BOOK REVIEWS

Stokes, W. L.; Judson, S.: INTRODUCTION TO GEOLOGY: PHYSICAL AND HISTORICAL, 530 pp. New Jersey: Prentice-Hall, 1968.

Designed for use in a one-term introductory course at Houston, this book is a combined and abbreviated version of the authors' two previous texts, "Physical Geology" and "Essentials of Earth History". They set out to cover the whole fabric of geology, except for systematic palaeontology. The chapter headings thus cover a very wide spectrum, namely the Earth in Space; Matter and Minerals; Weathering; Igneous, sedimentary and metamorphic rocks; Earthquakes and Earth's interior; Crustal deformation and mountain building; Running and underground water; Glaciers, mass movement and wind; Oceans and shorelines; Time in geology; Early history of the Earth; Origin of life and meaning of fossils; Keys to the past; Early and late Paleozoic periods; the Mesozoic era; Tertiary period; Man and the Great Ice Age; Continental drift; Natural resources; and Astrogeology. There are appendices dealing with the elements, mass and energy, powers of 10 and the metric system, minerals, and maps. There is also a 30-page glossary with quite full definitions of approximately 1000 terms, and an index.

With such a wide range of subject matter, coverage is necessarily superficial. The authors obviously realise this and have taken pains to give the maximum possible depth in the available space. An intelligent student using this book carefully would get a good overall appreciation of the science, and a selected bibliography is given at the end of each chapter. The authors have selected the controversial and stimulating topic of Continental Drift for more detailed consideration, as an example of the many challenging frontiers of geology. They have also chosen to bring the book right up to date space-wise, in their treatment of the solar system, the cosmic origins of the earth, and lunar and planetary geology. As well as providing topicality, of course, these parts of the book will necessarily go out of date fairly quickly.

The book is beautifully bound and printed, with few printing errors — "desiccation" swings between the double "s" and the double "c". The copious illustrations are on the whole very well designed and chosen, although there are a few that are superfluous. The level of the book is a little below that set in the full-year introductory courses used in New Zealand Universities.

P. F. Ballance.

Larsen, G.; Chilingar, G. V. (Editors): DIAGENESIS IN SEDIMENTS: DEVELOPMENTS IN SEDIMENTOLOGY 8, 551 pp. Amsterdam: Elsevier, 1967.

Almost exactly 100 years after the first introduction of the term "diagenesis" to designate the processes acting on sediments after their deposition, the publication of the present volume marks a significant step in the evolution of this particular branch of sedimentology. The "information explosion" of the last two decades has been especially violent in this field. Coverage in general texts of sedimentary petrology has been scanty, making lengthy forays into the literature necessary. Now that much of this mass of knowledge and opinion is in the one volume, the job of those who will contribute to the next phase of the explosion is that much easier. In many ways knowledge of diagenesis is still only rudimentary. Apart from the descriptive work from thin sections, which is well advanced, other aspects of the subject — experimentation, investigation of modern sediments in piston cores and drill holes, knowledge of the chemistry and physics of diagenetic processes — have hardly begun. The next decade should see further significant advances in our understanding of diagenesis.

Meanwhile the present book presents a formidable body of facts, from 13 authors. The Editors' introduction, and the next chapter by R. W. Fairbridge (Phases of Diagenesis), present a general coverage. Succeeding chapters deal with individual aspects: Diagenesis in Sandstones (E. C. Dapples), in Argillaceous Sediments (G. Muller), in Carbonates (G. V. Chilingar, H. J. Bissell, K. H. Wolf); Silica as an agent in Diagenesis (Dapples); Diagenesis of Organic Matter (E. T. Degens), of Coal (M. Teichmuller, R. Teichmuller), in Sedimentary Mineral Deposits (G. C. Amstutz, L. Bubenicek), of Subsurface Waters (Degens, Chilingar); and finally Interstitial solutions and Diagenesis (W. von Engelhardt). The extraordinary length (150 pages) of the Carbonate chapter is a reflection of the current surge of interest in these rocks, especially as a concurrent member of the series, "Carbonate Rocks, Developments in Sedimentology 9", itself runs to two volumes.

Pleasing features of the book are the cosmopolitan authorship, chiefly from America and Western Europe, and the extent to which German and Russian work is quoted. Other languages are much more sparsely represented in the reference lists, but this seems merely to reflect the preponderance of work done by English-speaking, German and Russian authors. The coverage of topics is wide, and on the whole even. Many chapters have a glossary of terms.

One minor criticism of the book concerns the index, which could have been more specific. Anyone wishing to look up the topic of authigenic feldspar, for instance, will find 53 page references for "authigenic" and 45 for "feldspar", but no specific reference to "authigenic feldspar".

This book, then, contains a vast amount of information and a host of references. It is primarily a research tool, and will be an indispensable reference for sedimentologists. Advanced students will find in the introductory two chapters a much more up-to-date and comprehensive survey of diagenesis than in any general text.

P. F. Ballance.

Bayly, Brian: INTRODUCTION TO PETROLOGY, 371 pp. New Jersey: Prentice-Hall, first edition, 1968.

This is an introductory text on igneous, sedimentary and metamorphic petrology suited to first- and second-year university students in geology. Unlike many introductory texts on this subject, this is not a book of descriptive petrology and petrography, but a readable account of the principles, methodology and assumptions that underly the present comprehension of this science. The author sees in this subject many examples that illustrate the principles of modern scientific philosophy. He states in his preface ". . . another feature consistent with the purpose of this book is the attention paid to the procedures of science. The segregation of fact from hypothesis on the one hand and methodology on the other hand is attempted; and the general topic of classification is repeatedly discussed . . . ." The author considers classification to be a basic human process and very clearly outlines the methods of classification and the often-overlooked difference between genetically and descriptive-based definitions in classification systems.

