

BOOK REVIEWS

Duff, P. McL. D.; Hallam, A.; and Walton, E. K.: CYCLIC SEDIMENTATION, DEVELOPMENTS IN SEDIMENTOLOGY 10. 280 pp. Amsterdam, London, New York: Elsevier. 1967.

Few geological phenomena have given rise to as much speculation, and, it seems, been the subject of as much wishful thinking, as cyclic- or rhythmic-sedimentation. Messrs Duff, Hallam and Walton's review includes in the one book a full set of examples of the various cyclic sequences, and a critical appraisal of the basis on which the "ideal" cycle has been erected in each case. The examples are classified into Cycles in Fluvial Regimes, in Lacustrine Regimes, in Transitional Regimes, etc. For each cycle discussed, the lithologies and stratigraphical relationships are given in full. The book is therefore a mine of factual information, but it is made readable by the lively and critical commentary that runs through the chapters. No unwarranted assumptions, no uncritical conclusions, are allowed to pass unchallenged. This is where the review of this type demonstrates its superiority over the other type of book which is increasingly fashionable, namely the collection of articles around a common topic. With the whole book coming from the pen of one group of authors, especially when, as in this case, they all worked in the same institution, it is possible for the material to be woven around a central theme. The theme in this case illustrates the way in which the thoughts of the three authors have been moving in their various publications over the last few years, namely towards increasing objectivity in the treatment of cyclothems. This objectivity is displayed in two principal channels. Firstly, the authors emphasise the need for a sound statistical approach to the description and definition of cycles, and discuss the topic at some length. Secondly, they stress the increasing understanding of the control exerted on the development of cyclothems by the sedimentational processes themselves. This is a sound uniformitarian approach, which can in many cases remove the necessity for appeal to tectonic, eustatic, or extra-terrestrial controls in the development of cyclothems.

The book is well presented, and uniform in style with the preceding nine volumes of the series. It is pitched mainly at the research level, but advanced undergraduates pursuing a stratigraphy-sedimentology course would find the introduction and conclusion useful, being much more up-to-date than any treatment in existing generalised texts. The large list of references is drawn from cosmopolitan sources, and it is gratifying to find New Zealand and Antarctic examples mentioned in a number of chapters. At the same time, the references to the voluminous literature on such topics as the European and North American Carboniferous coal-bearing cyclothems have evidently been carefully selected. In conclusion, a readable, useful and critical compendium on cyclic sedimentation.

P. F. Ballance

Gaskell, T. F. (Editor): THE EARTH'S MANTLE. 509 pp. London and New York: Academic Press, 1967. 140s. (U.K.).

The mantle, with much justification, has recently become the fashionable part of the earth to study. Authors have become fond of pointing out that the mantle, defined as that part of the earth between the crust and the core, comprises 83% of the earth's volume, and the majority of its mass. Interest is also concentrated on the mantle because we are so close to being able to sample it physically. Present theories of mantle conditions and composition must before too long be subjected

to test, when various deep drilling projects, now shelved for economic reasons, are inevitably resumed. When man has sampled the surface of the moon, perhaps he will once more turn his resources downwards.

Dr Gaskell has collected a remarkably good selection of articles from world leaders in many branches of earth science, and has achieved the rare distinction of producing a review book that is not excessively out of date before its publication. The fourteen articles are well balanced and well arranged. As is usual with such collections, the first articles, by K. E. Bullen and Miss Lehmann, deal with seismological topics, whereas the final article by S. K. Runcorn deals with the more controversial subject of continental drift. Seismology is also the subject of D. L. Anderson, who discusses recent observational advances, with particular emphasis on free oscillations, surface waves, and anelasticity. Miss Lehmann, who deals exhaustively with low-velocity channels, and Bullen, whose topic is the basic divisions of the Earth as revealed by seismology, both give good historical reviews of the work of early seismologists. A. T. Price in his chapter "Magnetic Variation and Telluric Currents" also emphasises the foresight of early scientists and points to the suggestion by Halley in 1692 that westward drift of the magnetic field could be due to the source of the field being located in an inner core rotating more slowly than the outer parts of the earth, thus anticipating by more than two centuries the seismologists' demonstration of the existence of the core.

