but readable manner. One of the outstanding features is an excellent summary of the linear flux–force relations for all types of forces (scalar, vector and tensorial in character) with a good discussion of the application of Curie's law to reactive multicomponent fluid systems. The general equations are then simplified for various special systems and applications. This discussion is also carried out in a formal manner, again being directed toward those readers familiar with hydrodynamics.

One of the unique and interesting features of this article is a discussion of the role of internal variables (which are usually used to describe molecular relaxation processes) in the irreversible thermodynamics and the frequency dependence of the thermodynamic variables in a medium with sonic and ultrasonic waves. There is also a section devoted to the relativistic theory. The article not only develops the thermodynamic principles but also includes a discussion of the statistical and molecular basis of these laws. Most of the emphasis is placed on the development of the Onsager–Casimer reciprocal relations.

The last article, Probability and Stochastic Processes, by Alladi Ramakrishnan, is a presentation of some of the results of the mathematical theory of stochastic processes in a physical language without the use of measure–theory concepts. The author uses Bartlett's recent book ("Stochastic Processes," by M. S. Bartlett, Cambridge University Press, Cambridge, 1955) as a guide and refers to this chapter as a sequel to Professor Bartlett's book.

The parts of probability theory basic to the subject of stochastic processes are covered in a conventional and adequate manner. The treatment of the principles of stochastic theory, however, is too often in the form of an inadequate summary. Many topics are mentioned as a passing reference, giving the reader only the vaguest impression. Most of the discussion is directed toward stochastic problems in astrophysics. The sections relating the theory to statistical mechanics and quantum mechanics will seem almost trivial to readers acquainted with these fields. In line with this, the treatment of Markov processes is outstanding and worth reading, while the subject of power spectra and correlation functions is given a very superficial treatment. The article does contain brief outlines of many applications of the theory, but the chemist will be disappointed to find no mention of recent applications to the theory of chemical kinetics.

In summarizing this third volume of the encyclopedia, one can say that it will be a valuable reference in the field of statistical mechanics and a good source of material on the irreversible thermodynamics of fluids. One could also use it as a reference for elementary statistical thermodynamics and as an introduction to the theory of stochastic processes, but it is not outstanding in these subjects.

DEPARTMENT OF CHEMISTRY
THE RICE UNIVERSITY
HOUSTON, TEXAS
ZEVI W. SALSBURG

Instability Constants of Complex Compounds. By K. B. YATSIMIRSKII and V. P. VASIL'EV. Translated from the Russian by D. A. Paterson. Translation Editor: R. H. Prince, Ph.D., University Demonstrator in Chemistry, University of Cambridge. Pergamon Press Ltd., 4 and 5 Fitzroy Square, London, W. 1, England. 1960. viii + 218 pp. 14.5 × 22 cm. Price 42s. net.

During the past two decades the emphasis in studies on metal complexes has changed from the earlier preparative and qualitative approach toward more quantitative physicochemical measurements. This has been particularly true with regard to the collection of thermodynamic data on the solution chemistry of these systems. In recent years thousands of papers have been published on many different methods of determining the stabilities of metal complexes in solution and the application of these to the determination of numerous stability constants. More recently current chemical bonding theories for such species have been applied in an attempt to explain the observed trends in their stabilities.

The authors of this book are to be congratulated for having done a good job of bringing together in a condensed form much of the information on the stabilities of metal complexes. This includes tables which give the instability constants of 1,381 complex compounds, from data published up to 1954, and in some cases up to 1955–1956. There are 99 tables listed according to ligands, 24 of which are inorganic ligands and the remainder are organic. No attempt is made to report all of the available data on a given system, instead the authors choose the literature values that appear to them to be most reliable. For example the system Cu^{2+}–NH_3 has perhaps been investigated by more different investigators and by more different methods than any other, yet only the results of Professor J. Bjerrum are given along with two other supplementary references.

One other feature of the book that is very good, particularly for the uninitiated, is the summary of the experimental approaches, methods of calculation and theoretical discussions. In most cases the experimental methods and the mathematical treatment of the data collected are given in sufficient detail to be directly useful. Specific references are always provided where more information is required. The chapter on the factors determining the stability of complex compounds in solution is especially good. It makes good use of the current chemical bonding theories for these systems.

This book can certainly be recommended to research workers who wish thermodynamic data and a better understanding of the solution chemistry of metal ions. However, one must call attention to the much more complete literature coverage that is given by the volumes "Stability Constants," compiled by J. Bjerrum, G. Schwarzenbach and L. G. Sillén under the auspices of IUPAC and published by the Chemical Society of London.

DEPARTMENT OF CHEMISTRY
NORTHWESTERN UNIVERSITY
EVANSTON, ILLINOIS
F. BASOLO

Progress in Semiconductors. Vol. 4. ALAN F. GIBSON, B.Sc., Ph.D., General Editor, Prof. R. E. BURGESS, Vancouver, B.C., American Editor, and Dr. F. A. KRÖGER, Salfords, European Editor. John Wiley and Sons, Inc., 440 Fourth Avenue, New York 16, N.Y. 1960. vii + 291 pp. 16 × 23.5 cm. Price $10.50.

This volume is the fourth in an annual series covering areas of current interest in the semiconductor field. The editor continues the previous format. Since the field is large and growing rapidly, only a very limited number of the multitude of possible topics are covered.

Volume 4 contains eight well-written papers by authors from the United States, Germany, Japan, the Soviet Union, Great Britain and Holland. The subjects are generally concerned with physics, although "Oxidation Phenomena on Germanium Surfaces" is certainly chemistry.

The first paper, "Negative Effective Masses in Semiconductors" by H. Krömer, describes the physical origin of effective mass and the general conditions under which it may be negative. Germanium is treated in considerable detail. A possible practical way to apply negative mass to achieve amplification is discussed.

"Oxidation Phenomena on Germanium Surfaces" by M. Green presents an excellent review of techniques for obtaining "clean" surfaces and the effects of oxidation and surface treatments on properties like surface conductance, work function, and surface recombination velocity.

"Theory of Avalanche Multiplication in Non-polar Semiconductors" by J. Yamashita contains extensive and complex mathematical treatments of hot electrons and electron multiplication. Avalanche breakdown on p–n junctions is depicted in terms of McKay's simplified model, and the limitations of this model are portrayed. Impact ionization and the effects of magnetic fields and crystal orientation on breakdown also are treated.

Various possible mechanisms of "Internal Field Emission" are treated by A. G. Chynoweth. The concept of quantum mechanical tunneling of carriers, which has recently led to a new family of practical solid state devices with promising futures, is treated.

D. Sautter discusses the various sources of "Noise in Semiconductors," describing experimental results and physical mechanisms. Generation–recombination noise is treated most extensively.

In "Effects of Dislocations in Semiconductors," W. Bardsley describes the types of dislocations generated in the diamond structure during growth or by bending, twisting, compression and indentation, and tensile deformation.