The book is organised into five parts. Part One deals briefly with the physical properties and processes thought to affect rocks within the crust of the earth. Part Two outlines the form, texture, classification and nomenclature of magmatic rocks, and contains a well-presented discussion on trends and associations in magmatic rocks, binary systems and their application to petrogensis, and the physics of magmatic processes. Part Three on sedimentary rocks covers observable features in sediment formation, classification and nomenclature, and chemical and physical aspects of rock genesis. Part Four on metamorphic rocks discusses varieties of metamorphism, classification and nomenclature, the products, reaction conditions and movement of material in metamorphism, veins and veining, and metamorphism

and magmatism in geosynclines. Each of these three parts is concluded with a chapter on methods of study. Part Five consists of the following appendices: data tables, igneous rock nomenclature, use of Norms, peritectic relations and Bowens discontinuous reaction series, and the use of triangular diagrams. The book concludes with a list of references used in the text, an annotated guide to further reading and a comprehensive index.

The author has written a very readable and useful book. The introduction to chemical and physical systems considered to be involved in petrological processes should be easily understood by most students with a background knowledge of the related sciences. The author can be criticised for some of his illustrations which are either not sufficiently self-explanatory or have an accompanying caption which is too brief. Some of the figures (other than the line graphs and phase diagrams) are rather sketchy and lacking in artistic appeal (e.g. Figure 5 - 3). It was annoying to find detailed discussions of phase diagrams on a different page to the relevant figure, so that both could not be read together. The author may assume too much of his reader's knowledge of mineralogy for an introductory text. Unfortunately there does not appear to be any reference in the text to the brief section on mineral varieties and formulas hidden in Appendix One. Finally, the lack of reference to field examples of the petrological features described, although explained in the preface, robs the student of some of the reality of this science. Unfortunately, not all students are placed in a situation where they have available suitable local examples for study.

Despite the above criticism this book has a refreshing, honest presentation and is to be recommended as a text.

P. J. Tonkin.

McAlester, A. Lee: THE HISTORY OF LIFE, 152 pp. New Jersey: Prentice-Hall, first edition, 1968 (paperback)

and

Eicher, Don L.: GEOLOGIC TIME, 150 pp. New Jersey: Prentice-Hall, first edition, 1968 (paperback).

These two books are part of a 10-volume "Foundations of Earth Science Series", edited by A. Lee McAlester of Yale University. The editor in his introductory preface states " . . . that elementary textbooks have too long reflected mere traditions in teaching rather than the triumphs and uncertainties of present-day science." and that " . . . the Foundations of Earth Science Series has been planned to provide brief, readable, up-to-date introductions to all aspects of modern Earth Science." The authors of these two books have achieved their intention by producing two interesting, readable, well-illustrated books that would encourage any student to seek further knowledge in these subjects.

McAlester in his book draws together relevant information from modern biology and ecology to help us to understand the ever-changing pattern of life on our planet; from the first simple microcosm in Precambrian seas, through the transition of plants and animals from the sea to the land, the changes in the structure and form of land plants, the development of reptiles and mammals, finally bring us to the advent of man himself. The author is more concerned with giving a general idea of the relationships of different groups of plants and animals, and their morphological and physiological adaptions that better fitted them to survive a changing environment, rather than submitting his reader to vast lists of formidable nomenclature and laborious details.

Eicher in his book discusses the history of the concept of geological time from medieval myth to modern radiometric dating. He discusses; the stratigraphic record, the subdivision of this record, the founding of geologic systems and the

understanding of time and stratigraphic units. There are also sections discussing: physical correlation and paleogeography, biostratigraphy, and radiometric dating methods.

Both of these books are to be recommended as introductory texts for first- and second-year university students in both biological and geological sciences and also the general reader. One comment on the separate presentation of each book in this series is that it could prove expensive to anyone contemplating buying the complete set.

P. J. Tonkin.

Zenkovitch, V. P. (Edited by J. A. Steers, assisted by C. A. M. King, translated by D. G. Fry): PROCESSES OF COASTAL DEVELOPMENT, 738 pp. Edinburgh: Oliver and Boyd, 1967. UK£12 12s 0d.

This book was originally published in Russia in 1962 when it won the Lenin Prize for its author. This superbly produced, lavishly illustrated book is possibly the most important publication on coasts since D. W. Johnson's *Shore Processes and Shoreline Development* (1919), not only because it uses modern quantitative approaches where they are appropriate to the subject, but also because for the first time, a large body of literature is made available to the English-speaking world.

The author begins with an analysis of shore processes, principally within the temperate zone, and then discusses the morphology of coasts in vertical section and in plan, and includes chapters on research methods and tasks for the future. Most of the examples are drawn from the enormous coastline of the U.S.S.R., but, where appropriate examples can only be found elsewhere, Zenkovitch draws on English, French and German language literature. Throughout the book the emphasis is on the dynamic equilibrium between forms and processes, and upon the role of waves in transmitting energy into the coastal environment.

The price of the book may deter some, but few books are likely to produce such a mine of information to the English-speaking geomorphologist and engineer. This is one work which should be in every appropriate library.

M. J. Selby.

Embleton, C.; King, C. A. M.: GLACIAL AND PERIGLACIAL GEOMORPHOLOGY, 608 pp. London: Arnold, 1968. UK70s 0d.

