somewhat historically minded to check up on some of their own history, although the jacket blurb points out carefully that historical detail has been trimmed down to an absolute minimum and most of it has been even omitted.

My first reaction in glancing over this volume was one of amazement—amazement about the number of named effects and laws. Somehow I hadn't realized there are so many. But when I started reading it, I realized that there are many more than listed here. In fact, just one after another I could supplement the listing with a number which I hadn't found. In many cases the omissions were not very serious. They were effects or laws which were covered, so to say, by some other listing. To give an example, while Debye temperatures are not mentioned explicitly anywhere, the Debye equation for heat capacity of a solid is treated on half a page and for those who are reasonably familiar with the literature it is easy enough to identify the Debye temperature with the characteristic temperature. There are other omissions which are less easily explained. To name a few, there are no mentions of Airy disk, Dewar flask, Eötvös balance, Einstein-de Haas effect, Fizeau's method, Galilean telescope, Geiger-Müller tube, Lagrange-Helmholtz law, Lorentz-Lorenz formula, Majorana force, Michelson interferometer, Mott scattering, Nicol prism, Pascal's law, Voltaic cell, or Wheatstone bridge. These are only a few which I picked out from a much longer list. The omissions may be explained on the basis of the reasonable length of the volume. In 205 pages, it is hard to compress all named laws and effects of three disciplines, to wit: chemistry, physics, and mathematics. This may point to a need for a similar volume designed for physics alone.

It is interesting to note that most of the omissions in my longer list are in the field of optics. This may be due to my own inclination or to a systematic omission in the volume itself. Nevertheless, if I may play Sherlock Holmes, I would venture the guess that the author responsible for the physical part of this volume is essentially a solid-state physicist. This at least would explain why some effects and the very recent laws of solid-state physics are more prominently displayed than some other effects.

On the whole, this is a very worthwhile volume which can be recommended to anybody who is interested in that kind of compilation.

**Physics of Meteor Flight in the Atmosphere.** By Ernst J. Öpik. 174 pp. Interscience Publishers, Inc., New York, 1958. Clothbound $3.85; paperbound $1.95. *Reviewed by S. F. Singer, University of Maryland.*

THE subject matter of this book has several unusual attractions. In the first place, it involves an extremely wide range of physical phenomena, embracing celestial mechanics, upper-atmosphere physics, aerodynamics, and atomic physics. The central problem to which the book addresses itself is nothing less than a complete quantitative account of the phenomena which accompany the flight of a meteor body through the ionosphere. The difficulties are formidable indeed.

How can one deduce the properties of meteor particles as well as the densities and temperatures of the upper atmosphere from observing little streaks of light in the night sky? The size, shape, mass, and even density of the meteor material are not known. Its velocity is ill defined, although celestial mechanics does set a lower limit of 11.2 km per second and an upper limit of 70 km per second if the particles are indeed members of the solar system. But these velocities are far beyond the range of present-day laboratory techniques. One can be sure that the meteor body (or meteoroid, as it is sometimes called) starts in solid form, although it is, as it turns out, very likely to be a fragile conglomeration of dust grains. But does it melt or does it evaporate as it enters the atmosphere? Is it rotating, or do the atmospheric atoms only hit one surface? There is no theory yet for the radiation efficiencies from the high-speed atoms which get detached from the meteoroid. There are not even good laboratory measurements for many of the atomic physics parameters on which the luminosity of a meteor trail finally depends.

Yet in spite of all these difficulties and in spite of the rather simple observations which can be made, the author has managed to construct a theory or rather a set of theories which is quantitative and allows one to calculate the drag, the heating, and the resulting fusion and evaporation of a meteorite, as well as the luminosities and ionization produced in the high atmosphere.

The first chapters describe in a concise way the prevailing views on the properties of the upper atmos-