

sected, peneplain surface is a marker of the same kind, but of even greater significance, to the geomorphologist that the stratification plane is to the stratigrapher".

The concept of the 'geomorphic cycle' has been criticized, particularly on account of the long-continued stability necessary to permit of the complete peneplanation of a large area, but it has afforded a framework for much fruitful discussion of relief. It is therefore particularly fitting that Prof. von Engelsh should devote an early chapter to a very interesting discussion of the peneplain concept. In this and a later chapter he considers the views of Penck in some detail: Chapter 13 (the Walther Penck geomorphic system) probably gives the fullest summary of Penck's opinions which has appeared in English. Penck believed that the Davis cycle of erosion applies only in the special case of rapid uplift followed by prolonged *stillstand*, and that varying rates of uplift are of primary significance in the development of types of relief. In particular, he considered that in certain cases very slow upheaval controlled the development of land forms; for example, in a newly emerged land rising very slowly and continuously he suggested that degradation would level the area as rapidly as it rose, so that there would be no increase in the amount of relief. Such a featureless plain or *primärrumpf* would truncate structures, and would have many of the characteristics ascribed to a peneplain as defined by Davis, but it would not have resulted from the degradation of a previously elevated tract. Such a *primärrumpf* might be raised later by an acceleration in the rate of uplift. Probably a great variety of land forms would result from differences in the ratio of rate of uplift to degradation.

In the present volume it is not suggested that the ideas of Davis and Penck are mutually exclusive. It is clear that both lines of approach are legitimate and may be useful. The two systems differ in the interpretations of slope forms, and if the attention here paid to Penck's views leads to a closer study of slopes and their development it will have been amply justified.

On the whole, the conclusions of British geomorphologists have been in line with Davis's concept of the cycle of erosion, and intermittent uplift with successive periods of comparative *stillstand* has been held to explain the origin of the features observed. In general, these views have been supported by much recent work on the gradient curve of rivers; Prof. von Engelsh makes little comment on this method of investigation. In Britain there is much opportunity for such detailed studies, but it is not surprising that many American workers are more attracted to wider problems.

There is an interesting chapter on factors of rock strength, while later chapters deal with the history of the folded Appalachians, desert and glacial geomorphic cycles, coasts, coral shore lines, karst topography and land forms resulting from volcanicity. It is no criticism of a work such as this to suggest that many workers will find statements with which they may not wholly agree. For example, the usual definition of superimposed drainage would scarcely cover the case illustrated in Fig. 114; the diagram showing Willis's interpretation of rift valley structure (Fig. 227) also is misleading owing to the geological shading adopted.

It remains only to add that the volume is illustrated in the lavish manner to which we have become accustomed in American works of this type, and that

a wide range of references to classical and current literature is given. By supplying such a thoughtful account of many aspects of geomorphology the author has placed teachers of geology and geography in his debt. It is a volume which may be warmly recommended for the reading of more advanced students.

A. E. TRUMAN.

THE POLYNESIANS

Polynesians—Explorers of the Pacific

By J. E. Weckler, Jr. (War Background Studies, No. 6: Publication 3701.) Pp. iv+77+20 plates. (Washington, D.C.: Smithsonian Institution, 1943.)

THE exploits of the early Polynesians in discovering and populating, at one time or another, every habitable island in the Pacific mark them as the most daring deep-sea voyagers the world has ever known. In spite of having tools made of stone or shell only, they fashioned large double-keeled ships which they stocked, like arks, with food-plants and animals, and then transported themselves and their women into the unknown. True, there are islands at intervals along the route which they almost certainly took from the eastern end of Asia to the nearer islands of Polynesia, but even these voyages entailed a week or two at sea, while islands like Hawaii and New Zealand took longer to reach. There is some controversy as to whether these emigrants travelled through Micronesia or Melanesia, the inhabitants of both showing certain cultural affinities with the Polynesians, but the author considers that evidence points rather to the northern route, with what one might call a backwash to the marginal islands of Melanesia from Samoa.

After discussing his reasons for assuming the Micronesian route, the author describes the ships used by the ancient Polynesians as compared with their present-day canoes, and again emphasizes their skill and courage in facing the unknown. Their navigation was aided by a knowledge of the stars and an extensive study of the weather, in the forecasting of which they were, and still are, adepts. The colonizing of the new lands presented increasing difficulties as they forged farther afield, for not only was the terrain different, coral atolls replacing the fertile volcanic islands, but also the supplies of food plants they brought with them must have been running short and there was no food for their animals. Colonization in these circumstances was no mean task, and although they eventually reached the more fertile lands of Polynesia proper, they might not have been able to profit much at first from them owing to the lack of plant and animal stock. Whatever their route or methods, however, the fact stands out that these intrepid people established themselves throughout the Pacific islands as far even as Easter Island. It is also possible that they reached South America, while their own traditions indicate that they penetrated into the Antarctic.

Following this introduction, the author treats of Polynesian ways of life first in pre-European times and then in the difficult transition days of early contact with their conflicting cultures, and finally in the present day. In a short appendix there is a brief account of each of the principal island groups, and the paper is illustrated by a map and excellent photographs, and accompanied by a bibliography.

K. RISHBETH.