This book was written in the belief that "the need to collate and summarise the results of research, from time to time, is just as important as the need for research itself." The literature in this field is accumulating at such a rate that 10 years is not too short a period for a successor to Charlesworth's *The Quaternary Era.* The emphasis in this work is on landforms and processes of erosion and deposition, and no attempt has been made to give an account of Pleistocene geology, stratigraphy or chronology, and sea-level changes are also discussed only briefly. The first part of the book is concerned with the characteristics of glaciers and ice sheets — their physical nature, regimes and flow characteristics. Brief mention is made of the nature of ice ages, their causes and indirect effects. Part II gives an account of the erosional effects of glacier ice and meltwater; this section contains detailed comment on the well-known phenomena of U-shaped valleys and cirques. Part III discusses glacial and fluvioglacial deposition; it comments particularly on the detailed study of deposits and describes the usefulness of fabric analysis. Part IV deals with the periglacial environment and gives particular emphasis to weathering processes, permafrost and solifluction. Each chapter has a bibliography which emphasises recent work and incorporates references up to 1967. The text is well illustrated with maps and diagrams which are mostly taken from recent papers.

So enormous is the literature that a summary of even 600 pages has to be highly selective and the authors have chosen to restrict themselves strictly to the work implied by their title. As a result, the sense of interdisciplinary work on the Quaternary, which is such a feature of recent years, is missing, but geomorphologists will be glad that their contribution has been summarised so ably.

M. J. Selby.

Barnes, Hubert Lloyd (Editor): GEOCHEMISTRY OF HYDROTHERMAL ORE DEPOSITS. Princeton Conference on the Chemistry of Ore-forming Fluids (1964), 670 pp. New York: Holt, Rinehart and Winston, 1967.

The years since the publication in 1955 of a review of hydrothermal ore deposits in the 50th Anniversary volume of Economic Geology, have seen the waning of the traditional descriptive theorisation of geology and its concomitant replacement by quantification. "At last", the philosopher may be heard to say, "geology has come of age as a science and can now take its place with its cousins — chemistry and physics." But is the cloistered laboratory worker, or for that matter, the "armchair" geologist now to be regarded as the all-wise oracle ? The answer must be an emphatic no !

If this comprehensive and up-to-date review of the generation, transport, deposition, and residual dispersion of hydrothermal fluids has an overall message, it is that however much we may quantify, the interpretation of the results still depends upon the fundamental mineralogical, petrological, structural, and geological field relations which have always been the basis of good geology. Quantification, whether in terms of chemical compositions and variations, of isotope abundances and ratios, of mineral stability and solubility ranges, or of thermodynamics of mineral separation, all of which form part of the subject matter of this book, remains a tool of geological interpretation and not a magic wand.

Because of this emphasis, the book provides a concise but comprehensive introduction to the methodic techniques, the presentation and application of data, and the inherent fallibility limits of research topics, the details of which may be unfamiliar to the large body of active field geologists and petrologists, although the results may be directly applicable to their work.

The scope of the book includes: lead, oxygen and sulphur isotopes; the role of water and the production of aqueous magmatic fluids; single and multiphase systems involved in wall rock alteration, sulphide stability equilibria and interreactions, gangue mineral paragenesis, and mineral stabilities in solution, all of which restrict possible geological and chemical causes of extraction from source rocks and concentration as ore deposits. A most informative chapter deals with the ever-increasing but already vast literature on fluid inclusions, a topic somewhat neglected by both field and research geologists although it represents our major source of information on the composition of the original ore-forming fluids, and still has considerable dependence on qualitative data.

To New Zealand workers, the chapter on explored geothermal systems (by Dr A. J. Ellis — Chemistry Division, D.S.I.R.), and a section dealing with mercury and base-metal deposits and their associated thermal and mineral waters will be of particular interest because of the inclusion and comparison of data from Wairakei, Waiotapu, and Ngawha, with results gained from the studies of similar thermal areas in the U.S.A., Russia, Japan, Mexico, Italy, Venezuela, Philippines, Yugoslavia, Peru, Chile and Iceland.

Although the book is described by the publishers as suitable for a graduate course on the theory of ore formation, I consider it to have a far wider application. This is not only due to the sequential content of the book, but also to its presenta-

tion. Each chapter has an introductory statement, and most chapters have an excellent summary. All except the thermodynamic chapter divide the subject matter into a broad explanatory section followed by detailed quantitative examples, applications, or results. In addition, a wealth of information lies in the very large bibliographic reference sections (50 pages); in the many tables of physico-chemical properties of mineral species and systems, and trace analyses of rocks, minerals and fluids; and in the two appendices on specific volumes and fugacities of water, and ionisation in aqueous solutions.

For the research geologist and geochemist, the book provides a source of reference and suggests many neglected and potentially productive lines of research. The field geologist and petrologist will find the book an essential introductory manual to which he can refer for guidance in the application of results gained from perhaps unfamiliar fields of geochemical research.

D. N. B. Skinner.

Cushing, E. J.; Wright Jr, H. E. (Editors): QUATERNARY PALEOECOLOGY, 433 pp. New Haven: Yale University Press, 1967.

The book-jacket tells us, on the inside flap, that "this volume, the first on Quaternary pollen analysis and other paleoecological subjects to be published in this country, is based on papers presented at the VII Congress of the International Association for Quaternary Research in Boulder, Colorado, in 1965. The articles, contributed by 29 authors from 10 countries, range from the statistical to the geochemical in their approaches to Quaternary environmental history. Included are many charts, diagrams, pollen profiles, and maps, and a full bibliography for each paper. Of the two editors we are told that "Mr Cushing is assistant professor of botany and Mr Wright is professor of geology and geophysics and director of the Limnological Research Center at the University of Minnesota."

