for liquids and gases. It consists of nine chapters: an introductory chapter, and sections on Critical Properties. PVT Relationships, Vapor Pressures and Latent Heats, Heats and Free Energies of Formation, Viscosity, Thermal Conductivities, Diffusion Coefficients, and Vapor–Liquid Equilibria.

The authors have been thorough in searching the literature and diligent in comparing the methods with experiment The sole test of all the methods is the pragmatic one of ability to predict or correlate data. It appears to the writer that the authors have been remarkably successful in avoiding personal prejudices. Where relatively esoteric theories such as the Hirschfelder version of the Chapman–Enskog theory give reasonably quantitative results the authors have not hesitated to bring in the results of these theories in usable form, but with no theoretical background. (This is probably sound in a book addressed to the practicing engineer, as it is most difficult to develop a theory accurately and correctly in a few pages.) On the other hand, the authors have not hesitated to introduce purely empirical methods where they seem to apply.

The index seems reasonably complete. Rather than a Table of Contents, the authors have inserted a list of Recommended Methods for Estimating or Correlating Properties, with appropriate page references. This seems to be a useful idea.

The writer would like to quibble with one point in the introduction. The authors imply that the theory of liquids is at present in quite good shape compared to the modern theory of solids. There are few people who would agree to this. There are probably sufficient other reasons for omitting a discussion of solids.

The book can be recommended to practicing chemical engineers and industrial chemists, as well as to students in design courses.

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Proceedings of the Symposium on the Role of Solid State Phenomena in Electric Circuits. New York, N. Y. April 23, 24, 25, 1957. Volume VII. Sponsored by Polytechnic Institute of Brooklyn, Microwave Research Institute. Edited by JEROME FOX. With the assistance of MARTHA CROWELL. Interscience Publishers, Inc., 250 Fifth Avenue, New York 1, N. Y. 1957. xvi + 339 pp. 15.5 × 23 cm. Price, $5.00.

The book contains twenty-five contributions and a short round table discussion. The symposium being international, offered twenty papers representing American laboratories, three English, one Canadian, one German and no others. The various papers are naturally of widely different scope and depth. Some seem limited by company policy, but on the whole they give an interesting expert birds-eye view of the beginning of a new avalanche of developments in solid state electrical engineering. Certainly not all areas that one might expect are discussed, no thermo electric effects, for example, and hardly any photo-magneto-electric devices. The main emphasis is on amplification, switching, and modulation.

A principal theme, expressly stated in the first paper, but underlying many others, is that the production of one new semi-conducting material with unusual properties "can do more to revolutionize the performance of an electric circuit than can all the classic ingenuity of circuit design." Inasmuch as the guide lines for creating materials with specified properties are still very scant, a veritable gold rush is on, in which the theoretical surveyors can barely keep up with the new claims staked from day to day. The book gives a living picture of this situation. By its very nature it is in the first place of interest to those concerned more or less directly with one of the branches which it covers, but also the reader with a general background in electrical circuitry or in solid state physics can read many of its papers with profit to keep up qualitatively with new developments. The manner of presentation of most of the papers is very non-mathematical.

In the second paper E. W. Herold endeavors to outline "future circuit aspects of solid state phenomena," based on superconductivity, molecular amplifiers, magnetic effects in semiconductors, and the general use of controlled inhomogeneity. As a matter of fact, all these principles are being used or explored at present so that their future use is certain. However, the clear manner in which these are presented systematically is commendable and instructive.

In a short paper P. P. Ewald shows how, historically, our knowledge of solids has grown, and how the present development is rooted mainly in two ideas: the perfect crystal. and the role of imperfections and their interactions with external agents. The tone of the paper cautions against overconfidence in present "patchwork theory" and predicts many as yet undiscovered "bugs."

R. C. Fletcher summarizes recent progress in the fields of semiconductors and of magnetism. It is a very concise account of the interrelations between many branch studies in these two fields.

