BOOK REVIEWS

Development of the sciences. Second series. By Oystein Ore, Frank
  Schlesinger, Henry Margenau, John Arrend Timm, Chester Ray
  Longwell, Lorande Loss Woodruff, Walter Richard Miles, John
  Farquhar Fulton. New Haven, Yale University Press; London,
  Humphrey Milford and Oxford University Press, 1941. 10+336 pp.
  $3.00.

Keyed to the present interest in scientific advance, these chapters
form a short introduction to science, its methods and ideas, back-
ground and trends. The presentation is not technical but designed for
the general reader. The material was first offered during the winter
and spring of 1940 as a series of public lectures sponsored by the
Yale University chapter of Gamma Alpha. It comprises discussions
by eight well known Yale scientists, representing the fields of mathe-
matics, astronomy, chemistry, physics, geology, biology, psychol-
ogy, and medicine. Each of the first seven lectures traces the develop-
ment of one of the basic sciences from its beginnings to its most
recent results. The last lecture shows the interdependence of these
various sciences as illustrated by specific examples in the history of
medicine.

The preceding statements are quoted literally from the jacket of
the book under review. Since the book comprises less than three
hundred and fifty pages, it is obvious that the presentation is ex-
tremely concise. But the reviewer found that it makes interesting
and stimulating reading, and feels that the book cannot fail to convey
to the general reader an overwhelming impression of the power of the
human mind engaged in unselfish and purposeful endeavors. The
chapter on mathematics, written by O. Ore, comes up in every way
to the well known standards of depth of thought and clarity of pres-
entation of its author. This chapter should be very valuable to
graduate students of mathematics who, as a rule, have little help in
obtaining an integrated picture of mathematics from the historical
point of view. It is to be hoped that this chapter may be made avail-
able to this particular group of readers in some mathematical jour-
nal, possibly in somewhat extended form.

TIBOR RADÓ

The methodology of Pierre Duhem. By Armand Lowinger. New York,
  Columbia University Press, 1941. 184 pp. $2.25.

Pierre Duhem (1861–1916) was an outstanding French physicist
whose work was mainly concerned with thermodynamics, but he

was one of those scientists who not only walk on scientific paths but want to understand the history of discoveries and the different methods used in scientific proceedings.

The greater part of the present book is a well ordered report on the writings of Duhem on methods in theoretical physics. These investigations have two aspects. On the one hand, Duhem tries to describe objectively the actual methods; on the other hand, he cannot suppress his temperament and speaks, appreciatingly or blamingly, about the different methods and gives prescriptions about the aims and the proceedings. He belongs to that group of physicists of the latter half of the last century who could be called methodical ascetics. They asserted that the theoretical physicist has only the task to *describe* and order the physical phenomena but not to *explain* them. They tried to suppress the natural demand to find out *causes* for the phenomena, a demand which requires the connecting of the phenomena through intermediate tensions and phases which are not directly observed. A more detailed analysis would show that it is impossible to avoid in the description such intermediate, invisible, "theoretical" phases of the pair, cause and effect.

Another object of dislike for Duhem are the "models" in physics, for instance the electrical models of the English school of physicists. He admits that the models sometimes suggest valuable ways of progress but he does not like them. They are not abstract enough, too near to the tempting but forbidden field of "explanation." He would, probably, have been astonished to see the progress of modern molecular physics made with the help of the atom model. From the logical point of view there is no precise distinction between representation through mathematical symbols and through models.

Duhem is somewhat subjective in his views and indulges in dangerous generalizations and summaries in describing the different kinds of minds. There is the broad but feeble mind (mainly English) which uses models, and the narrow but strong mind using the method of abstract reasoning (French and German). Later, after the first world war had started, he discovers also some characteristics of the "German mind." It is "geometric"; it treats all things by the axiomatic method and gives birth to theories which deny obvious truth, for instance, the various non-Euclidian geometries. This assertion is a good example of the innate tendency of the human understanding to order and simplify the wealth of phenomena, outside physics as well as in it, and of the manner in which prejudice, antipathy, and sympathy help to achieve this order.

The last chapter gives critical remarks and conclusions of the

author. Some of the remarks are given above. I do not quite share his opinion that the "methodologist" has only to describe the methods used by the physicists or the scientists in general. Even a non-expert may see sometimes, by general considerations, ways which the researchman should go. Plato and Aristotle were no mathematicians, Bacon no physicist in a proper sense, but, undoubtedly, they furthered the development of mathematics and physics. That Aristotle was an impediment to the development of physics was the fault of "experts" who adhered in a slavish way to his physical theories. The outsider *sometimes* sees more of the general landscape of science, where the scientific workers go the toilsome ways which lead to discoveries.

In his conclusions the author presents certain "indefeasible facts" of the scientific situation, for instance that in modern physics metaphysical explanatory theories are excluded. His last "conclusion" is somewhat metaphysical and not easily accepted, namely that science approaches "asymptotically" a perfectly adequate account of reality. And it is given as an "indefeasible fact of the human situation—that the Human Spirit is one and that the different activities in which it expresses itself must in the end arrive at the same conclusion." It is difficult for me to imagine common conclusions which will be reached "asymptotically" by the Human Spirit in its metaphysical, social and scientific activities.

Only one little critical remark: the mathematical reader will be astonished to find on page 94, quoted from Poincaré, an erroneous description of the method of mathematical induction.

<div align="right">M. DEHN</div>

Transients in linear systems, studied by the Laplace transform. Vol. I. By M. F. Gardner and J. L. Barnes, New York, Wiley; London, Chapman and Hall, 1942. 9+389 pp. $5.00.

This book is remarkable in that it is perhaps the first serious attempt to present the theory of the Laplace transform to the mathematics or engineering student at an early stage of his studies. For the complete understanding of this transform it is necessary to have mastered the theory of functions of a complex variable. This fact has hitherto barred many a student from the use of a valuable analytic tool until rather late in his mathematical career. The present work shows conclusively that this delay is unnecessary.

The authors are able to place the fundamental idea of the method before the reader even in the first chapter. The essence of the matter consists in replacing by the Laplace transform one function space