

In his preface, however, Dr. Dunsheath indicates a second objective. He attempts to show both the need for a change of approach in university teaching for students destined for a life in industry, and that the new conditions of the present day may be adequately matched to the tradition of the university as a place where young people find a philosophy of life which remains with them to guide and strengthen them throughout the conflicts of life which lie ahead. Here Dr. Dunsheath has much to say that is stimulating and sometimes provocative, but he writes with insight as well as with a deep sympathy with the social aspirations that so often colour the ideals of students which will commend his book to them, no less than to those responsible for determining the trend and content of university teaching.

Dr. Dunsheath's book from the first point of view gives a fair indication of the structure on which the attempt to obtain quantitative estimates of the future demand for graduates should be based. Here his book is as important to the industrialist as to the appointments boards which attempt to prepare those estimates. Some chapters, indeed, are almost specifically addressed to the industrialist: if there are graduates prejudiced against entering industry there are also industrialists prejudiced against employing graduates in some at least of the fields which Dr. Dunsheath indicates. He gives some attention to the question of the man of science as administrator, and not only here but also in other places he emphasizes the importance of the student taking full advantage of the opportunities which a university offers to broaden his mind and outlook and enlarge his contacts with men and women. All the weight of his experience is thrown against the narrow bookish conception of education, as it is against premature or excessive specialization.

As might be expected in a book of this size, some parts of the wide field are surveyed rather sketchily, and Dr. Dunsheath would be the first to admit that he initiates rather than exhausts either discussion or description. Nevertheless, he has given a fairly clear statement of what is involved in the present discussion on the expansion of the universities, and his book should not be without value to those also who are endeavouring to see that a reasonable balance is achieved between the numbers of university-trained men and women who enter industry and those entering the universities and the public services. For its price, the printing and production might well have been better; its usefulness would be increased if it could be issued in another edition at half the price.

R. BRIGHTMAN

SEA WAVES AND SURF

Wind Waves at Sea, Breakers and Surf

By Henry B. Bigelow and W. T. Edmondson. (United States Navy Department: Hydrographic Office: H.O. Pub. No. 602.) Pp. xii + 177 + 24 plates. (Washington, D.C.: Hydrographic Office and Government Printing Office, 1947.) 2.80 dollars.

SEA WAVES are as unruly as ever; but their characteristics are becoming more predictable as knowledge accumulates. The pioneer work of Arago and Stevenson was energetically extended by the American army engineer Gaillard, whose book on "Wave Action" published in 1904 has recently been reprinted. The aim of theory has always been to extract from the reality simpler ideas that are

comprehensible; that real sea waves are complicated is sufficiently evident from the stereophotographs and contour diagrams prepared in 1939 by Schumacher. The first mathematical guess at the nature of a sea wave was made by Gerstner in 1802, and the later theories, most notably those of Stokes and Rayleigh, have provided a sound basis for the work of the physicist and engineer.

The appearance, therefore, of a book by Henry B. Bigelow and W. T. Edmondson is particularly welcome because of the extensive work on waves that has been done since 1940. It is described in the preface as a popular book; but the reader may take notice that it contains too many facts to be easy reading for the landsman. It aims at being a simple comprehensive account of wind waves written for the seafaring man. For this reason it is not a text-book, and the authors present only the general findings of theory supported by numerous practical illustrations taken mainly from the seaboard of North America. This practical bias is very desirable in a science which has such practical applications. The European reader may find difficulty in appreciating the practical examples and applying them to his home waters, unless he is provided with a good atlas of the American lakes and seaboard. The book is illustrated by 57 photographs and diagrams and contains 37 numerical tables with a sufficient number of selected references.

A notable feature of the book is an atlas of the frequency of occurrence of high seas and low seas and of high swells and low swells in all the major oceans during summer and winter. This atlas is one result of the military demands of the Second World War; it may prove to be of value to commerce, since such information is needed in the construction of new harbours and other engineering ventures that are exposed to the sea, as, for example, certain new oilfields. This atlas is the only one available as yet to the public.

The first four chapters describe the character of waves at sea, their growth under wind and their propagation away from the storm as swell. The last three chapters describe how waves change their behaviour when approaching the coast, due to shoaling water, to refraction around islands or headlands or to the effect of tidal streams, and describe the different types of surf which form on various beaches. The complicated effects are rationalized in a pleasing way, and these chapters deserve the attention of all maritime engineers. Though the discussion of theory is avoided, the numerous practical observations will suggest useful lines of work to the specialist. Is the grouping of waves, for example, as fortuitous as it might seem, for if fifty or more successive waves are observed by a ship, could not the next one be predicted with fair certainty? When a moderate swell is partly beaten down by an opposing wind, in what form does it emerge? Is its wavelength increased or diminished or does it merely show a reduced height?

As a correction of fact it may be pointed out that in 1911 Rayleigh deduced that waves would show a small decrease in height as they first approached shallow water, so this is not a recent discovery.

The authors give no space to the description of modern wave-measuring instruments or to techniques such as frequency analysis which are advancing the science. These subjects would find a place in a specialist's text-book, and it is to be hoped that the authors will compile one, since the present book meets its own purpose so well.

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