Several articles are devoted to the theme of the earth's thermal regime and its application to theories of convection in the mantle and continental drift. Madame Lubimova gives a very detailed account of a possible thermal history of the earth, while R. P. Von Herzen describes the distribution of surface measurements of heat flow, in which he claims to be able to delineate areas of anomalous heat flow only a few hundred kilometres in dimension. In discussions of thermal convection in the mantle L. Knopoff shows that convection must be confined above the seismic discontinuity at a depth of a few hundred kilometres and D. C. Tozer suggests that internal heat production in the convecting material would lead to an elongation of the convection cells, still enabling them to be of continental width, in spite of their thinness. In their articles, J. Tuzo Wilson and S. K. Runcorn invoke these convection currents to help explain the present configuration of continents. Runcorn suggests that the upwelling and sinking of the convection occurs at points rather than along lines, and correlates these points with lows and highs of the earth's gravity field.

The remaining articles are a scholarly description of the earth's gravity field by A. H. Cook, and a group of papers dealing with the constitution of the mantle by H. Kuno, E. L. P. Mercy, and S. P. Clark and A. E. Ringwood.

The only lack one can find in the subject matter of the book is a discussion of earthquake location in the mantle, and theories of earthquake origin. Perhaps in North America and Europe earthquakes are still considered as an essentially crustal phenomenon, in spite of their occurrence at depths as great as 700 km. in certain areas.

The book is an excellent reference work for the serious student, and will remain so for more years than most of its kind. The lay-out and illustrations are good, the only criticism being that misprints and misspellings occur more frequently than one would expect in a book otherwise so worthy.

R. D. Adams

Love, A. E. H.: SOME PROBLEMS OF GEODYNAMICS. xxvii + 180 pp. New York: Dover, 1967. \$2.25 (U.S.).

Paperback publishing offers a real benefit to science through the reprinting of such classics as this winner of the Adams Prize of 1910: one can install on the study bookshelf what is nowadays all too likely to be ousted to the stackroom.

Despite its non-committal title this book contains the original and definitive analyses of a number of profoundly important matters. The chapter on seismic waves (Ch. XI) is quintessential: 35 pages suffice to discover the theory of Love waves and of dispersive Rayleigh waves, to show that these are the "Large Waves" so prominent in seismograms, and to deduce that "there is a veritable crust of the earth". Hence have sprung our present elaborate methods of dispersion analysis, and much of our highly detailed knowledge of the structure of the crust and upper mantle.

The discussion of surface waves is approached, with thorough-going generality, by way of the theory of free oscillations of a gravitating compressible sphere. In Love's day this work was of interest chiefly as confirming that even the gravest modes of oscillation are too rapid to affect the bodily tides significantly. Not until 50 years later did instrumental developments permit the free oscillations, including the 54-minute fundamental, to be actually recorded, as they were after the great Chile earthquake of May, 1960.

Several chapters are devoted to the bodily tides. This phenomenon is still a major source of information about the earth's deformational properties and structure and is also now recognised as contributing an important fraction of the continuously generated terrestrial heat. According to recent studies in New Zealand and elsewhere the tidal stress seems unconnected, surprisingly enough, with the occurrence of earthquakes. Love examines the effects on the bodily tides of the earth's rotation, ellipticity, compressibility and heterogeneity. It is here that he defines the critical parameters now known as Love's numbers, and develops the general theory of a gravitating compressible planet.

Other problems discussed are the expression of the earth's solid surface in spherical harmonics, and the stresses involved in the support of mountains and continents. Such static analyses seem rather old-fashioned today. Yet spherical harmonics are still supposed by some to elucidate surface observation, for example, the pattern of natural heat flow. One could wish that the current vogue for mantle convection and continental drift were backed by theoretical discussions of the upper mantle such as these of Love's, with the physical premisses clearly stated and the mathematics adequately set forth. The difficulties are of course far greater, but in the end no lesser treatment is acceptable.

This is essentially a mathematical work, yet there is a great deal of lucid prose in it, not only in the 17-page abstract but throughout the book, for the edification and delight of every serious student of the earth.

F. F. Evison

Burnet, Thomas: THE SACRED THEORY OF THE EARTH, 412 pp. London: Centaur Press, 1965, £6 6s 0d (U.K.).

