

further, it can be said at the outset that", or "when one is measuring . . . he must never forget . . .".

Many of the photographs are uninformative, and would be better replaced by line drawings.

Polymers are highly complex materials, generally exhibiting non-linear visco-elastic behaviour. Their performance cannot adequately be assessed by a simple test giving a single rating of quality. *Testing of Polymers* does not emphasize this point sufficiently, and although not a worthless book is a disappointing one.

D. W. HADLEY

PUMPS AND GAUGES

High Vacuum Technique

Theory, Practice and Properties of Materials. By J. Yarwood. Fourth edition, completely revised. Pp. x+274. (London: Chapman and Hall, Ltd., 1967.) 36s. net.

IN a wide variety of experimental sciences there arises, sooner or later, the need to produce and measure a low gas pressure. To the beginner in vacuum technology the problem may appear to present no particular difficulty. One should, presumably, select a pump guaranteed by the manufacturer to achieve the desired ultimate pressure together with a gauge capable of measuring it, and connect the two in some manner to the vacuum chamber. Only after the gauge has remained for some hours obstinately indicating a pressure perhaps one or two orders of magnitude greater than the desired ultimate does one suspect that "Nature abhors a vacuum" may be more than an obsolete proposition in metaphysics.

Amidst his encircling gloom the novice needs a kindly light, shed by an expert in vacuum science, to lead him on. He will find it in Mr Yarwood's book, whose past success is testified to by the appearance of this fourth edition. When the third edition was published vacuum technology was just at the beginning of the great leap forward initiated by the work of Nottingham, Alpert and others on the production and measurement of ultra-high vacuum in the early 1950's. Since that time a hundred flowers have bloomed in the form of new and improved oils for diffusion pumps, better methods for the construction and sealing of systems, bakable all-metal taps, the intensive development of getter-ion and cryogenic pumps and the application of mass spectrometry to residual gas analysis. All these are fully described in this completely rewritten fourth edition. Today, residual pressures of the order of 10^{-10} torr are achieved, more or less painlessly, in many laboratories. The majority of vacuum users will probably be content with residual pressures perhaps ten thousand times greater than this limit, but the guiding principles of the art of high vacuum production still apply. These principles and their practical implementation are clearly and cogently described.

As to the measurement of low pressures the novice may, in his innocence, be inclined to believe implicitly what his gauge tells him. In the past his simple faith was, at least in part, shared by the specialist. It was known that some types of gauge were more troublesome and produced more undesired side effects than others, but at least there was a rock of ages in the shape of the McLeod gauge as the ultimate calibration standard. Alas, even the McLeod gauge has fallen under increasing suspicion as hitherto unknown or neglected sources of error have come to light. The advice in the chapter on the measurement of vacua will make the novice aware of these difficulties and assist him in the intelligent selection, calibration and use of an appropriate type of gauge.

Though intended by the author as an introductory text for students of vacuum science at undergraduate and postgraduate level, the book contains much detailed and up to date information for the specialist. Types of

vacuum systems, components, methods of leak detection and the measurement of pump performance are given full attention and there is a final chapter on materials, devices and processes which is a mine of useful information. The text is supplemented with more than a hundred line drawings, graphs and tables. At its very modest price it should find a place in all vacuum laboratories.

JOHN A. PRYDE

GAS AND ELECTRICITY

Introduction to Electrical Discharges in Gases

By Sanborn C. Brown. (Wiley Series in Plasma Physics.) Pp. viii+281. (New York and London: John Wiley and Sons, 1966.) 80s.

THIS is an admirable book, which gives a comprehensive account of the physics of electrical discharges in gases. Although meant for beginners in this field of research, the book will be invaluable to the research worker as well. Too many people in the important field of plasma physics do not know sufficiently the background of the subject in gas discharges.

The author is particularly meticulous in the graphical presentation of results and clear in the diagrams of experiments. The book may be divided into several parts. First, one is introduced to the basic processes in a gas of atoms and free electrons: elastic collisions, free diffusion and mobility of electrons. As the density increases, co-operative effects between ions and electrons become more important, and aspects such as ambipolar diffusion are discussed. This leads naturally to a discussion of the processes of inelastic collisions and ionization themselves.

After several chapters dealing with miscellaneous but important topics such as secondary emission, recombination, observational techniques, and a.c. and d.c. breakdown, Professor Brown introduces the boundary sheath problem of a finite plasma, and includes several chapters, partly historical, on the various types of gas discharges.

In a final set of three chapters the author introduces important plasma phenomena, including the propagation of electromagnetic waves in plasmas, interaction of a plasma with an electromagnetic field, and plasma oscillations.

Perhaps one fault of the book is the slight imbalance of mathematics—too much rigour in some parts, not enough in others. There are also a few inaccuracies, but these can be left as an exercise for the student.

E. W. LAING

THOUGHTS ABOUT SOIL

Amazon Soils

A Reconnaissance of the Soils of the Brazilian Amazon Region. By W. G. Sombroek. Pp. 292 (31 photographs) + 7 maps. (Wageningen: Centre for Agricultural Publications and Documentation, 1966.) 45 D.fl.; 90s.; \$12.50.

THE scope of this volume is much wider than its title suggests. Two-thirds of the book systematically presents a considerable amount of basic information relating to the soils themselves, while the remaining third is concerned with the vegetation and agriculture, and includes some interesting observations on the ecological status of the different types of savanna. Much unpublished or difficultly accessible information is ably summarized and used, and the work is thus an extremely valuable compendium of knowledge.

Considerable and original though the body of information is, the contribution to thought and ideas made by the study is limited. Fundamental issues are raised only by implication, and the book can be considered to be