particular manufacturer. There are excellent sections on general measuring technique in bridge circuits, for phase and frequency measurement, and for practical work on fluorescent lamps, camera shutters, flash bulbs and television receivers.

Neither book deals with the preferred functional circuit, a concept that would greatly simplify the pursuit of conventional circuits and reduce them to system-design, by building up an assembly of functional circuit 'bricks'.

Whether or not it is worth while using this approach to clear away retrospectively the profusion of detail in circuit design is in question for thermionic circuits, but it should be done for transistor circuits. The treatment of transistors in the first book extends only to the end of 1955, but is an excellent guide of what is to come, as semi-conductors are particularly suited to industrial applications. The second book looks backward rather than ahead in its field, and transistors are not mentioned, although they have made possible a significant future development, the miniature, portable, earth-free oscilloscope.

Denis L. Johnston

## FLAME SPECTROSCOPY

### The Spectroscopy of Flames

By Dr. A. G. Gaydon. Pp. ix+279+6 plates. (London: Chapman and Hall, Ltd., 1957.) 50*s*. net.

From the earliest times of recorded observations of matter, flame and fire have occupied a place of particular interest and importance, being so obviously remarkable in nature that they were frequently regarded as constituting a principle, or element. In the early nineteenth century it became clear that flames were generally to be associated with very rapid chemical reactions, usually of combustion, and attempts to understand them, on the basis of the characteristic light emitted from them, commenced. Serious attempts of this kind have had to await the development of the application of wave mechanics to spectroscopic data, which allowed of the analysis and identification of the spectra of short-lived radicals such as, for example, $C_2$, CH, OH, which appear in many common flames. The next step is to deduce the part played by such radicals in the physico-chemical processes occurring in flames, as part of a general scheme of elucidation of the detailed reactions of combustion.

A major part has been played in these studies in recent years by Dr. A. G. Gaydon, the author of the work under review. From time to time Dr. Gaydon has published monographs relating to the physics and chemistry of flames, which have been distinguished by their scope, their presentation of conflicting theories or points of view in a fair-minded way, and their ability to stimulate further work of importance. The present volume is no exception to this, and like the previous ones, is also most valuable for the large number of useful practical hints to workers in the field.

The book opens with a number of introductory chapters on methods of studying flame spectra, on techniques for obtaining special types of flames, such as diffusion and low-pressure flames, and on the elementary theory of atomic and molecular spectra. The last of these, while by no means supplying all the spectroscopic knowledge required by an intending worker in the field, is nevertheless a useful introduction.

The next three chapters deal, broadly, with accounts of the electronic spectra of hydrogen, carbon monoxide, and hydrocarbon flames with oxygen or air. They provide very complete descriptions of the observed features, with some discussion of whether the spectra show chemiluminescence (that is, non-thermal excitation), and of whether the concentrations of emitters are in excess of those to be expected for thermodynamic equilibrium. For example, a typically balanced account of the various views of processes of reaction in carbon monoxide flames is given. A further chapter discusses the analysis of spectra so as to obtain the effective translational, rotational, vibrational, etc., temperatures, understanding of which is required if the complicated distribution and exchange of energy between various types of molecule and degrees of freedom occurring in flames is ever to be solved in detail.

In further useful chapters the book deals with infra-red emission from flames (a rather neglected topic), the correlation of spectroscopic results with processes of reaction (including an account of carbon formation in flames), and industrial flames and engines. The book ends with an interesting account of various unusual flames, in which oxides of nitrogen, halogens, compounds of sulphur, etc., take part, and with a brief discussion of spectrophotometry of trace additives, which is itself beginning to throw light on the chemistry of flame reactions.

This is a most valuable book to all those working in any field which has points of contact with the study of rapid reactions of simple molecules. It may be that spectroscopic studies tend to emphasize the role of a small number of rather special free radicals and molecules, but it must be agreed, with the author, that "emission of light is the most distinctive property of a flame and must surely be capable of giving much information about what is happening".

T. M. Sugden

## THE BIOLOGY OF AGEING

### Ciba Foundation Colloquia on Ageing

Vol. 2: Ageing in Transient Tissues. Edited by G. E. W. Wolstenholme and Elaine C. P. Millar. Pp. xi+263. 36*s*. net. Vol. 3: Methodology of the Study of Ageing. Edited by G. E. W. Wolstenholme and Cecilia M. O'Connor. Pp. x+202. 32*s*. 6*d*. net. (London: J. and A. Churchill, Ltd., 1956–57.)

### The Biology of Ageing

Edited by W. B. Yapp and G. H. Bourne. (Symposia of the Institute of Biology, No. 6.) Pp. xiv+128. (London: Institute of Biology, 1957.) 25*s*.

Reports of the various symposia and colloquia, especially on endocrinological subjects, which have been organized by the Ciba Foundation, are by now widely known and appreciated. A series of colloquia on ageing is one of the more recent activities of the Foundation, and Volumes 2 and 3 provide the material which was presented at two meetings of gerontologists in July 1955 and July 1956.

Volume 2, which is devoted to a study of the ageing of component tissues of the body whose span of life is shorter than that of the whole animal, might at first glance be mistaken for one in the series of endocrinological symposia; for many of the papers deal with the growth and development of tissues concerned with reproductive processes in a fairly narrow endocrinological context. Thus, among