THIS book is characterized by a very happy mixture of experimental methods, particularly those pertaining to recent advances in acoustics, with the mathematical theory of the subject developed to the stage of use in advanced problems, but without such dilution by generalities which often, in more advanced treatises, prevents one from getting rapidly to the point which he wishes to reach.

The mathematics is presented in attractive and comparatively easily understandable form, and in the classical realm the book should form a good intermediary between an elementary book and such profound treatises as Rayleigh's "Theory of Sound."

As an illustration of the respects in which the book brings the science of acoustics up to date, we may cite from the subjects treated such topics as "Applications of Supersonic Waves," "Echo-Sounding," "Sound-ranging in Air," "Submarine Detection by Binaural Listening," "Supersonic Waves in Liquids and Solids," "Measurements of Intensity by Various Modern Methods," "Quartz Oscillators," "Magnetostriction Oscillators," a chapter containing about 40 pages on the ear and hearing, a chapter of about 30 pages on the recording and reproduction of sound and a chapter of about 30 pages on the acoustics of buildings.

The author is to be congratulated upon producing a work which should be of considerable use not only to the mathematical physicist but also to the experimental physicist who wishes to enrich the possibilities of his experiments by sound theoretical analysis.

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THE GLASS ELECTRODE

The Glass Electrode, Methods, Application and Theory. By MALCOLM DOLE. xv + 332 pp. Illustrated. New York: John Wiley and Sons, Inc. 1941. $4.50.

IN 1906 Haber and Klemsiewicz first showed that the potentials on glass surfaces in aqueous solutions functioned with respect to hydrogen ion concentrations as did hydrogen electrodes. Twenty years elapsed before practical use was made of this discovery to measure pH, and it was natural that the earlier applications were made by physiologists who had long realized the importance of hydrogen ion concentration in vital processes. This delayed development was in major measure due to lack of convenient electrometers for use in the high resistance glass electrode circuits. The rapid development of thermionic tubes, which were early applied to glass electrode circuits, coincided with the rapid spread in the use of the glass electrode. To-day commercial instruments are made in large quantities by methods of mass production, and the formerly laborious pH determination with the hydrogen electrode is, with the glass electrode, now about as simple as a temperature measurement.

Now Professor Dole has fittingly capped this period of development and application by a treatise on the glass electrode which should be authoritative for many years to come. His knowledge, gained by much experience in the theory and practice of the glass electrode, has been combined with an unusual skill in scientific writing and the result is an authoritative book of unusual clarity and completeness.

Professor Dole devotes several chapters to theory which though brief are complete and furnish just the right amount of background for the understanding of practice. These include considerations of the theory of solutions pertinent to hydrogen ion measurements, theory of vacuum tube circuits and their application to glass electrode circuits, theory of cell assemblies and liquid junctions. In particular the chapter on the "Theory of the Glass Electrode" is noteworthy. Here the author has compiled all the literature and discussed in detail the theory and experiment which is concerned with the mechanisms by which the glass electrode functions as a hydrogen electrode.

The book devotes several chapters to the history of the development of pH methods and to special applications of the glass electrode in biological chemistry. This latter shows how varied has become the use of this new tool including as it does not only the measurement of pH of blood *in vitro* but also continuous recording of pH in circulating blood. Even instantaneous measurements of the pH changes in contracting muscle have been measured and important interpretations concerning muscle physiology drawn therefrom.

In the discussion of the application of the glass electrode in industrial research and control laboratories are included references to the important uses in food, leather, rubber and many varied industries. Special chapters are devoted to micro methods, continuous recording of pH and automatic pH control, potentiometric titrations, and many other special applications of the glass electrode. Technical details of standardization and management of glass electrode circuits are fully given in special chapters. The use and limitations of the glass electrode in non-aqueous solutions is authoritatively discussed. The extensive bibliography alone is a valuable compilation.

Research chemists, physiologists, physicists, pathologists, industrial chemists and many others will feel indebted to Professor Dole who has so ably given them this aid in their technical application of the glass electrode and a stimulus to the development of new uses for this invaluable tool.

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