The "versitron," presented by M. W. P. Strandberg, is a new variety of maser, based on spin reversal of a gadolinium salt or similar material, whose low noise the author-inventor calls fabulous.

J. O. Artman discusses the general principles of maser amplifiers with special emphasis to the microwave region. His mathematical analysis of gain, band width, noise, and power limitations gives a clear and concise description of the factors governing this new class of devices.

W. P. Mason describes how ferroelectric single crystals can be used for similar applications as those where ferromagnetics are used, in particular for information storage and amplifiers.

T. S. Moss from England surveys In Sb devices. They are essentially based on the high mobility, low effective mass and small energy gap of this material, and lead to three types of applications, based on magneto resistance, Hall effect and photo effects. An interesting variety of some twenty devices is sketched.

H. F. Mark presents a brief report on the conduction properties of some organic plastics.

G. Fischer and W. B. Pearson from Canada attempt to relate the occurrence of semi-conduction in solid compounds to the bond properties between the atoms, by a set of semi-empirical rules.

H. Kroemer discusses the theory of graded inhomogeneities in semi-conductors, which produce effects similar to, but in some instances more favorable than, those obtained by applying electric or magnetic fields.

Three papers on transistors follow. W. W. Gaertner discusses mathematically the possibilities which depletion layer transistors have in microwave amplification. E. L. Steele and B. R. Gossick discuss frequency limitations. G. C. Sziklai and L. R. Hill report on what seems a promising beginning of the construction of tetrode transistors as commutators.

Two papers on superconductivity are due to I. M. Templeton from England and to H. O. McMahon. Both misspell the name of the inventor of superconductivity and neither mentions the Bardeen Cooper theory. This field clearly stands in its infancy and awaits the discovery of new materials with higher transition points. Meanwhile reversing switches, and d.c. transformers as well as other special devices are being developed.

A. Papoulis and T. C. Chen thoroughly develop the theory of the time dependence of the magnetization M when a stepfunction ΔH is applied, on the basis of domain wall motion, and its application to fast core switching.

D. L. Fresh reports on the development of some new ferrites. E. Stern and P. S. Pershan follow with theory and experimental confirmation of second harmonic generation and mixing in certain microwave ferrites, due to the non-linearity of the equation of precession.

J. J. Dropkin sets the stage for subsequent papers on photoconductivity by reviewing the principles of its mechanism in phosphors and barriers. A number of possible applications are next discussed by R. E. Halsted, using a photon stage for coupling two electrical circuits, for example. The wealth of possibilities in this area is expanding exponentially. A. Bramley and T. E. Rosenthal discuss photoconductive switches, especially multiple switches, their merits and limitations. This type of application seems very promising. A. A. Gibson and T. W. Granville from England describe a fast modulator for microwave and infrared radiation, named "transparitor" because it becomes transparent when an r.f. field is applied in right geometrical relation to the microwaves. Its time constant is of the order of 10^{-12} sec. I. Broser

from Germany relates a nice story of CdS and ZnS single crystals. The hydrogen-like emission lines, together with evidence from the spectra of absorption, photo conductivity and quenching, prove a new point: the existence of a series of non-conducting excited activator states, involved in the process of excitation as well as in quenching. As a result the quenched luminescence as well as the photo conductivity can be shown to depend only on the ratio of the intensities of the exciting and quenching illumination. This property has been used cleverly for the construction of an optical pyrometer, since the intensity at two given wave lengths depends on the color temperature only. Other applications also are described.

Finally, H. Kallman and J. Rennert discuss persistent internal polarization in photo conductors when electric fields are applied. Radiation causes depolarization. The principle seems to be related to electrets, though the authors do not mention this. Neither do they mention quantum efficiencies for depolarization. However, application possibilities in electrophotography, memory devices, and infrared detection are described.

A brief round table discussion about transistor frequency limitations, switching speeds and single *versus* poly crystals terminates the book.

