analysis and presentation of the basic atomic theory of general aspects of gas radiance, excitation, and depopulating processes, covering both theory and experiment, is exceptionally lucid, up to date, and, in fact, superb. It adds practical value and usefulness to the subject content of both volumes under review.

Chapter 4, "Electrical arcs and thermal plasmas," by W. Finkelnburg and H. Maecker, in German, constitutes the *pièce de résistance* of this volume. It alone makes the purchase of this book imperative for the modern worker in gaseous electronics. In 1950, before publication of volume XXII, I asked Finkelnburg to write a chapter on arcs for a contemplated and still only partially completed book on the electric breakdown of gases. He replied that he felt not enough was known about arcs for him to write such a chapter. After joining the group at the Sieman's Laboratory in Erlangen, Finkelnburg and Maecker, with their able coworkers, cracked the mystifying cipher of the electric arc behavior. As a result of their modern and versatile experimental techniques and modern and sound, but often laborious, theoretical physical analyses, they are able to present, in this chapter, the most advanced and complete description yet given of that group of phenomena classified as arcs—a description which is physically sound and satisfying. Thanks to their activities, these phenomena are now perhaps the best understood of all the breakdown forms. Much work yet remains to be done, but with my past experience, I stand in awe of this achievement. For all those venturing into high temperature plasma work, a careful study of this chapter is imperative.

Chapter 5, "Electrical breakdown of gases with steady or direct current impulse potentials," by Loeb, starts with basic definitions of electric breakdown and spark breakdown in terms of current potential relations. Next, the temporal growth of the Townsend discharge is developed. This leads to the threshold equation and its implications. Then follows a treatment of statistical fluctuations in terms of theory and experiment, which leads to concepts of time lags. Breakdown in nonuniform fields at highly stressed anodes is discussed in terms of photoionization in gases, leading to the Geiger counter pulse and the streamer mechanism. Spark breakdown, through streamers, is related to the Townsend thresholds through time-lag studies of Fisher and Bandel. This is followed by an analysis of steady breakdown to Townsend discharge in coaxial cylindrical and point-to-plane gaps for various gas types, both from highly stressed anodes and cathodes.

Chapter 6, by Sanborn C. Brown, in English, deals with the breakdown in gases in alternating and high-frequency fields. In his characteristic clear and concise style, this leading experimental investigator develops the basic concepts in an admirable fashion. The more esoteric theory based on the Boltzmann transport equation is then developed, and about it as a framework is developed the theory upon which interpretation and computed comparison with experiment is made. The work of the author's school is effectively collected and summarized in terms of solutions for various container forms with superimposed direct-current and magnetic fields. Further discussion covers electron attachment, controlled breakdown, and mobility controlled breakdown and introduces the amplitude oscillation limit concepts. The secondary electron resonance controlled breakdown is also treated. A notable omission is the lack of any discussion of the alternating-current breakdown for the low-frequency cases with external electrodes or internal electrodes, at frequencies much below 10^5 cycles—a field of current interest which merits the critical techniques and analyses of this excellent group of investigators.

Chapter 7, "The lightning discharge," by B. F. J. Schonland, in English, is a remarkably fine summary of this complicated phenomenon by the world's leading expert. It is beautifully written and (unlike his more popular booklet, *Flight of the Thunderbolts*) is a highly valuable, scientific, professional treatise on methods, results, and interpretation (as of 1956), and encompasses all important contributions, including his own.

In summarizing the contents of this volume, I can only say that the appearance of volume XXII has rendered unnecessary the completion of my own half-written volume on electric breakdown of gases and represents an essential addition to the library of all workers in the field.

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Solid State Physics. Advances in research and application. vol. III. Frederick Seitz and David Turnbull, Eds. Academic Press, New York, 1956. 588 pp. Illus. $12.

This latest volume of comprehensive survey articles on various aspects of solid-state physics contains six articles. The first, by Welker and Weiss, is an almost encyclopedic account of present knowledge about III–V compounds. Extensive references are given to methods of preparation and to physical properties. The main body of the article discusses the electric, magnetic, and optical properties of both pure and doped materials.

The second article, by Eshelby, discusses the continuum theory of lattice defects. This theory is applicable to the study of the deformation and energy changes associated with the presence of defects. The formal theory is given in some detail, and applications to point defects and dislocations are discussed.

The third article, by Guttman, is on order-disorder phenomena in metal alloys. After a short but useful introduction to the subject, the author discusses the various types of short- and long-range order and their description. There are sections on thermodynamic and statistical treatments of the problem and on the kinetics of order-disorder transformations. Many references are given.

The primary purpose of David Turnbull's article on phase changes is to discuss the problem of the formation of one phase of a given substance in another phase of the same substance. The article gives ample references to the field and includes a review of the thermodynamics of phase changes, a discussion of phase stability, and the theory for phase-change kinetics. Nucleation and precipitation are discussed in detail.

In the article on imperfections in crystalline solids, Kroger and Vink consider vacant lattice sites, interstitial atoms, misplaced lattice atoms, foreign atoms, and electrons and holes. The main purpose of the article is to discuss the interdependence among the concentrations of the various types of imperfections, but, in so doing, it covers nearly the entire field of imperfection studies. More than 400 references are given.

The final paper, by Kittel and Galt, is on ferromagnetic domain theory. This is an excellent review of domain theory and its application to the understanding of the behavior of ferromagnetic materials. Many useful references are given.

The diverse subject matter of the review articles in this volume is probably unavoidable. With the present increase in specialization, the survey volume is becoming indispensable, and it is pleasing to see that the high standards for clarity of the first two volumes in this series are being maintained.

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The Encyclopedia of Chemistry. George L. Clark, Ed. Reinhold, New York; Chapman & Hall, London, 1957. 1037 pp. Illus. $19.50.

This encyclopedia provides a thorough and timely coverage of at least 1000 chemical and physical terms, selected mainly, though not exclusively, on the basis of their importance to industrial chemistry. In addition, the work con-