

BOOK REVIEWS

Scheiddeger, A. E.: THEORETICAL GEOMORPHOLOGY, 436 pp. London: Allen & Unwin, 1970, UK£9 15s.

The second edition of this book has several rewritten sections and chapter 5, on drainage basin development, is almost completely new. The book starts with an introductory chapter describing a wide variety of landforms. The descriptions are inevitably brief and it is difficult to see the relationship between this section and the main body of the book in which slopes and geomorphic processes are discussed in terms of geometry, statistical mechanics and the laws of physics. This brevity has inevitably produced some misleading descriptions. Section 1.94 for example, in a treatment of "karsts and caves" in about 200 words, shows four block diagrams of karst landscape development which might be appropriate to tropical cockpit karst, but are certainly not generally valid. One may level numerous other criticisms of the same kind for the treatment is seldom related to field examples, does not treat the complexity of landforms with their varied history and changing influence of processes, and is often scarcely recognisable as geomorphology.

The theoretical aspect of discussion is by far the most important part of the book, and unique of its kind. If the variety of geomorphic phenomena are ever to be understood in the same terms as the physicist understands the phenomena with which he deals then there is little doubt that this book is the pioneer text in its field. A confirmed field man may perhaps be forgiven for wondering if the complexity with which he is everyday confronted will ever be resolved into the terms of the physicist, even if studies of some aspects of drainage basins have shown themselves to be amenable to statistical analysis. Nonetheless every professional geomorphologist will need to look closely at the assistance mathematical treatment can give to the unravelling of geomorphic problems, and this volume is his guide book.

M. J. Selby.

Tuan, Yi-Fu: THE HYDROLOGICAL CYCLE AND THE WISDOM OF GOD, A THEME IN GEOTELEOLOGY. xiii + 160 pp. Toronto: University of Toronto Press (University of Toronto Department of Geography Research Publication No. 1), 1968.

Discussion of earth processes contained in such works as John Ray's treatise *The Wisdom of God Manifested in the Works of Creation* (1691) which laid the basis of eighteenth century "physicotheology", or William Paley's *Natural Theology* (1802), is frequently dismissed by earth scientists as unscientific, or, at best, regarded as amusing, fumbling, pre-scientific attempts at explanation. But this represents a failure to comprehend the nature of eighteenth century scientific thought. As Yi-Fu Tuan remarked "Not only was there no sharp distinction then between natural theology and science but scholars who wrote on the theme of the water cycle within the context of a physico-theological treatise actually contributed to it."

With liberal use of quotations from a variety of English and Continental writers over the period 1700-1850, Yi-Fu Tuan examined the development of the concept of the hydrologic cycle. The harmony, inter-connectedness and "beautiful economy" of the earth's physical processes demonstrated the unity of nature created by a provident God for the benefit of man. But there were considerable variations in interpretation of the actual processes involved. How much water? (The causes of aridity do not seem to have been considered much until the nineteenth century). How much river flow could be attributed to rainfall? What was the role of winds in the circulation of water vapour? And what of water within the earth? And the nature of erosion by rain and rivers? These are questions still being asked by earth scientists. And although the hydrologic cycle itself may now seem to be too loose

and generalised a concept to be of great use, nevertheless, it does convey the idea of a dynamic cycle of earth processes, however varied the pattern and whatever the sequence. Such a dynamic attitude to earth processes was very much part of eighteenth century science. Although the ultimate aim was the demonstration of the wisdom of God, the concept of the hydrologic cycle was developed during the eighteenth century by rational, scientific attempts to ascribe some order to the explanation of the variety of physical processes observable in nature. Yi-Fu Tuan has done a considerable service to the history of the earth sciences in gathering together in this one volume a summary of the major contributions to the development of the concept of a hydrologic cycle.

Evelyn Stokes.

Small, R. J.: THE STUDY OF LANDFORMS, 486 pp. London: Cambridge University Press, 1970. U.K. 90s.