The papers are collected into the following four groups: Symposium on relations of the Late-Wisconsin Vegetational History of the Glacial Sequence in the Great Lakes region (6); Methodology (5); Regional studies (8) and Climate history (4); and they are concisely summarised by the editors (Cushing and Wright) in an eight-page introduction. The pollen analysis data are mainly from peats and lake deposits, an interesting exception being the investigation (in Czechoslovakia) of the loess series of Central Europe. A broad picture is given of the latter part of the Quaternary from the last interglacial through the post-glacial, illustrated from the relatively well-documented Great Lakes region of the U.S.A. with comparative data from the West and from Central America and also studies from England, Belgium, Germany, European Russia and Turkey.

The material stems mainly, then, from the two great continental areas of the northern hemisphere and the wide range of topics, together with the diversity of contributors, expose broadly the themes and problems related to the reconstruction of Quaternary history in terms of vegetation and climate. Interpretation still presents challenges to the palynologist, since there is often a lack of modern analogues to the fossil pollen assemblages. The effect on the "pollen rain" of filtration by the vegetation cover is discussed as is also the mixing of lake-bottom sediments by burrowing organisms. In discussion of climate interpretation there is no reference to use of oxygen isotopes, but in addition to vegetational reconstructions, some attention is given to other members of the biota. For example "fossil molluscs recovered from buried silt beds consist dominantly of species whose northern limits now lie in the —7°C mean annual isotherm but include a few species whose southern limit is near the 0°C isotherm. This, coupled with other physical and biotic data, suggests that the mean annual temperature within about 10km of the ice margin (U.S.A.) probably was about —3°C." By contrast with these periglacial conditions an English study, considering beetles as climate indi-

cators, finds that a last interglacial fauna is dominated by species of *Onthophagus, Caccobius* and *Oniticellus,* the last two genera having no living representatives in Britain today. "Of particular interest," says the author, "is the occurrence of the thermophilous carabid species *Oodes gracilis* . . . it appears to require an average July temperature of at least 1.5°C above that of Ipswich today." A last glaciation fauna contains a number of arctic stenotherms suggesting that the glacial climate of Worcestershire was in some way similar to arctic Europe of the present day. Brief quotations do not do justice to these discussions of paleotemperatures. A rather unusual topic in the methodology section is the subject of changes in the microchemical constituents of clamshells. These changes are hypothetically correlated with the destruction of forests by an agricultural economy, resulting in reduced concentrations of carbon dioxide in the soil and consequently in reduced rates of dissolution of alkaline earth carbonates from the soil matrix.

Radiocarbon dating is strongly featured, with some reference also to factors introducing sources of error. Of particular interest to New Zealand workers is the supporting evidence for an abrupt or rapid warming about 10,000 years ago. It is generally held that sea level was rising rapidly from this time to about 7000 years ago, and this may be reflected in New Zealand in areas subject to eustatic control. Radiocarbon dates from peats in the Hauraki Plains and at Wallaceville are consistent with this hypothesis. Related to this is the proposal by Neustadt (Russia) to date the Holocene from the Alleröd fluctuation which is a well-dated event, and which marks the beginning of this warming period.

The book is well produced, liberally illustrated with maps and diagrams, and has a useful index. It brings together English-language accounts of work of wide geographical range, illustrating the paleoecology of the full glacial, periglacial, interglacial and postglacial. It is thus an excellent source book for the preparation of short courses and seminars, and is a useful reference work for the Quaternary palynologist and geologist, the plant ecologist and the pedologist. New Zealand is well situated for the study of the Quaternary, is well stocked with pollen and spore-bearing deposits, and the book offers a useful reminder that our rich resources in lake deposits are as yet unexploited by the paleoecologist.

W. F. Harris.

Sparrow, C. J.; Healy, T. R.: METEOROLOGY AND CLIMATOLOGY OF NEW ZEALAND A BIBLIOGRAPHY, 64 pp. Wellington: published for the University of Auckland by the Oxford University Press, 1968. NZ$1.80.

Climatological material on New Zealand published over the last few years has been substantial in quantity with the result that Wallace's bibliography of 1964 has become outdated. Sparrow and Healy have replaced the American reference source with a bibliography of pleasing form, containing approximately 600 items classified into 16 main categories. In addition, the development of climatological and meteorological research in New Zealand has been amply summarised at the beginning of the review under the heading "General Comments". As the authors state, certain references can be considered under more than one heading. This is to be expected in any classification, yet in the reviewer's opinion it is odd to find Gluckman's work included in the category "Regional Climatology and Meteorology" but not in the section "Air Pollution and Urban Climatology". However, with the aid of the index of authors and the sub-categories no reference is difficult to locate.

Sparrow and Healy have to be thanked for producing so comprehensive a bibliography, one which will become an essential acquisition for any person with a serious interest in New Zealand's climate.

G. R. McBoyle.

BOOK NOTICES

Butzer, K. W.; Hansen, C. L.: DESERT AND RIVER IN NUBIA, 562 pp. Madison: University of Wisconsin Press, 1968. US$17.50.

When construction of the new High Dam at Aswan began in 1958, and threatened to submerge a 375-mile stretch of Nubia, UNESCO appealed for an attempt to salvage and record the cultural heritage of Nubia. The authors of this book were members of the Yale Prehistoric Nubia Expedition of 1962-63, and they extended their field work to the Kom Ombo Plain, north of Aswan, the Kurkur Oasis and part of the Red Sea Coast. Nubia is of outstanding importance because it forms part of the link between tropical Africa and the Mediterranean world. The theme of this book is the geomorphic evolution of southern Egypt, the changing environment of the area, and the relationships between human settlement and the past environments. The detailed study of deposits, pollen, morphology, soils and artifacts will ensure that this book becomes one of the major works on arid land geomorphology.

Martin, P. S.; Wright, H. E. (Editors): PLEISTOCENE EXTINCTIONS, 453 pp. New Haven: Yale University Press, 1967. US$12.50.

