

industrial processes, for example, optimum settings for a cigarette machine and a conductivity bridge for tests on extraction apparatus and continuous flow empty and packed columns.

"Problems of Analyzer Applications" includes the calibration of gas monitors and process gas chromatographs and the application of flame ionization chromatography to raw motor-car exhaust gases and to the analysis of paraffin waxes. Space research is catered for by a paper on the design of a lunar gas chromatograph.

"Laboratory Instrumentation" has an interesting paper dealing with polymer molecular weight measurement by gel permeation chromatography: a potentiometric method detects as little as 2.5 p.p.m. of chloride in various salts: peroxyacyl nitrates, 'smog' air pollutants, are determined by gas chromatography. Other papers are concerned with instrument demonstrations and processing analytical data.

In the section dealing with "Electrochemical and Chemical Methods" we find described a sensitive instrument for continuous measurement of temperature changes on mixing two liquids, for example, dilute solutions of citric acid and sodium hydroxide. An all solid-state pH meter, a new method for instrumenting square wave polarography and an autoanalyser for the determination of chemical oxygen demand in water are also described. Two papers are concerned with the measurement of moisture, one based on the use of microwaves and one on a dielectric system.

"Radiation Methods of Analysis" contains two papers concerned with the use of infra-red in the determination of gases and toxic vapours: infra-red absorption data for 320 gases and vapours are tabulated. Lunar exploration receives attention in a paper describing neutron activation methods for compositional studies and another paper relates to the use of charged particles for the bombardment. Two instruments are described, a gamma-ray density gauge and a spectrodiffractometer, the latter an instrument for chemical analysis by both X-ray diffraction and emission.

With such a mass of information, detailed comment in a review is not possible.

The book should be of interest to all concerned with instrumental methods.

C. O. HARVEY

NORTH AMERICAN ECOLOGY

The Ecology of North America

By Victor E. Shelford. Pp. xxii+610. (Urbana: University of Illinois Press, 1963.) 10.00 dollars.

THIS large, well-illustrated book is the culmination of a lifetime of ecological research by Prof. Shelford, aided by numerous students, and is based on many field expeditions throughout North America. By combining the observations of early travellers with surveys of semi-natural areas, Prof. Shelford is able to attempt to describe the ecological situation in North America during the sixteenth century before the arrival of European settlers. He has succeeded remarkably well in this formidable task, but not everyone will agree with his description of primeval North America. It is strange, for example, that the effects of windblow receive scant attention, yet American ecologists at Yale and Harvard have emphasized that uprooting of forest trees by wind was of widespread occurrence, with tornadoes regularly cutting swathes through the forest sometimes over two kilometres wide. The effects of successive, ancient windthrows can be traced in the irregular forest floor of humps and pits and in the complex soil morphology that has resulted from repeated overturnings of the soil layers.

The Ecology of North America contains nineteen chapters, the first of which deals with the definition of ecological

terms and concepts used in the book. Some of these, such as permeants and influents, are not generally used and are of doubtful value. Each of the remaining eighteen chapters is devoted to the description of a major ecological community, which range from the tundra biome of the north to the tropical rain forest of the south. The major communities are subdivided into regions and seral stages of development. A large list of literature cited is given but unfortunately many modern investigations, such as the description of the vegetation of Wisconsin by Curtis, are not included. Excellent locality and species indexes are provided but no general index, so that it is difficult to obtain readily a picture of the influence of fire or of Indians.

In describing the ecological communities, Shelford expertly brings together a great amount of information on the characteristic species of plants and animals present and also on their numbers and interrelationships at different seasons of the year. This information is set against the background of topography, soil, climate and human influence. The careful integration of knowledge gained from different disciplines provides an excellent insight into the complexity of natural biological situations and of the virtues of comprehensive investigations.

Undoubtedly the book will be invaluable to conservationists and to anyone concerned with management of natural resources, for it provides a unique historical perspective against which to view past and future developments in North America. It also serves to direct attention to the inadequacy of our knowledge of the interrelations between plants and animals and of the quantitative aspects of community dynamics. These deficiencies need to be remedied if ecologists are to contribute significantly to schemes of land use and to understand the impact of modern technology on Nature and natural resources.

J. D. OVINGTON

THE BIOSPHERE

Animal Worlds

By Marston Bates. Pp. 316+plates. (London: Thomas Nelson and Sons, Ltd., 1963.) 84s.

ANIMAL WORLDS is an introduction to natural history by way of ecology. It makes no attempt at a systematic description of the animal kingdom but deals in turn with many different environments, their floras and faunas. Marston Bates has travelled widely and is well qualified to write on natural history from this angle; he writes skilfully and has produced a lively and interesting volume that will be appreciated both by the layman and the professional zoologist. In spite of the vast range of the subject, its salient points are covered and much illuminating detail is included within the moderate space of more than three hundred pages.

The ecological treatment gives scope for the consideration of many aspects of animal life, including not only the direct reaction of animals to the physical environment, but also their physiology, behaviour, special adaptations, migrations, breeding habits, relationship to other species of animals and to plants, to mention only a few. The result is a real natural history of the biosphere in which the wood is not obscured by the trees and which gives a good insight into the complicated relations between animals and their physical and biological surroundings. As Bates remarks in the foreword, a survey such as this is necessarily selective from the great mass of material available, but his selections are judicious and very much to the point.

The final three chapters deal with the relationships between man and the other animals, with domestication, extermination, parasites, pests and pets. Much of the surface of the Earth is rapidly being changed by man's activities; the changes eliminate some species of animals