**Milieux conducteurs ou polarisables en Mouvement.** By Henri Arzeliès. 347 pp. Gauthier-Villars, Paris, 1959. Paperbound 58 NF. *Reviewed by Nicholas Chako, Queens College.*

WRITTEN with the collaboration of J. Henry and dedicated to the memory of Hermann Minkowski, this is the third in a series which the author is preparing under the general title "Etudes relativistes". Unlike its predecessors, the present work is primarily concerned with the representation of electromagnetic fields in moving media, such as conductors, dielectrics, and magnetic materials. The subject matter centers around the equations of Maxwell, although a fair share of the text is devoted to electrostatics and magnetostatics, fields in stationary and moving conductors, dielectrics, and magnetic bodies.

Beginning with a discussion of isotropic media at rest in a proper frame of reference, the author proceeds to derive expressions for the field quantities (**E**,**D**,**H**,**B**) and Maxwell equations for such systems. This is followed by a detailed treatment of the fields and currents when such systems are in uniform motion, including conductors, dielectrics, and paramagnetic bodies in uniform motion in a vacuum. In addition, one finds a good discussion of famous experiments by Rowland, Roentgen and Eichewald, Wilson, and others, which are relevant to theory.

In the second part the analysis is extended to systems under any form of motion (accelerated). In treating such systems the author uses freely the methods of tensor analysis. By introducing the so-called *spatial tensor* which is in general not the spatial part of the metric tensor $g_{ik}$ (except in situations where time and space are orthogonal), the author expresses the quadrivector of charge and current densities in terms of $\gamma_{ik}$. The Maxwellian equations are written in terms of $\gamma_{ik}$, instead of the usual formulation with the aid of $g_{ik}$. Except for the special case where $\gamma_{ik}$ corresponds to the spatial part of $g_{ik}$, the displacement field quantity **D** depends both on the field **E** and the magnetic induction **B**, and similarly **B** depends both on **H** and **D**. Thus, there is a difference when the equations of the field are expressed in a proper coordinate system and when referred to any coordinate system, since the relations between the field quantities are different for the two systems. Finally the three-dimensional vectorial form of the equations is obtained for both static and nonstatic fields in a general coordinate system and for the case where time and space coordinates are separable. The author has also included a short chapter on the representation of the fields in material media which is referred to a general coordinate system and also to a rotating frame of reference. The last two chapters contain a detailed analysis of the fields due to uniform rotation of spherical and cylindrical permanent magnets.

In the several appendices several mathematical topics have been included to facilitate the reading of the text, among which is one on anisotropic media. Contrary

to French custom the author has included an author's index.

The material presented here is usually neglected or only briefly touched upon in modern books on electrodynamics (classical). For this reason it is a valuable contribution to the literature of this particular field of physics. Other good features are the historical and biographical notes appended to each chapter or principal section. The notes and short commentaries make interesting reading both as observations of the historical development and as brief critiques by the author.

In view of the numerous citations and a rather extensive bibliography, the reviewer is somewhat puzzled by the author's omission of some important works appropriate to this volume. For example, the important contributions by Dr. Kottler from 1911 to 1922, the comprehensive treatise by Weinstein *Die Physik der bewegten Materie und die Relativitätstheorie* (Leipzig, 1913) in which the subject matter of many chapters of the book under review is treated in great detail, and Schott's classic *Electromagnetic Radiation* (Cambridge, 1912).

**Electrical Noise.** By William R. Bennett. 280 pp. McGraw-Hill Book Co., Inc., New York, 1960. $10.00. *Reviewed by George Weiss, Institute for Fluid Dynamics and Applied Mathematics, University of Maryland.*

SEVERAL books have been devoted to particular aspects of noise theory and to specific applications of the theory. None of them claim as broad a coverage of the physical concepts as this particular exposition.

Bennett writes for the engineer, which implies that the theoretical development is subordinated to a more physical discussion. In the present case, thanks to Bennett's pleasant style and his acquaintance with the material, the result is an account of noise phenomena which is a valuable one even to those whose inclinations are more on the theoretical side.

The book opens with a discussion of thermal noise which follows the spirit of Nyquist's treatment. It then describes in some detail the various types of noise in vacuum tubes and semiconductors, with special emphasis put on the order of magnitude of the quantities which are involved. To bring the subject up to date, there is a chapter on noise in electromagnetic radiation with particular application to the maser. Bennett next devotes several chapters to the relation of noise to hardware, discussing noise measurement and the design of low-noise equipment. After a chapter on the theory of the usual parameters, such as spectral density and autocorrelation function, which are used to characterize noise, there is a final one on noise in communication systems and the various coding schemes which are used to minimize noise effects.

On the whole, the book is a clear introduction to the subject and will be welcomed by those who are interested in noise phenomena.

**Introduction to Solids.** By Leonid Azároff. 460 pp. McGraw-Hill Book Co., Inc., New York, 1960. $9.50. *Reviewed by Henry Wise, Stanford Research Institute.*

IN recent years several authors have written textbooks on the subject of the properties of solids. The contents have varied from crystal structure and physical metallurgy to quantum theory and dielectric behavior. However, the student desiring an elementary acquaintance with the science of the solid state was left to choose between a textbook emphasizing theoretical aspects and one dealing with applied developments. To some extent, the book written by Azároff fills this void. By means of a descriptive approach, the properties of inorganic crystalline solids are described in a lucid and interesting manner, supported by imaginative illustrations. More than half of the book is devoted to crystal structure, crystal imperfections, and mechanical properties of solids. Subsequently, with a minimum of mathematical complexity, the principles of quantum mechanics are considered with special application to metals, semiconductors, and insulators. The author carefully states the assumptions made in the theoretical derivations; occasionally qualitative arguments are employed to give the reader an understanding of some of the more complex properties of the solid.

Obviously this text is not designed for the specialist in solid-state physics. Rather it is a well-balanced account of the more important facets of this branch of science which has made such rapid progress in the past few years. As a result it will prove a valuable reference to the students of related scientific disciplines. A set of references and exercises form useful additions to this introductory textbook on the properties of the solid state.

**Growth of Crystals, Vol. 2.** Edited by A. V. Shubnikov and N. N. Sheftal'. Transl. from Russian. 178 pp. (Chapman & Hall, London) Consultants Bureau, Inc., New York, 1959. $16.00. *Reviewed by Allan Carlson, Clevite Corporation.*

AN English translation of 25 papers originally published in Moscow by the Academy of Sciences Press, in 1959, has now been made available. The editors state that this collection contains interim contributions to the subject which have been made in the period following the Soviet conference on Crystal Growth in 1956. The proceedings of this conference appeared as *Growth of Crystals, Vol. 1*, in 1957 and 1958. Volume 2 is thinner, both in pages and scientific value. The subject matter is diversified, but emphasis is on synthesis of specific crystals. Theoretical analyses tend to be either primitive or wasted on trivialities. While the field seems new to many of the authors, they are redeemed by the gratifyingly detailed descriptions of their experimental methods and observations. With regard to the growth of semiconducting, dielectric, and optical crystals, Western readers will find little that is