

stones; is not *Stromatactis* a trace fossil, probably of plant origin? Indeed, plants on the whole are given short shrift in this compendium. Stromatolites are traces of the growth patterns of blue-green algae, themselves rarely preserved—but stromatolites are barely mentioned in this book. The numerous impressions of jellyfish(?), sea-pens(?) and so forth, in late Pre-Cambrian rocks, particularly at Ediacara in South Australia, are not mentioned, though several contributions make it clear that the chronological distribution of trace fossils shows that burrowing life forms appeared only in very late Pre-Cambrian times.

This book makes the science of palaeo-ichnology respectable, and it should be on every historical geologist's shelf.
T. D. FORD

Flow Mechanisms

Annular Two-Phase Flow. By G. F. Hewitt and N. S. Hall Taylor. Pp. ix + 310. (Pergamon: Oxford and New York, December 1970.) £7.50; \$20.

Now that the vast literature on two-phase flow in pipes seems to be past its peak, it is timely that an authoritative monograph on the subject should make its appearance, and what better stable could it come from than the Chemical Engineering Division of AERE, Harwell? Over the past 15 years Dr Hewitt and his co-workers have been amongst the leaders in this field, particularly in emphasizing the fundamental flow mechanisms involved in the flow of liquid-gas mixtures in vertical tubes and the implications these have for the heat transfer properties of such systems. This book is largely a consolidation of the published work of the authors and their co-workers, set in context with present knowledge by reference to nearly 400 published papers. As the title implies, it is concerned chiefly with the annular flow regime, and largely restricted to upward flow in vertical tubes. Reference to experimental results is usually confined to air-water or steam-water systems, as indeed is most of the literature in this field.

After discussing flow regimes, the authors proceed to apply momentum and energy balances to various flow models. The application to annular flow assuming a smooth interface is presented in detail. A chapter on empirical correlations concludes with an example of a pressure gradient calculation. Whether such a calculation will always yield the sort of agreement with experiment here demonstrated is an open question. The theory of interfacial waves is discussed in some detail and another chapter treats droplet entrainment very thoroughly.

Heat transfer, boiling and burnout

are dealt with in three of the twelve chapters. There is perhaps a tendency throughout to present theory for its own sake, exemplified in the discussion of the heat transfer resistance of an interface. If such a resistance is significant, it is certainly not in the situation illustrated in Fig. 10.1, where a considerable temperature gradient in the gas phase is shown. Nevertheless, these three chapters form an excellent and clearly presented summary of the present state of knowledge. The final chapter reports on a number of experimental techniques used in the Harwell laboratories and warns of pitfalls that await the inexperienced in this field. It should prove invaluable to the young research worker.

A comprehensive nomenclature list includes units of measurement, both British and metric. It is a pity that the units quoted are not all directly comparable with the SI unit conversion table, thoughtfully included for the uninitiated as an appendix. For some, ft^2/s^2 are not the most obvious units for latent heat, though correct, unlike those quoted for thermal conductivity. But errors have been hard to find in this excellently produced book. The designer of two-phase systems may find few ready-made design techniques, but by studying this book he will certainly gain a better understanding of the beast he is up against.
G. H. ANDERSON

Tools for Research

pH Meters. By A. Wilson. (Laboratory Instrument and Techniques Series.) Pp. 119. (Kogan Page: London; Barnes and Noble: New York, 1970.) £2.00.

Electron Microscopes. By J. A. Swift. (Laboratory Instruments and Techniques Series.) Pp. 88. (Kogan Page: London; Barnes and Noble: New York, 1970.) £2.00.

Gas Chromatography. By C. Simpson. (Laboratory Instruments and Techniques Series.) Pp. 117. (Kogan Page: London; Barnes and Noble: New York, 1970.) £2.50.

THESE three titles announce the beginning of a series of books about instruments and techniques in common use in research laboratories. The level of readership at which the books are aimed is a variable because each book can be subdivided and is not likely to be read in its entirety by all readers. A section at the end of each book is devoted to tables which give a broad picture of the commercial instruments available together with their individual characteristics and range of functions. The books would therefore seem to be suitable both for people involved in the purchase of instruments such as electron microscopes and chromatographs, and

for the student who will presumably use the body of the text to obtain an account of the theory and practice of the particular technique.

The book on electron microscopes is rather spoilt by a mistake on page 12 at the end of a section in which the author describes advantages of an electron beam over a light beam; during the calculation of the wavelength of electrons accelerated by a potential difference V , reference is made back to the wrong equation and the expression for λ (metres) needs to be multiplied by $10^{-10} V^{1/2}$. The calculation to establish a sample wavelength is, however, correct and the point is validly made. The remainder of the book is remarkable for its account of the many different uses to which a commercial electron microscope can be put (for example, X-ray microanalysis and magnetic domain study). The basic functioning of an electron microscope and its attachments are well described although one might have hoped for a clearer diagram of a complete microscope than the longitudinal section of the commercial model illustrated. In this book, as in the other two, the general appearance leaves much to be desired and there is a complete lack of justification of the right text margin.

The first page of *Gas Chromatography* might be a little daunting for the reader approaching the topic for the first time because it seems to assume an understanding of precisely why different solutes should emerge from the column at different times. The quality of the printing on several pages is bad and part of one page is completely unreadable; figure 3.3 does not seem to be referred to in the text at all. In a few cases it would have been better if the order of presentation had been somewhat different—for example, several of the solute detectors are referred to in a way which demands some appreciation of their mode of operation before they were fully described. Such a list of criticisms should not, however, detract from the value of the book as a very comprehensive guide to the art of gas chromatography which will answer or suggest a source for the answer to most questions which are likely to arise.

The book *pH Meters* is also remarkable for its comprehensive coverage of the topic and, although the abundance of mathematics at the beginning of the book could deter the casual reader, anyone who wants information about methods of measuring pH, including a brief description of colorimetric indicators, should be able to find it. The book not only considers the measurement of pH in a chemistry laboratory but also discusses pH measurement and control in industry and the measurement of pH in medical and biological laboratories.

ROGER WOODHAM