The growth of geomorphology in recent years has been such that any introductory textbook cannot be expected to touch on all aspects of the subject. Dr Small has chosen to omit many features of macro-geomorphology—volcanism, orogenesis, plate tectonics—from his discussion, and has used a number of areas as case studies which enable him to show the complexity of landforms, and the necessity of a multiple hypothesis approach to the subject. The areas from which detailed examples are drawn are mainly in southern Britain, the Isle of Arran, the Grandes Causses of Southern France and the Val d'Hérens of Switzerland. This emphasis is very useful for people living in southern England who can reasonably expect to be able to study a number of the examples in the field, but it is unlikely to commend the book to a wide audience for class use.

This book is intended for use in sixth forms and by students in introductory courses at university. It has few errors in the text, is well printed with clear type and plates, and the diagrams are easy to follow. The emphasis on measurement, experiment, scientific hypothesis testing and the uncertainties in many hypotheses is welcome. *The Study of Landforms* should find its way into many libraries used by geomorphologists.

M. J. Selby.

Herbert, W.: ACROSS THE TOP OF THE WORLD, 209 pp. London: Longmans, 1969. U.K. 36s.

This book is an account of the British Trans-Arctic Expedition, by its leader. The 3600-mile journey by dog-sledge across the shifting floes of the Arctic sea ice is claimed, and probably rightly, to be the last major pioneer journey on Earth. It is almost certainly the longest sledge journey ever undertaken and it would have been quite impossible without the airdrops of the R.C.A.F. and R.A.F. and the final pick up by helicopters from H.M.S. *Endurance*. Much of the journey took place in semi-darkness with temperatures as low as -55°F . The four travellers depended greatly on the patience of the fifth expedition member, Sqn.-Ldr. Church, on continuous radio watch at Point Barrow, and on the skill of pilots and navigators who found the expedition amongst the wilderness of floes and pressure ridges. That they were found is also a tribute to the expedition's own navigational accuracy.

The book is well written, although it might have been improved by leaving out some of the introductory sections on early polar explorations. The photographs are good, and the interest of the reader is maintained throughout.

M. J. Selby.

BOOK NOTICES

Jeffreys, Sir Harold: THE EARTH, ITS ORIGIN, HISTORY AND PHYSICAL CONSTITUTION, 5th edition. 525 pp. London: Cambridge University Press, 1970. U.K. 140s; US\$22.50.

The Earth is an outstanding example of the power of applied mathematics. On the basis of Newtonian dynamics, classical elasticity and the conduction of heat, Jeffreys has constructed a model of the interior of the Earth which successfully explains many of the seismological and other data of classical geophysics. The fifth edition of this book is remarkable for the way it is able to use data derived from satellite orbits to show the presence of the long wave undulations of the geoid which Jeffreys had predicted, from spherical harmonic analyses of early land and sea observations of gravity, in an earlier edition. In this edition the analysis which concludes that continental drift and mantle convection cannot occur in the Earth's present state, though their existence in an earlier fluid state is admitted, will provide many geologists with testing challenges at a time when so many are already accepting plate tectonics and a mobile crust as geological axioms. The fifth edition of this work in no way diminishes the significance that this book has for all Earth

Degens, E. T., and Ross, D. A. (Editors): HOT BRINES AND RECENT HEAVY METAL DEPOSITS IN THE RED SEA, 600 pp. Berlin, New York: Springer-Verlag, 1969. Dm 128.

Within the Red Sea rift have been discovered three morphological deeps containing hot and saline waters. Water temperatures as high as 56°C and salinities of 256 parts per thousand (compared with normal Red Sea salinities of 40 parts per thousand) occur in water bodies up to 200 m thick. The water and underlying sediment are generally devoid of life, and the sediments have high concentrations of metal ions and are very brightly coloured. This unique set of circumstances is discussed in 50 papers with contributions by 70 authors. The approach is interdisciplinary. The papers are grouped: geological and geophysical setting; water; organisms; sediments; economic and legal implications; and there is a very useful final summary chapter. The papers not only contribute to the conclusion that the brines contain chemical components from bedded evaporites, shales and juvenile igneous constituents, but suggest that the present conditions represent either a unique set of environmental and geological circumstances or a transient phase which in other deposits has been destroyed by subsequent events. The book raises doubts about present theories on the origin of ancient marine metalliferous deposits and provides a useful handbook on the entire Red Sea area.

