none implicitly—thus making it unable, by itself, to satisfy the needs of biological and medical students.

The subject matter is divided into sections on the structure of matter (176 pages) and the interactions of matter, the latter section being further subdivided into considerations of reactions and some principal types of reaction systems (128 pages), the properties and reactivity of the elements and their compounds (152 pages), and nuclear chemistry (19 pages). The material on the structure of matter is reasonably comprehensive at the elementary level, but a good deal of it is presented in rather too didactic a manner: we are offered statements, sometimes of experimentally determined fact and sometimes of hypothesis, rather than explanations. This is particularly apparent in the chapters dealing with electronic configuration and bonding; here a certain amount of didactic statement is admittedly inescapable, but students are left, for example, without a clear picture of what atomic orbitals actually are, and hybridization is introduced without any adequate explanation of why it is necessary.

By contrast, the chapter on free energy and spontaneous change, rate and reversible equilibrium in chemical reactions is written so as to give the student a more imaginative insight into what determines the answers to those vital questions about a chemical reaction—how far, and how fast? The systematic coverage of the elements and their compounds does not follow the usual organization by groups but divides the material up into electropositive elements (metals), electronegative elements (non-metals), and metalloids, which works out reasonably well in practice, given that there is no intention of making the treatment exhaustive. Nevertheless the impression remains of too many statements and too few explanations; thereby making this a book more useful to the student for revision than for his first acquaintance with the subject.

PETER SYKES

RIPPLES IN THE SAND

Current Ripples

Their Relation to Patterns of Water and Sediment Motion. By John R. L. Allen. Pp. xiii + 433. (North-Holland: Amsterdam, 1968.) 108 fl.; 252*s*; $30.

THERE are nineteen chapters in this book. One of them deals with fluid flow for a variety of boundary shapes, and with the related grain transport. Another introduces ripple marks and gives a rather uneven treatment of some other migratory and depositional bodies of incoherent material, arranging them in size rather than in a more natural environmental sequence. The next indicates the various types of asymmetrical ripple marks, making use of a series of new descriptive terms. It usefully draws attention to the reality of two size populations of bedform, the ripple marks and sand waves of many authors. Cross stratification models are provided for idealized types of asymmetrical forms and for some natural examples, and there is a short discussion on preservation. The sixth chapter gives a brief mention of their environmental distribution together with an extensive review of their possible origin and hydraulic limits. The remaining thirteen chapters, representing almost two-thirds of the book, are devoted to theoretical models of flow for various simple bed shapes and to numerous pretty demonstrations of the actual flow over plaster of paris models, showing that downstream of these models similar bed forms become moulded in loose granular materials. This work is followed by an extensive flume study of grain movement in the lee of crests.

The book consists of two rather disparate parts, is needlessly long and is too expensive. It would have been more successful if the flow diagrams had been limited to those required to illustrate the main ripple types, rather than demonstrating a continuum of variation. Similarly, there are far too many photographs of the plaster models—a few would serve to demonstrate the power of the method. The rest of the models, because of the difficulty of photographing them adequately, tend to cast doubt on the author's interpretation. Many of the compound figures would be clearer if only one set of flow axes was shown. There are some minor misunderstandings in the text, particularly on the marine side.

The geologist will find the first few chapters a valuable summary of much of the available information and there is a long list of up to date references with only a few notable gaps. He will find the book disappointing, however, as it does not really help him in interpreting the depositional environment of rocks of the geological past.

A. H. STRIDE

OCEAN CURRENTS

Ocean Currents

By G. Neumann. (Elsevier Oceanography Series.) Pp. xi + 352. (Elsevier: Amsterdam, London and New York, 1968.) 150*s*.

To the physical oceanographer, ocean currents are at the core of his subject. Besides representing one of the main responses of the oceans to the forces acting on them, water movements interact closely with the processes of heat and salt exchange and the distribution of nutrient substances and sedimentary material. They therefore extend into the fields of interest of the marine biologist and geologist, while their importance to marine technology, including navigation, fisheries and the exploitation of sea-bed resources, needs hardly be emphasized. By producing a textbook of ocean currents which is, at the same time, simple to understand, authoritative and up to date, Professor Neumann has performed a most valuable service.

The author starts with a comprehensive but concise survey of methods of current measurement, ranging from pioneer achievements, such as those of Pillsbury in "Blake" in 1885–90, to recently developed techniques including moored buoy systems. A major practical problem is presented by the essential variability in time and space of ocean currents and the need to choose appropriate techniques for the purpose in hand. The most sophisticated instrument is not necessarily the most useful in a particular investigation. Although the techniques of direct measurement have advanced greatly in recent years, it is still necessary to supplement them by indirect methods. These are also discussed briefly and put in their right perspective. The presentation of ocean currents, which must vary with the purpose for which the information is required, is treated next. Examples are given of current charts designed for the navigator and for the scientist, and this section ends with a condensed description of the major current systems of the world.

Having described the broad scene, the author turns to the basic hydrodynamical background. The equations of motion are developed, including the Coriolis and frictional terms and the concepts of circulation and vorticity. There is little scope for originality here, but the material is well presented, with the ideas being carefully explained and the mathematics kept as simple as possible. The author then deals systematically with the major types of ocean currents—geostrophic, inertia, circular, currents affected by friction and wind-driven currents in a homogeneous and in a non-homogeneous ocean. In each case the basic theory is given first, then its application to actual currents is described, and finally there is a brief indication of recent developments. The study of individual types of currents leads on to that of the circulation of the oceans. The pioneer work in this field was that of V. W. Ekman from 1902 onwards, and Neumann shows clearly