

reading material rather than sources for the author who developed his book in an original manner (little or no copying from other books!). The historical development of quantum theory is not considered. For example, Born's originating of the statistical interpretation is not mentioned. Typography is good, except for the unusually heavy brackets!

The book contains a number of instructive and challenging problems. Any student willing to work through the book will be richly rewarded as will be the teachers who will use this book as a text for a course in advanced quantum mechanics.

Electrical Breakdown of Insulating Liquids. By J. A. Kok. 132 pp. (Philips Technical Library, Eindhoven) Interscience Publishers, Inc., New York, 1961. \$6.00. *Reviewed by H. A. Liebhaufsky, General Electric Research Laboratory.*

ELECTRIC strengths measured for liquid hydrocarbons under the best laboratory conditions are at least ten times as great as the fields these dielectrics can be relied upon to sustain as insulation in electrical equipment. This great difference has inspired much research: pure research to establish the *intrinsic* electric strength and its relation to molecular structure, and applied research to discover how and why breakdown under practical conditions occurs at such low fields.

The pure research has recently taken an unexpected turn. It seems that hydrocarbon liquids can be prepared so free of impurities that breakdown occurs via a bubble of vapor that forms owing to field emission at an asperity on the cathode—even on cathodes prepared with the greatest of care. Consequently, as the vapor (except near the critical point) is of lower electric strength than the liquid, the intrinsic strength of the liquid must elude measurement because of imperfections on the cathode. The pure research therefore encounters a limitation similar in character to that long known under practical conditions.

This situation increases the importance of the kind of work described in the book under review. The main thesis of the book is that breakdown occurs under practical conditions because nonuniform fields compel impurity "particles" of high dielectric constant to migrate toward the region of highest field, where they form a bridge along which breakdown is likely.

Within the limits set by this thesis, the author has collected and collated important information. He has performed a valuable service in emphasizing that phenomena (notably migration and coagulation) well known in colloid chemistry and related fields may sometimes be involved in breakdown. But is not the formation of bridges under actual conditions generally too complex for useful mathematical treatment? Also, the reviewer finds it difficult to believe (see p. 49 and elsewhere) that "particles" 16 Å in diameter, aggregated as bridges, are responsible for breakdown in highly purified liquid hydrocarbons.

Partly because English is clearly not the author's

native language, the book demands unusual patience and alertness from a reader not expert in the field.

Absorption Spectroscopy. By Robert P. Bauman. 611 pp. John Wiley & Sons, Inc., New York, 1962. \$12.00. *Reviewed by Robert H. Asendorf, Hughes Research Laboratories.*

THIS excellent book provides a comprehensive introduction to theory and practice in absorption spectroscopy. The first four chapters cover spectrometer components, design and performance, and sample preparation. One of the more unusual features of the book is a review of more than seventeen commercial instruments (including drawings of their optical systems), intended, as the author states, "not as a critical evaluation of any one instrument . . . but to illustrate important variations in design, historical trends, and something of the scope of the instrumentation now commercially available". Even two Russian machines are mentioned, although only briefly and in passing.

Beginning with Chapter 5, a lucid review is offered of those aspects of classical and quantum mechanics which are appropriate to spectroscopy. Chapter 6 deals with such topics as bonding and antibonding orbitals, the Franck-Condon principle, etc., and the following chapter takes up molecular vibrations and rotations (valence and band strengths, selection rules, Raman effect, rotational vibration band, etc.). In Chapter 8, Qualitative Analysis, the application of ultraviolet, visible, infrared, and Raman spectroscopy to the identification of chemical compounds is considered. Chromophores, auxochromes, bond stretching and bending vibrations are among the topics discussed here. This chapter is a storehouse of information: wave-number tables, pictures of spectra, charts, etc. Of special interest is the inclusion of a guide to various bibliographies and indices of spectra. Chapter 9, Quantitative Analysis, tells how to deal with both ideal and non-ideal systems having either one or many components. Least squares and matrix methods are used. The last chapter is slanted toward the reader with a theoretical inclination. This chapter contains a good review of the fundamentals of group theory; stereographic projections are given for 28 of the 32 crystallographic point groups; character tables are given in an appendix. Other topics include orbitals, the anharmonic oscillator, transitions from excited states, statistical weighting of intensities, etc. The treatment is intended to be tutorial rather than exhaustive.

There is an appendix which gives an unusually good review of matrix methods. Problems are given at the end of practically every chapter, with answers at the end of the book.

There comes to mind the remark of F. C. Phillips, author of *An Introduction to Crystallography*, who in the preface of that book states, "Textbooks of science, in the mind of the discerning critic, usually fall readily into one or the other of two groups, the helpful and the impressive, accordingly as the author's outlook is