To summarize, the book is a vivid report of a lively conference of a most alive subject. It will be interesting to compare, say ten years from today, what has become of the predicted possibilities.

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British Medical Bulletin. Vol. 14, Number 2. **Causation of Cancer.** E. BOYLAND, Scientific Editor. Medical Department, The British Council, 65 Davies Street, London, W. 1, England. May 1958. pp. 73–196. 22 × 28.5 cm. Price $4.00.

This series of essays by a most distinguished group of British investigators on the numerous causes of cancer was timed so as to precede the Seventh International Cancer Congress which took place in London on July 6 to 12, 1958. During its preparation the dean of investigators in this subject, Sir Ernest Kennaway, passed away in his 77th year, and so the volume became a memorial to him as well. A felicitous tribute to Kennaway by Alexander Haddow properly forms the introduction to the symposium, and the reader is once more reminded of the immeasurable debt which the field of cancer research owes to this versatile and indefatigable investigator.

There are 21 separate contributions to the volume, ranging over the entire field of carcinogenesis, and including discussions on the role of exogenous and endogenous factors, viruses, radiation, immunity and occupational hazards, as well as on the development of cancer in such specific organ sites as the liver and the lung. The opening review by Haddow on Chemical Carcinogens and their Modes of Action is a masterly summation of this classic area of research, and with its emphasis more on experiment than on speculation sets the tone for the brilliant articles which follow.

The number of chemical agents which produce cancer in the experimental animal is almost astronomical. The two most important questions which arise from this phenomenon, namely, what factors these agents possess in common, and what relation they bear to cancer in man, remain largely unanswered. The discovery of new carcinogenic agents (including those presumed to be implicated in the pleasurable social vices) only adds more details to a tapestry already almost undecipherable. A rational generalization to explain the carcinogenic process, on the one hand, and a rational prophylaxis to avoid cancer, on the other, are apparently not easily attainable. The lucid articles in the present volume are part of the good fight to reach these goals.

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Mass Spectroscopy. By HENRY E. DUCKWORTH, Professor of Physics at Hamilton College, McMaster University, Ontario. Cambridge University Press, 32 East 57th Street, New York 22, N. Y. 1958. xvi + 206 pp. 14 × 22 cm. Price, $6.50.

Considerable skill and judgment are required to write concisely and give adequate coverage to a field which has many applications. Authors writing on a broad research area to which they themselves have contributed frequently give undue emphasis to those aspects with which they are especially acquainted. In this monograph, Professor Duckworth has done a remarkable job of organizing the material and maintaining a balance between the various topics covered.

After a brief historical survey, the fundamentals of mass spectroscopy are covered in five chapters. Major topics are: positive ion optics, sources of positive ions, detection of positive ions, deflection-type instruments and time-of-flight mass spectrometers. The remaining five chapters of the book are devoted to applications of mass spectroscopes to the fields of: determination of isotopic abundances, determination of atomic masses, applications to nuclear physics research, ionization and dissociation of molecules under electric impact, and applications to geology.

The monograph is an excellent starting point for one interested in learning about the fundamentals of mass spectroscopy and many of its more important applications. Some chemists interested in applying mass spectroscopy to their fields may be disappointed in the brevity of treatment of points of particular concern to them. Those studying chemical reactions or molecular structure problems will probably regard the eighteen pages devoted to ionization and dissociation of molecules as inadequate. Also, no attempt is made to cover engineering-type problems such as vacuum or electronic considerations which enter into designing or operating mass spectrometers.

A monograph of 206 pages obviously cannot cover all topics to the depth that some may wish. What is lacking in volume is compensated for by the clarity of explanation and the excellent bibliography of some 650 references. A table of isotopic abundances and masses is appended. There appear to be relatively few errors. In the isotope table and also in the text (p. 158) the abundance of K^{40} is given as 0.162% instead of 0.0119%. A typographical error exists in the very last entry of the isotope table—U^{236} instead of U^{238} is given as the most abundant isotope of uranium.

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