It is pleasing indeed to see this fine modern edition of the Reverend Thomas Burnet's *Sacred Theory of the Earth*. This work, first published in Latin in 1680, and in English in 1684, was one of the most controversial books in geology ever written. It sparked off a lively discussion which continued over 20 years. The book remained popular, appearing in several subsequent editions up to the seventh and last in 1759. This Centaur Press edition reproduces the second English edition of 1690-91 containing all four books of the *Sacred Theory of the Earth* and *A Review of the Theory of the Earth and of its Proofs especially in reference to Scripture*, 1690.

The mid-seventeenth century was a time of considerable philosophical debate on the nature of the earth, whether its tangled mountains and irregular coastlines could be reconciled with the neo-Platonist view of beauty in order, symmetry and proportion. Such qualities must surely be found in the works of the Supreme

Architect. Like many of his contemporaries, Burnet, a deeply religious man, maintained that there was no ultimate conflict between the truths of religion as revealed in the Scriptures and the truths of the new science. His conclusion must be then that this once ordered and beautiful earth had been transformed into its present ruin. In his preface Burnet wrote that his theory was "writ with a sincere intention to justify the Doctrines of the Universal Deluge and of a Paradisiacal State and protect them from the Cavils of those that are no well wishers to Sacred History . . . This Theory of the Earth may be called Sacred because it is not the common Physiology of the Earth, or of the Bodies that compose it, but respects only the great turns of fate, and the Revolutions of our Natural World; such as are taken notice of in the Sacred Writings and are truly the Hinges upon which the Providence of this Earth moves . . . "

Briefly, the Theory holds that when the earth was created by God out of Chaos, it was eggshaped with the axis perpendicular to the plane of the ecliptic; there were, therefore, no seasons and the climate was continually mild and equable. The surface was smooth, regular and uniform, without markings and there were no seas and oceans. In Book I of the Sacred Theory, Burnet describes how this antediluvian earth, because of the evil of its inhabitants, was visited by the Universal Deluge, Noah's flood. The crust broke up and collapsed when "the fountains of the great Abyse were broken open" and the earth was engulfed by "those subterraneous waters". The earth's axis was tilted in the cataclysm and seasonal variations in climate occurred. Book II compares and contrasts the Golden Age of the antediluvian world with the earth in its present form. Burnet then investigates the location of Paradise and concludes that it is impossible that "all the properties of a Terrestrial Paradise ever meet together in one place though never so well chosen in this present Earth" and therefore Paradise was located in the antediluvian earth. Books III and IV which are concerned with the Burning of the World and the New Heaven and New Earth, the millenium, are of less interest to the historian of earth science, containing largely prophetic material, based on Scriptures, concerning the ultimate fate of Earth and Man. The Universal Conflagration will again renovate the earth and a new heaven and earth will evolve.

Burnet knew little of mathematics or mechanics and his Theory was rightly attacked vehemently on scientific grounds. He was equally bitterly attacked on religious grounds, inspiring the doggerel lines: "All the books of Moses, Were nothing but supposes." Nevertheless, the grandeur of his generalizations, expressed in fine sonorous prose, had immediate appeal. Burnet, the divine, probably did more to stimulate scientific investigation of earth history than many a latter-day geologist. It is a pity that in his brief introduction, Basil Willey has not provided more of the scientific background to the period. Nevertheless for the modern reader, Burnet's Sacred Theory still stands well on its own, a fascinating and fantastic attempt by a sincere and religious man to reconcile the "truths" of science and religion.

E. M. Stokes

Fullard, H., and Darby, H. C.: THE UNIVERSITY ATLAS. Twelfth Edition (redesigned). xxiv + 176 colour plates + 88 pp. index. London: George Philip & Son Ltd., 1967. 45s (U.K.).

The Twelfth Edition of this well-known atlas reminds one of that continental car which prides itself on selling the same basic shape year after year while improving only the details. Despite its claim to be "redesigned" it is virtually the same atlas as before, with a number of small changes. An attractive new type face is used for the index and prefatory material; colouring (with the glaring exception of the geological map of France and Central Europe) has been softened and improved, and hill-shading has been added to the layer coloured maps. The climate

graphs which have long been a feature of this atlas have also been improved by the use of a constant scale, so that Cherrapunji's 425-inch annual rainfall may now be visually compared at a glance with Aden's 1.8-inch drought. One or two projections have been changed (with mixed success) and some maps have had unnecessary detail removed to give a less cluttered and more pleasing visual effect.

