transports of heat and moisture in relation to that of momentum and energy are of particular concern, and processes in the planetary boundary layers where Coriolis effects become important. A parallel treatment of effects in both the atmospheric and oceanic layers is followed as far as possible.

Three-dimensional interactions form the subject of the last, and longest, chapter and in a sense the whole book has been preparing the ground for this wide field of study. The interrelation of sea-surface temperature and the dynamics of the tropical atmosphere, the development of hurricanes and the inter-tropical convergence zone are among the topics treated. The properties of inertio-gravity and planetary waves in the ocean are discussed in relation to the response of the ocean to storms and to seasonal changes in the wind regime. It will be seen that the appearance of this book is particularly opportune at a time when GARP (the Global Atmospheric Research Programme) is getting into its stride and GATE (GARP Atlantic Tropical Experiment) is in active preparation.

K. F. BOWDEN

Coastal Habitats

Ecology of Salt Marshes and Sand Dunes. By D. S. Ranwell. Pp. xiv+258+16 plates. (Chapman and Hall: London, December 1972.) £4.60.

SINCE the emergence of ecology as a distinct discipline, both sand dunes and salt marshes have exercised an almost magnetic attraction for plant ecologists. It is not difficult to recognize the cause of this attraction. Both types of habitat have very distinctive types of vegetation which contain a high proportion of species restricted to them, and many of these species show obvious adaptation to the special conditions which prevail. On salt marshes, particular attention has been given to the causes of zonation and to the adaptation of plants to salinity and to periodic immersion in seawater, while on sand dunes interest has generally been focused on adaptation to movement of sand and on mineral nutrition. It has been generally accepted that both habitats provide clear evidence of vegetational succession and indeed sand dunes were among the habitats where this process was first recognized and described in the early years of this century.

It has long been recognized that a full understanding of both habitats requires knowledge of coastal physiographic processes and it now seems likely that the establishment of flowering plants on freshly deposited marine sediment or wind-blown sand is dependent on the activities of the soil fauna and of microorganisms.

In recent years, both habitats have acquired a less welcome reason for attracting the attention of ecologists. This is the vulnerability of salt marshes to pollution of estuarine and coastal waters and of sand dunes to destructive erosion apparently activated simply by the wearing away of their vegetation by holiday-makers.

The success of interdisciplinary investigations of both habitats, and the recognition of their vulnerability to damage, fully justify a new appraisal of the state of our knowledge of their overall ecology. Dr Ranwell has set out to do this. Certainly a lot of information is presented but often in the style of a summary without any real synthesis. For example, the description of physiographic types of dune-systems is written almost in the form of notes. Maps and diagrams would allow a reader, unfamiliar with more than a few sites, to grasp the full range of diversity and its probable causes. One of the four sections of the book is devoted to the effects of man and draws attention to many aspects of the ecology of dunes and salt marshes which were either unrecognized, or regarded as less important, in accounts written at a time when damage was less obvious and conservation was not uppermost in our minds.

Although the title of the book includes the unqualified word ecology, the treatment of both animals and microorganisms is brief and superficial. Rabbits, once so important, are discussed in a few short paragraphs and there is almost no mention of birds. The few pages devoted to insects are largely concerned with energy-flow, not with their biology, and other groups of invertebrates are scarcely mentioned. There are scattered references to microorganisms but such interesting groups as the bacteria which are concerned with oxidation–reduction processes in waterlogged soils of salt marshes are not discussed.

The book is primarily concerned with plant ecology but, even in this, the author deliberately restricts himself in a way which seems to lead to a confused presentation. The overall successional relationships are omitted on the grounds that they are often an oversimplification. But this is true of most ecological generalizations and not least of attempts to formulate flow diagrams of energy or substances through ecosystems. These are generally based on very sparse measurements of fluxes and inadequate knowledge of pathways. Then all descriptions of the composition of vegetation are excluded on the doubtful assertion that "the presence or absence of most species in a habitat is irrelevant to the great majority of other species (including man) in the habitat". One must wonder what does control the composition of vegetation and the population dynamics of animals. As a consequence of these two omissions much of the discussion and analysis has no clear focus. It is not easy to reconcile this rejection of accurate description with the plea on page 181 to give more attention to detailed studies of parts of ecosystems in order to understand the whole.

Much of the book seems symptomatic of a deep seated confusion in the minds of many ecologists. Description may not bring understanding but at least it defines what has to be understood. Analysis and many numerical data derived from analysis are often still purely descriptive. What is a model but a form of description? The equation on page 84 which is claimed to be a model of accretion and has its constants given to three significant figures, but fails to give the units of measurement, shows convincingly that numbers alone do not improve bad science.

C. D. PIGOTT

Food Technology

Health and Food. Edited by G. G. Birch, L. F. Green and L. G. Plaskett. Pp xi+224. (Applied Science: Barking, Essex, 1972.) £4.20.

THIS is a collection of papers read at a meeting organized by the authors as one of a series of annual international symposia of the National College of Food Technology, University of Reading.

It was intended as a discussion of the potential health problems that may arise from changes taking place in our food because of the rapid development of food technology. Almost all our food—a figure of 98% of the total energy intake has been suggested—passes through the hands of the food processor. Two questions were to be asked: are manufactured foods safe from the point of view of additives, processing changes, pesticide residues and so on; and what should be regarded as a good diet?

As might be expected, no conclusions were reached but the topics covered included discussions of consumer attitudes to processing, hazards of natural foods, methods of testing additives, legal aspects, pesticide residues in baby foods, yeast protein, ready-made meals, clinically designed foods, space foods, diet and longevity, problems arising with new foods. Speakers were drawn from industry and the academic field and from the United States, Holland, Poland and France as well as the United Kingdom.

As the titles indicate, the symposium was somewhat diffuse and unstructured