

electrical stimulation of the same area of the hypothalamus in a rat may produce not only eating but also drinking or gnawing. Similarly possible differences between the effects of bilateral hippocampal lesions in man and other animals are mentioned, but no real attempt made to account for them. The reviews at the ends of chapters are of no help since they do little more than summarize. A student on an introductory course may find the chapters on motivation helpful, but for the rest he will not gain a grasp of the essentials of physiological psychology. There are other better and more interesting books which will help him to do that.

R. E. PASSINGHAM

## Gases in Metals

*Interaction of Metals and Gases.* By J. D. Fast. Volume 2; Kinetics and Mechanisms. Pp. ix+318. (Macmillan: London and Basingstoke, January 1972.) £10.

In volume 1, published in 1965, Professor Fast covered the thermodynamics and phase relations of gases in metals. In volume 2 he deals with kinetics but excludes the topics of absorption, catalysis and oxidation on the grounds that these are adequately treated elsewhere. Volume 2 has only five chapters of which chapter 1, on solution of gases in metals, to some extent covers the material of volume 1 but with greater stress on the atomic interpretation of solution phenomena. The remaining chapters are on diffusion in interstitial alloys, internal friction in metals and the Snoek effect and interaction of interstitials with other lattice imperfections. The emphasis, therefore, is on the effect of foreign atoms on the structural and mechanical properties of metals.

By limiting his field, however, the author has again achieved a satisfying balance between theory and practice, as is appropriate to a professor who is also Chief Metallurgist to Philips Research Laboratories. Because the author intends the book for students of metallurgy as well as practising metallurgists, the theory of a particular phenomenon such as interstitial diffusion or relaxation is developed from elementary first principles, in both phenomenological and atomic terms and then applied to an abundance of experimental data on gas-metal systems. The many references to original work make this an invaluable source book for practising metallurgists. For students, who would benefit greatly from Professor Fast's clear expository style, I fear that the high price of the book for the restricted field covered may prove a deterrent. J. A. PRYDE

## Marine Geochemistry

*The Changing Chemistry of the Oceans.* Edited by D. Dyrssen and D. Jagner. (Proceedings of the 20th Nobel Symposium held at Göteborg, August 1971.) Pp. 365. (Wiley: New York and London, October 1972.) £9.

THIS volume contains most of the papers and the informative discussions from a Nobel Symposium at which the main theme was the effects of man's activities on oceanic processes. These activities are increasing detectably the rate of movement of certain elements in natural cycles and introducing significant inventories of substances hitherto absent or at negligible concentrations. Increased knowledge is needed of the background levels and perturbations against which such changes may occur, and the processes governing the behaviour of the chemical forms concerned. It is appropriate then that the proceedings were concerned as much with the changing perspectives of our understanding of marine geochemical and biogeochemical processes as with pollution which can only be interpreted in the light of such information.

The balance of subject matter reflects the emphasis placed on atmospheric interactions and pathways, in current marine chemical research. Wind-blown dust as a component in pelagic sediments and an influence on trace metal distributions is discussed by Chester. The importance of aeolian pathways for pollutants is brought out by Goldberg in a synthesis with many quantitative insights into human influences on the sedimentary cycle. The transfer of particles from ocean to atmosphere is examined by Chesselet, Morelli and Menard, who also discuss the atmospheric gaseous chlorine, probably as hydrogen chloride, of marine origin. Hahn shows that parts of the Atlantic Ocean act as a source for atmospheric nitrous oxide also. The more fully explored carbon dioxide cycle is discussed here by Machta, with emphasis on the human perturbations of the inventory and seasonal atmospheric variations, and by Pytkowicz, who considers the long-term geochemical aspects. An important and rather neglected aspect of the air-sea boundary layer, namely the influence of surface films, is examined by Garrett.

Some information on changes in the chemistry of sea water on both recent and geological time-scales is recorded in the sedimentary deposits. Lal and Krishnaswamy describe investigations of ferromanganese concretions which, because of their dominantly authigenic character and slow kinetics of formation, may constitute especially valuable sedimentary records. Sedimentary pyrite formation and its quantitative

importance as a removal route for oceanic sulphate is discussed by Berner. Several papers describe the occurrence of specific pollutants and the behaviour of elements which can cause pollution problems in coastal waters. Some useful contributions give relevant information on physical, meteorological and biological processes. The importance of modelling as an aid to understanding highly complex environmental systems emerges as another pervasive theme, to which Odum contributes an outstanding and thought-provoking study of energy circuit modelling.

The papers were published only fourteen months after the symposium. Misprints and eccentricities of presentation, numerous in some parts, might have been removed at the cost of a longer gestation. Although the uninitiated may ponder on page 326 over the nature of the testes which are said to fall rapidly to the sea bed and dissolve, these errors do not seriously detract from the value of the publication. It deserves a wide readership.

J. D. BURTON

## Irradiated Polymers

*The Radiation Chemistry of Macromolecules.* Edited by Malcolm Dole. Volume 1. Pp. xiv+369. (Academic Press: New York and London, November 1972.) \$23.

POLYMERS, like materials of other kinds, are prone to suffer damage when exposed to high energy radiations but it often is the case that the effects can be turned to good use. For example, cross-linking can be induced by suitable irradiation of a moulded plastic article in order to stabilize its shape and enhance its mechanical strength, a reaction distinguished from other post-treatments of comparable types in taking place throughout the specimen rather than in limited depth at the surface.

Great interest attaches to the radiation chemistry of polymers at the academic level as well as the technological; previous accounts of the subject are now a decade out of date and the volume under review is the first half of a two-part treatment which is obviously timely, if not overdue. To some extent this volume is preparatory in that it deals for the most part with the theoretical aspects of the subject, including the concepts of energy transfer in polymers, the nature of free radicals, molecular mobility and electrical conductivity.

There is also a chapter describing experimental techniques and the book ends with two discussions of radiation effects in relation to polyethylene. These latter contributions seem rather out of place after the very general foregoing matter, but they are really a pre-