The late-Pleistocene extinction of over 200 genera of large land mammals is discussed in this volume of papers, which is Volume 6 of the proceedings of the VII Congress of INQUA. In his introduction Deevey declares that it is far too soon to reach an agreed solution to the problem posed by this sudden extinction and the following papers support this contention. Martin, particularly, suggests that man is almost entirely responsible and shows how on a world map (p. 114) the extinction pattern spread from Africa and southeast Asia to Australia, then to Eurasia, North America, South America, and lastly the isolated island groups of the West Indies, Madagascar and New Zealand. This pattern corresponds to the spread of prehistoric hunters. By contrast Guilday stresses that large herbivores demand more of an ecosystem than smaller animals and so suffer differential extinction which may be effected by local conditions although post-Pleistocene dessication is regarded as the prime cause. The other papers examine man, climatic with vegetation change, and combinations of causes. The book also contains an annotated list of vertebrate genera mentioned in the text.

Hamelin, L.-E.; Cook, F. A.: ILLUSTRATED GLOSSARY OF PERIGLACIAL PHENOMENA, 233 pp. Quebec: Les Presses de l'Université Laval, 1967. C$10.

This bilingual (English and French) monograph contains discussions of over 100 types of periglacial phenomena arranged under nine headings — ground ice, frost-shattering, nivation, floating ice forms, fluvial features, eolian forms, patterned ground, solifluction and frost churning. Most of the entries consist of a discussion, which may vary in length from a hundred to over a thousand words, and a photograph. Some entries have several photographs and some have line dawings. The text is not a French-English translation but the work of two authors, each putting his own point of view, so that the lengths of discussions vary and occasionally differences of opinion are evident. The book also contains an introduction which discusses the term "periglacial", a bibliography of 395 items, details of the source of the figures, and an index.

Hopkins, D. M. (Editor): THE BERING LAND BRIDGE, 495 pp. Stanford: Stanford University Press, 1967. US$18.50.

As early as 1937 Eric Hultén showed that Beringia, as he called the arctic lowland that must have been exposed during the Quaternary glaciations, must have been a refugium in which most arctic and many boreal plant species were isolated while much of northern North America and parts of Siberia were covered with glacial ice. Hultén also showed that Beringia had lain exposed as a land bridge during much of Riss and Würm times. In spite of the considerable increase in the data available since 1937, it is not possible to go much beyond Hultén's analysis. This volume, however, provides much of the data, shows where the gaps are, suggests areas for future research and poses some important questions. The book is a symposium of 24 papers arranged in four subject groups: geology, past environments, fossil evidence of migrations, and biographic reconstructions of Beringia. The authors come mostly from U.S.A. and U.S.S.R. The editor contributes a synthesis as the final chapter.

Mather, K. F. (Editor): SOURCE BOOK IN GEOLOGY, 1900 - 1950, 435 pp. Cambridge: Harvard University Press, 1967.

The editor has selected excerpts, from 65 articles by 63 authors, to represent the most important contributions to geological literature during the first half of the twentieth century. The excerpts are arranged in chronological order of the dates of birth of their authors, but a "Guide to Subject Matter" allows reference to subjects. The range of topics covered is large and includes crystallography, ground water and geophysics as well as the usually recognised branches of geology. The range of authors is also wide and includes such people as Vening-Meinesz, Bagnold, Rutherford, Libby, Penck, Davis, Mackin, Kay, Ahlmann, Chamberlin, Daly, Cloos, Gutenberg, Barrell, Fairbridge, Hess, Krynine and Bullard. Each excerpt is preceded by a brief biographical note on the author.

Wright, H. E.; Osburn, W. H. (Editors): ARCTIC AND ALPINE ENVIRONMENTS, 308 pp. Bloomington: Indiana University Press, 1968. US$12.50.

Volume 10 of the procedings of the VII Congress of INQUA contains 21 papers of which two are on climatology and glaciology, nine on ecology, and 10 on geology and geomorphology. The arctic region (north of the tree line) and the alpine region (above the tree line) have long been regarded as having such a similar environment, dominated by low temperatures, that they can be regarded as one unit. The papers in this volume, however, bring out the numerous differences between them resulting from differences in length of day, atmospheric density, solar radiation received at the ground, slopes, soil cover, runoff, erosion and microclimates. These physical factors produce a greater diversity of microhabitats for organisms in alpine, than arctic environments, and so support a greater variety of plant and animal communities as well as relics. By contrast the arctic regions have large areas of uniform terrain with few communities for the area, but each of these has a large population. The papers in the book vary in length from a virtual abstract of two pages to comprehensive reviews.

Eiju Yatsu: ROCK CONTROL IN GEOMORPHOLOGY, 135 pp. Tokyo: Sozosha, 1966. US$7.

This book is a compressed statement of the importance of chemical and physical properties in the disintegration and erosibility of rocks and soils. Most of the book is a review of investigations in rock and soil mechanics which are

relevant to geomorphology. As the book is dealing with fundamental, but largely unsolved, problems in rock dynamics it often poses more questions than it solves. It does, however, point out the sort of research which is needed, and particularly the way in which geomorphology should move away from landform description and classification towards studies of processes and causes. The book contains about 17 pages of references — many of which are not usually included in works on geomorphology. The author is particularly critical of the cycle theory approach and descriptive classifications such as C. F. S. Sharpe's classification of mass wasting.

Ward, R. C.: PRINCIPLES OF HYDROLOGY, 403 pp. London: McGraw-Hill, 1967. UK62s 0d.