Wright, H. E. (Editor): QUATERNARY GEOLOGY AND CLIMATE, 162 pp. Washington: National Academy of Sciences, 1969. US\$15.75 (paperback); US\$18.25 (library binding).

This book is Volume 16 of the Proceedings of the VII Congress of the International Association for Quaternary Research, held at Boulder, Colorado, in 1965. The 23 papers it contains are divided into four groups: climatic change; glacial geology; nonglacial geology; coastal geology. The topics discussed under these headings are extremely varied—ranging in the first group from "Geographical regions and zones in the Quaternary" to "The water budget of a prairie water hole." Equally varied is the standard of presentation so that Kaiser in his paper "The climate of Europe during the Quaternary Ice Age" presents an extensive review of 17 pages with about 150 references, but Markov dealing with the geographical zones of the Earth in the Quaternary provides two pages of unsupported comment with no references. In spite of the obvious difficulties of assembling papers by contributors of several nationalities the publishers have succeeded in presenting a very useful volume.

Strahler, A. N.: EXERCISES IN PHYSICAL GEOGRAPHY, 320 pp. New York: Wiley, 1969. A\$5.20.

This manual of laboratory exercises is intended for use with Strahler's *Physical Geography*, 3rd edition, although it could easily be used with other texts. It consists of about 100 exercises on 29 major topics. The topics include: the shape of the earth; map projections; time; tides; climatology and geomorphology. There is one exercise on soil textures but none on biogeography. The exercises vary from calculations and plotting of data on charts and graphs to the writing of paragraphs. On each topic the basic data are supplied and the student is required to write his answers on charts or in spaces which are supplied. All pages are punched and are easily torn out for storage in a folder. Two colour printing is used throughout the text and each section is well arranged and clearly set out. There is an instructor's edition for the manual in which answers to all of the questions are printed in green. The arrangement of the book is such that a teacher can choose individual exercises or adopt the whole course, and the answer sheets could be used to allow students to correct their own work. The price will probably prevent the issuing of this manual to classes but many teachers will find it a valuable source of ideas on practical work and a useful method of training students to think for themselves.

Tricart, J. (translated E. Watson): GEOMORPHOLOGY OF COLD ENVIRONMENTS, 320 pp. London: Macmillan, 1970. UK80s.

This book first appeared in French in 1963 and has been translated from a revision, by Professor Tricart, in 1968. The book has three parts. Part one is concerned with the extent of frost climate phenomena at the present and during the Quaternary. Part two is a discussion of periglacial processes and phenomena in which the main topics are: frozen ground and soil processes; microrelief caused by frost; slope development; and the action of fluvial, wind and coastal processes. Part three is the largest part of the book and discusses glacier dynamics, rudimentary forms (i.e. snow, névé, and cirques), glacier beds and valleys, the ice margin and its deposits, the morphogenetic effects of multiple glaciation; and the final chapter discusses the indirect effects of glaciations—especially glacio-eustatic changes and glacio-isostatic warping.

At a time when many students of geomorphology have a background in science rather than the arts, and hence little ability in foreign languages, a translation of the work of a leading French geomorphologist is very valuable. It gives access to ideas in the French, German and Russian literature which are otherwise inaccessible to many students. The translation is very easy to read, and although the text could be better illustrated, this is no fault of the translator.

Zaruba, Q; Mencel, V.: LANDSLIDES AND THEIR CONTROL, 205 pp. London: Elsevier, 1969.

There are very few books in the English language discussing landslide investigations and practice. This book not only adds to the literature, especially by numerous case studies, but gives access to the considerable Czech literature on the subject. The authors stress the interrelated roles of soil mechanics and geological investigations of slope stability, and are sensibly critical of the inadequacies of static analyses of complex dynamic geological conditions. In the chapter on rock and soil mechanics as related to landslides the following topics are mentioned: mobilisation of shearing resistance and progressive failure of slope materials with increasing deformation of a slope; influence of ground water; and influence of the state of stress. The emphasis throughout the book is on the geological background and the author's classification of landslides is based primarily on the type of materials involved and secondarily on the type of movement. The section on control of landslides is comprehensive but brief.