The result is undoubtedly an atlas which has improved in many small ways. But one might well ask (as some do of the automobile referred to earlier) whether the time has not come for some more substantial changes, especially if it is to live up to the claim of being "redesigned". One might well question the devotion of 14 pages to climate graphs when the only attempt to portray world climate as a whole is a very generalised, half-page map of modified Köppen types. Similarly, one wonders whether the emphasis on maps showing little more than relief and location of towns is what today's geographers want. The section devoted to world distribution of natural and cultural phenomena is very brief and suffers by comparison with many of its competitors.

Well-bound, well-designed graphically, and accurate in many details, this atlas is still of good value to secondary schools or for students at the undergraduate level who want a satisfactory general atlas at a reasonable price.

R. M. Frazer

Middleton, W. E. K.: A HISTORY OF THE THEORIES OF RAIN, 223 pp. London: Oldbourne, 1965. 45s (U.K.).

This book deals with the history of hydrometeors from biblical times to the beginning of the First World War, paying particular attention to the 17th, 18th and 19th century ideas on rain, snow and water vapour. Although Middleton states "Probably everything written about the hydrometeors before the seventeenth century ought to be classified as speculation rather than theory," the section referred to makes fascinating reading, as does the major part of the book on the later centuries.

From the pages of this book we learn of the problems, frustrations and the intuitive ideas that have gripped the minds not only of the well-known names of science but also of the unknown amateurs all of whom were vying for the truth. Though in the hands of many authors the content might be dull and uninteresting, Middleton, by his wit and turn of phrase, succeeds in making rainfall theories come alive. A preponderance of footnotes makes all too many pages bottom heavy.

This book is essential for the serious student of the history of science but is of secondary importance to the practising meteorologist or climatologist.

G. R. McBoyle

Barrett, E. C.: VIEWING WEATHER FROM SPACE, 140 pp. London: Longmans Geography Paperbacks, 1967. 21s (U.K.).

The successful launching in 1960 of the first TIROS satellite provided the climatologist not only with a new angle of study but also served to remind him of the varying scales of climatic research, of the atmosphere's three-dimensional form and of the considerable steps which meteorology and climatology have made since computers were first used in data processing and mapping.

Part I of Barrett's book sets the scene by considering the historical development of satellite climatology and indicates that the events of the last seven years have constituted as great a breakthrough as did the communication links of telephone and telegraph.

It is unfortunate that weather observations are sparse over the vast oceanic and polar regions for weather disturbances in these regions may have a significant influence on conditions experienced in distant, populated areas. In this context, earth-orbiting satellites provide meteorologists with information to interpolate conditions occurring in the large voids between the land-based observing stations. For this purpose satellite data and photographs are now considered essential in weather analysis and forecasting, and, in addition, have led to a re-evaluation of climatic classifications which until recently had been dependent on data from land-based stations.

Photographs obtained from these satellites have led to two lines of approach for studying weather (1) through cloud amount and, (2) using radiometric information received. Barrett chose to deal mainly with cloud studies. Here he indicates the problems still existing, some technical, some climatological. The former are mainly photographic; since much of the interpretation depends on the brightness of cloud cover many incorrect deductions might be made if a norm were not applied. Clapp succeeded in partly overcoming the problem by using cloud charts made from each individual photograph and basing his interpretation on these, hence eliminating the problem of brightness.

The tendency is for satellites to orbit at a low angle resulting in a concentration of study on tropical areas at the expense of the polar regions.

In Part II of his book, Barrett explains how the results have led to an appraisal of the Intertropical Convergence Zone and have centred attention on the origins and life cycles of hurricanes. A case in point was the discovery and tracking of Hurricane Esther by means of TIROS III pictures.

However, climatological interpretation of space photographs is still in its infancy, as is illustrated by the many discontinuities and unsolved problems which Barrett elaborates. Yet there is no doubt that increasing expertise in cloud analysis will result in increasing accuracy of weather forecasting. Indeed cloud height today may be measured in practice from satellite photographs with an accuracy of 2 km. (Weather XXII [12] p. 512).