This book is an introduction to physical hydrology for geography students. As such it ignores applied aspects of the subject as being the province of engineers, and it uses an entirely non-mathematical approach. The author deals in separate chapters with: precipitation, interception, evaporation, evapotranspiration, soil moisture, ground water and runoff. Of particular value are the large number of examples taken from British and European sources and also the excellent review of English language literature. Weaknesses spring from the lack of mathematical approaches and from the decision to avoid applied aspects of the subject so that such a subject as "runoff", which is of great interest to many geographers, is dealt with far too briefly.

Szafer, W. (Editor): THE VEGETATION OF POLAND, 738 pp. Oxford: Pergamon; and Warszawa: PWN, 1966. UK£6.

The wealth of information summarised in this publication is indicated by the 53-page bibliography which mainly cites works in Polish. The seven authors discuss: the historical development of plant geography in Poland; factors affecting plant distribution in Poland; the influence of man; floristic statistics and elements of the Polish flora; a review of terrestrial and fresh-water plant communities; vegetation of the Polish Baltic; cultivated plants and geobotanical divisions. As a meeting ground of Holarctic and Mediterranean elements, Poland has a relatively rich flora from diverse sources, but it is poor in endemics. The text also brings out the considerable variety of environments within the region, although there are now few undisturbed natural communities. Since few English-speaking botanists and geographers are familiar with the Polish language the Pergamon Press has performed a major service by publishing this book at a reasonable price.

Rankama, K. (Editor): THE QUATERNARY Vol. 2: THE GEOLOGIC SYSTEMS, 447 pp., London: Interscience, John Wiley, 1967. UK155s 0d.

Quaternary studies now cover so many disciplines and there is such an enormous literature that extended review articles are very important for many workers who wish to retain contact with recent developments. By producing their *Geologic Systems* series Interscience Publishers are doing much to remedy this problem.

Volume 2 of the Quaternary contains four reviews: R. G. West on the British Isles, Marie-Henriette Alimen on France, Paul Wolstedt on Germany, and Jan de Jong on the Netherlands.

West deals particularly with the regional stratigraphy, relative land and sea level changes and history of the flora and fauna. Alimen is particularly concerned with the Paris Basin, the Pyrenees, Alps and Massif Central. Woldstedt discusses the three contrasting regions of Germany: the lowlands of the north, the alpine area

of the south and the non-glaciated corridor of central Germany. The Netherlands has less lateral variation but a complicated stratigraphy which is admirably summarised.

Sissons, J. B.: THE EVOLUTION OF SCOTLAND'S SCENERY, 259 pp. Edinburgh: Oliver and Boyd, 1967. UK63s 0d.

This book is the first since Geikie's classic *The Scenery of Scotland* to offer a detailed account of the development of the landforms of Scotland. The book has 12 chapters which fall into four sections. The first part of only 28 pages covers the whole of the preglacial evolution. The second part consists of about half of the book and deals with the effects of glaciation. The many examples of glacial erosion and deposition are illustrated by maps and plates. The third part deals with changes of sea level and relies heavily on the original researches of the author and his students.

The final chapter forms the fourth part of the book and is devoted to periglacial and postglacial changes — which include the effects of man on the landscape.

The book is well produced and illustrated and, although perhaps rather heavily weighted towards southeast Scotland, it provides a most valuable summary.

Anderson, J. G. C.; Owen T. R.: THE STRUCTURE OF THE BRITISH ISLES, 162 pp. Oxford: Pergamon, 1968. UK32s 6d (soft cover).

This book attempts to provide a background to the geological structure of the British Isles at a level suitable for undergraduates studying geology and geography. The introductory chapters discuss the structural framework and then the tectonic evolution of the Islands. Precambrian, Caledonian, Hercynian and Alpine terrains are described in that order and the book concludes with an account of the Tertiary igneous terrains. There is a very useful bibliography, an index, and there are 54 figures.

Moss, R. P. (Editor): THE SOIL RESOURCES OF TROPICAL AFRICA, 225 pp. London: Cambridge University Press, 1968. UK40s 0d.

This book is the procedings of a symposium on the soil resources of tropical Africa held in London in 1965 by the African Studies Association of the United Kingdom, with the addition of one chapter on tree crops. The papers are: J. L. D'Hoore — The classification of tropical soils; R. P. Moss — Soils, slopes and surfaces in tropical Africa; I. Langdale-Brown — The relationship between soils and vegetation; H. Vine — Developments in the study of soils and shifting agriculture in tropical Africa; E. Walter Russell — some agricultural problems of semiarid areas; H. L. Richardson — The use of fertilisers; C. W. S. Hartley — The soil relationships and fertiliser requirements of some permanent crops in west and central Africa. There is a summary of each of the papers in French.

Bird, E. C. F.: COASTS, 246 pp. Canberra: Australian National University Press, 1968. A$5.00.

This book is essentially a revised edition of Dr Bird's *Coastal Landforms* (1964) in a new format. It forms volume 4 of a new series of seven volumes on systematic geomorphology intended for undergraduates. The treatment is mainly descriptive, but processes are discussed where necessary. The emphasis is on the dynamic equilibrium between processes and forms and the cyclic approach is largely rejected. The book is well illustrated and has a lengthy bibliography.

Twidale, C. R.: GEOMORPHOLOGY: WITH SPECIAL REFERENCE TO AUSTRALIA, 406 pp. Melbourne: Nelson (Australia), 1968. NZ$1.20 (paperback).

This book is divided into four parts: There is a brief introduction to the nature and content of the subject; a second part deals at length with the geological background, tectonic and structural landforms; part three is concerned with processes — weathering, rivers and valleys, arid lands, coasts; part four deals with historical geomorphology, particularly with the Quaternary and the cyclic and non-cyclic development of landforms. There is a useful bibliography and a lengthy appendix on South Australia.