Ollier, C.: WEATHERING, 304 pp. Edinburgh: Oliver and Boyd, 1969.
UK£4 5s.

There has long been a gap in the geomorphological literature on weathering processes and resulting landforms. This book has gone a long way toward filling it. That there are over 400 references in the bibliography at once marks this work as being an original and significant contribution to the literature. In spite of the title the book is primarily concerned with the effects of weathering as expressed in landforms. The chapter headings include: physical weathering, chemical weathering, biotic weathering, mineral weathering, clay minerals, rock weathering, hydrology and weathering, climate and weathering, deep weathering, soils, weathering and the evolution of landforms, weathering rates, weathering through geological time; the last chapter, which is in essence an appendix, describes a few of the laboratory techniques used in analysis of weathering products.

Because the processes of weathering are associated with investigations in many branches of science the book represents an eclectic viewpoint rather than a central theme. Hence it calls on contributions from soil science, hydrology, climatology, geology, chemistry and physics. The necessity to call on examples from many disciplines has made it a very difficult book to write and the text is sometimes lacking in a smooth flow of words but the deficiencies in style are adequately compensated for by the usefulness of the compilation.

Twidale, C. R.; Foale, M. R.: LANDFORMS ILLUSTRATED, 154 pp. Melbourne: Thomas Nelson (Australia) Ltd., 1969. A\$4.95.

This volume is a collection of vertical, oblique and horizontal photographs with accompanying sketch-maps, block-diagrams and extracts from survey maps—the latter in full colour. The illustrations are arranged in topics which include: simple geological features, hillslopes, landforms associated with flat-lying strata, tilted and folded strata, joints, tors, inselbergs, karst, faulting, volcanoes, weathering, mass movements, rivers, accelerated erosion, desert plains, glaciation and coasts. Most of the examples are from Australia with a few from New Zealand and Antarctica. The text is brief but the illustrations are so clear and well produced that they can speak for themselves. The large size of the page (28 x 32 cm), has allowed space for many well-produced stereo-pairs of photographs. The book is clearly meant to be used in conjunction with a textbook, and it may provide a very useful source of materials for practical work. The level of presentation makes it suitable for upper forms of schools and first-year university work. The authors and publishers are to be congratulated on providing such excellent materials at a very reasonable price.

The SECOND CIRCULAR of the 24th International Geological Congress is now being prepared. Over 6900 geologists have mailed their application forms from the FIRST CIRCULAR. If you have not, you will NOT receive the SECOND CIRCULAR as the IGC computer does not have your name in its memory. Send your completed questionnaire NOW to the Secretary General, 24th IGC, 601 Booth Street, Ottawa, Canada.

INTERNATIONAL UNION FOR QUATERNARY RESEARCH (INQUA)

The IX INQUA Congress is to be held in Christchurch from 2 - 10 December, 1973. This will be only the second time the congress has been held outside Europe. The 1973 Congress is being organised by a committee under the chairmanship of Prof. Maxwell Gage, with Prof. Jane M. Soons as secretary.

INQUA seeks to bring together those working on all aspects of the Quaternary — from tectonics to human pre-history, and so its scope is far wider than can be covered by any one scientific discipline. Accordingly each country belonging to INQUA sets up a National Committee for Quaternary Research — in New Zealand it has been set up by the Royal Society, the present chairman being Dr R. P. Suggate, and the secretary Mr C. G. Vucetich.

INQUA attempts to stimulate co-operation on particular topics through the organisation of commissions and subcommissions, some for regional purposes, others concerned with world-wide problems. New Zealand has representatives on several of these groups, and in addition Prof. Soons is a Vice-President of INQUA. The principal commissions of interest to New Zealand are those concerned with Quaternary Stratigraphy (with subcommission on stratigraphic nomenclature and the lower boundary of the Pleistocene), Tephrochronology, Neotectonics, Shorelines and Quaternary Biology.

It is hoped that all those interested in New Zealand's Quaternary history will be able to participate in the 1973 Congress, and that important contributions will be forthcoming. It is anticipated that New Zealand's key geographical position and its complex Quaternary history will attract several hundred participants.