This abundantly illustrated text is unusual in giving much stress to tectonic and structural landforms — examples of which abound in South Australia. It also reduces the space given to glacial erosion and deposition when compared with older, and particularly Northern Hemisphere, textbooks. The level of treatment makes this a suitable book for first-year University classes and the extraordinarily good value for money will, no doubt, be appreciated by all students.

Caine, N.: THE BLOCKFIELDS OF NORTH-EASTERN TASMANIA, 127 pp. Canberra: Australian National University (Dept. of Geography Publication G/6), 1968. A$2.50 (paperback).

This research report is printed by the offset process on foolscap paper. It contains a detailed account of the blockfields with an emphasis on texture analysis and statistical treatment of the data. It is concluded that the history of the blockfields can be regarded as a sequence of four stages: (1) the raw material was derived by diverse processes amongst which are Tertiary deep weathering, glacial erosion, periglacial frost riving and interglacial weathering; (2) flow movement of the block rubble under Pleistocene periglacial conditions; (3) eluviation of the fines; (4) deposition of humic material between the blocks and weathering of the blocks.

Williams, P. W.; Jennings, J. N.: CONTRIBUTIONS TO THE STUDY OF KARST, 110 pp. Canberra: Australian National University Press (Dept. of Geography Publication G/5) 1968. A$2.50 (paperback).

This publication contains two papers: Williams — An evaluation of the rate and distribution of limestone solution and deposition in the River Fergus Basin, Western Ireland; and Jennings — Syngenetic Karst in Australia: Williams has made a study of water samples from one river basin and found that removal of dissolved limestone varies directly with discharge. Most of the solution takes place in the upper 8m of limestone where infiltrating water is not fully saturated. Solution by streams is most effective at the edges of limestone outcrops. Of outstanding importance is irregularity in time and place of the solution, and this may account for the pitted nature of karst relief. Jennings shows that the karst processes in the dune limestones of the south and western parts of Ausralia have gone on concurrently with the consolidation of the calcareous shell sand into aeolian calcarenite. Caves are well developed and are mostly the result of lateral solution at the water table and some of them, at least, have formed during the late Quaternary.

Fairbridge, R. W. (Editor): THE ENCYCLOPÆDIA OF ATMOSPHERIC SCIENCES AND ASTROGEOLOGY, 1200 pp. New York: Reinhold, 1967. A$39.75.

This work is Volume II in a projected eight-volume *Encyclopaedia of Earth Sciences.* It contains 400 articles contributed by 150 authors. The articles are

on three distinct levels: (1) broad introductory surveys; (2) review articles of recent research; (3) "building block" articles of definitions, formulas, facts and figures. The device of using lengthy essays means that the comprehensive index has to be used to find discussion of many topics, but the gain is considerable. The entry under "Meteorology" for example has 19 double-column pages and contains accounts of the composition of the atmosphere, the branches of meteorology, water vapour content of the atmosphere, atmospheric circulation, forecasting, history of meteorology, and meteorological instruments and networks. Other references in the encyclopaedia will amplify many of these accounts so that an entry "Weather map explanation", for example, will provide another five pages of detail for someone who wishes to follow up a reference in the section on forecasting. A few of the entries are very full. "Tree-ring" analysis, for example, has 18 pages of which 13 are maps, tables and diagrams.

The encyclopaedia is expensive, but contains far more information than many sets of conventional text books and is much better illustrated. It would be a valuable addition to any school, college or general library used by people with approximately school certificate or higher standards of education.

West, R. G.: PLEISTOCENE GEOLOGY AND BIOLOGY, 377 pp. London: Longmans, 1968. UK63s 0d.

Pleistocene studies involve palaeontologists, ecologists, stratigraphers, geomorphologists, palynologists, climatologists, glaciologists, pedologists and other earth scientists. With such a wide field few experts are able to acquire an understanding of the other fields of study and knowledge tends to remain compartmentalised. Dr West, who is Director of the Subdepartment of Quaternary Research in the University of Cambridge, has written this book, intended for third-year undergraduates, which covers most aspects of Pleistocene studies. Its contents include accounts of ice and glaciers, glacial geology, non-glacial sediments, the periglacial zone, stratigraphical investigations, biological investigations, land-sea level changes, chronology and dating, climatic change, Pleistocene successions, and two chapters on the Pleistocene of the British Isles. Nearly all of the examples are taken from western Europe and frequent reference is made to individual sites and to methods of research. Perhaps one of the most useful features of the book is the way it outlines the present state of knowledge and the problems which remain to be investigated. The book is well presented and illustrated.

Bird, J. Brian: THE PHYSIOGRAPHY OF ARCTIC CANADA, 336 pp. Baltimore: The John Hopkins Press, 1967. US$15.00.

This review brings together a large body of information from available published sources and field reports of work carried out under the auspices of the Geographical Branch, Canada, and the RAND Corporation; between 1948 and 1957. The area covered is mostly south of the Parry Channel. The first part of the book is concerned with the physical background — the Precambrian basement, the climate, glaciers, permafrost, soils and vegetation. The second part discusses the major episodes in landscape development — the origin of the pre-Pleistocene surfaces, drainage systems, glaciation and marine transgressions. The third part is concerned with present-day processes in the landscape and hence provides a valuable account of periglacial conditions. The book is beautifully presented, with numerous figures and plates and a comprehensive bibliography. It will obviously be the starting point for future researchers in the area.

Gillott, J. E.: CLAY IN ENGINEERING GEOLOGY, 296 pp. Amsterdam: Elsevier, 1968.

This book is a study of many facets of clay research and use. Written by a geologist with an interest in engineering, it discusses the origin, composition, fabric, chemistry, strength, moisture and products of clay, and their analysis by mineralogical and physical methods as well as engineering properties.

Dunbar, M. J.: ECOLOGICAL DEVELOPMENTS IN POLAR REGIONS, 119 pp. Englewood Cliffs: Prentice-Hall, 1968.

Professor Dunbar has written a short book to show that many nineteenth-century ideas of specific adaptation to temperature conditions are not the major problems of life at high latitudes, for adaptation appears to be easily accomplished. The basic problem is that of adaptation of the ecosystem as a whole to Pleistocene polar conditions which have provided an oscillating environment for plants and animals. Adaptation has had to be towards this oscillating environment and towards ecological stability. The book is also a demonstration that biology is developing not only at the molecular level but also at the ecosystem level. "The real forum of organic evolution is not in DNA nor in the cell, nor even in the individual organism, but in the forests . . . and oceans." (p.v.)

Maignien, R.: REVIEW OF RESEARCH ON LATERITES, 148 pp. Paris: UNESCO, 1966. US$5.00 (Available in N.Z. from the Government Printing Offices).

Laterites and related ferruginous deposits cover an enormous area of the tropics. The reason seems to be that laterite — and the variant bauxite — "is not uniquely identified with any particular parent rock, single way of formation, climate", or location. "It is rather a response to a set of regionally varying physico-chemical conditions which are still far from being fully known in their interaction." As a result there is an enormous literature on the subject containing many confusions. The author has attempted to assist in the solution of this problem by providing an analysis of characteristics, distribution, origin, classification and uses of laterites.

Eckardt, F. E. (Editor): FUNCTIONING OF TERRESTRIAL ECOSYSTEMS AT THE PRIMARY PRODUCTION LEVEL, 516 pp. Paris: UNESCO, 1968. US$16.00 (Available in N.Z. from the Government Printing Offices).

UNESCO is concerned with ecosystems because as the world's population expands, natural forests, grassland and lakes will be increasingly turned over to cultivation. In order to minimise the unfavourable consequences of this transformation much research must be carried out into the functioning of ecosystems. It has been evident for some time that biologists are much better able to study individual plants than to deal with the vegetation or the ecosystem, and that the real bottleneck was in the lack of a methodology. The July 1965 symposium, of which this volume is the proceedings, was called in Copenhagen to act as a forum for experts in micrometeorology, plant physiology and soil science. The proceedings fall into three parts: (1) the fundamental aspects of energy exchange; (2) research methods; (3) choice of experimental sites. The 45 papers are presented in either French or English, with a summary in the other language.

Acheson, A. R.: RIVER CONTROL AND DRAINAGE IN NEW ZEALAND, 296 pp. Wellington: Ministry of Works, 1968. NZ$9.00.

This review is an historical and technical account of its subject. It gives fairly detailed accounts of methods used in soil conservation and river control, and an outline of the administration of conservation and river engineering work in New Zealand. The book is well illustrated with a large number of photographs showing erosion and engineering works and structures.

Robson, D. A.: THE SCIENCE OF GEOLOGY, 272 pp. London: Blandford, 1968. UK 45s 0d.

This is a geology for the general reader or the "A" level student in Britain. Its outstanding features are a very readable text, a large number of excellent line drawings and numerous coloured plates of landforms, sections, and rock and mineral specimens. A number of coloured maps are also included.

Kirkaldy, J. F.: FOSSILS, 223 pp. London: Blandford, 1967. UK25s 0d.

This book is small enough to fit into the pocket, but large enough in content to please even the practised amateur geologist. The outstanding feature is the 80 pages of colour photographs, diagrams and maps . All this with the authority of Professor Kirkaldy behind it makes it a good buy.

NOTES FOR CONTRIBUTORS TO THE EARTH SCIENCE JOURNAL

Aims of the Journal

Articles and communications submitted for publication should be either reports of research or other original contributions of wide interest to those concerned with geology, geomorphology, pedology, climatology, oceanography and physical geography. Reviews and summaries of the present state of knowledge in the various branches of the earth sciences, and papers which explore the interrelations of these sciences and the boarders of traditional disciplines will also be welcomed. The journal will accept long articles but authors should consult the editor before submitting them.

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Contributions should be typed on good heavy-grade quarto paper, double spaced, with wide margins all round. The top copy and the top carbon copy should be sent to the editor and a third copy retained by the author. All matter to be printed in italic type (e.g. generic and specific names) must be underlined. Style and layout should follow "Selby, M. J., 1967: Aspects of the geomorphology of the greywacke ranges bordering the lower and middle Waikato Basins. *Earth Sci. Jnl.* Vol. 1, No. 1."

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A brief summary indicating the scope of the paper and its principal conclusions should be included at the beginning of all articles exceeding 1000 words in length. Contributions in languages other than English must have an English language abstract.

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————————1958: The Rim of the Pacific. *Geogr.J.* 124 (2): pp. 223-31.

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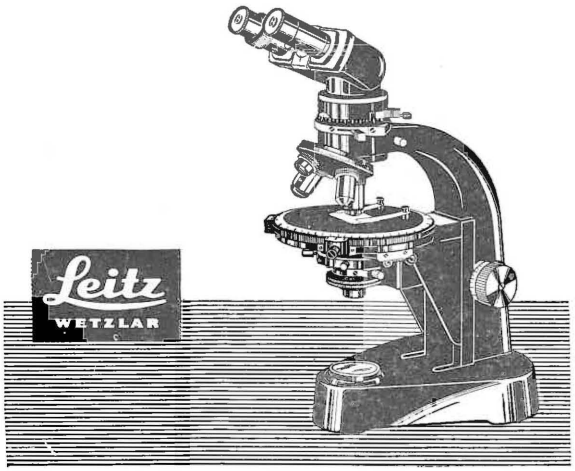

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