Other important aspects dealt with in the second part of the book are the consideration of weather systems in temperate latitudes and the appearance of the earth's surface from space. Barrett realises the significance of these fields. Had others done so and applied their knowledge, some prediction might have been possible of the recent freak weather conditions experienced in the North Atlantic when the westerly depressions were funnelled into a narrow gap between warm and cold air masses following the spread south of Arctic ice.

With the new information available from satellite photography, certain models may be reassessed, re-evaluated and rebuilt. Adem's thermodynamical model for predicting the seasonal mean temperature on the earth's surface (a model which depended upon cloud amount), may now be reappraised as additional data becomes available. However, any new development brings with it new problems. One presenting itself in the sphere of satellite climatology is the existence of an area of high temperature in the stratosphere in winter over the Aleutians, a feature which was discovered by radiometric analysis and so far has proved inexplicable.

The last section of the book deals with future developments. The importance and speed of advance of satellite meteorology is such that many of Barrett's predicted developments have taken place while the book was in print.

Throughout the book the author makes good use of the overwhelming amount of material available on the subject. His enthusiasm for the subject inspires the reader to acquaint himself with the bibliographic material in his search for more knowledge about the topic. It is unfortunate that the presentation of the lists of references is confused and the style is unpleasing to the eye. All in all, this book has much to recommend it to the layman and professional alike.

G. R. McBoyle

Vanders, I., and Kerr P. F.: MINERAL RECOGNITION, 316 pp. New York: Wiley, 1967.

The authors state that this book is intended “ . . . for the mineral collector, the non-professional reader with an interest in minerals, the beginning student of mineral science, the geologist, and the scientist in related fields”: thus the book does not presume to be a definitive text, and includes many appeals to the popular market, with its simplicity and many colour plates.

The main purpose of the book is stated as being “ . . . the development of criteria for rapid recognition.” Acknowledging that precision in identification may still require laboratory methods, the authors point out that a great many common and some less common minerals may readily be identified by visible and easily-determined physical characteristics.

The book opens with an interesting review of mineral usage through historical to modern times. It continues with three chapters on crystal growth, crystal chemistry, and the symmetry of mineral crystals. Chapter five is a straightforward and comprehensive discussion of the physical properties of minerals, and the sixth continues with descriptions of simple chemical tests. These are disposed of fairly briefly in a dozen pages. In a work devoted to “rapid recognition” the authors, understandably, do not give great prominence to this section, but do give emphasis to the usefulness of chemical testing in checking or confirming diagnoses made on visual and physical evidence. To their credit they do not spurn, as many modern writers do, the use of these simple well-known tests.

Today many writers treat chemical tests with disdain, as outmoded, in favour of optical, x-ray diffraction and spectrographic methods. These more elegant methods have an undoubted advantage if a well-equipped laboratory is available, but the simple chemical tests can be made readily in the classroom, at home, or even in the field. Therein lies their usefulness.

In Chapter eight, of “Mineral Identification Tables”, the authors present their “key to accelerated recognition.” With tables for each colour, and listing the colour shade, lustre, streak, and hardness, with a column for particular features under “Remarks”, they set out a wide range of minerals. I must confirm that using these tables to identify some new and unusual specimens, I found the system simple, speedy, and reliable.

The tables are used in conjunction with the more detailed “Mineral Descriptions” in the following chapter. The classification in these descriptions follows the Dana System, and the colour plates are grouped in similar manner. There is a brief appendix dealing with meteorites, and the book has a useful index.

The illustrations are a prominent feature of this work. Line drawings and halftones are generous, carefully selected and well produced. Colour plates are unexpectedly profuse, and well over 200 minerals are shown in the 49 plates. The choice and grouping is systematic and orderly. First plates show representative mineral aggregates, then follow crystals of the different systems with corresponding wooden models. There are twinned crystals of several types, luminescent minerals, native metallic elements, and non-metals. Next come minerals and crystals of the many species in their groups — sulphides, oxides, etc. The specimens are well chosen, and the authors have not hesitated to present more than one specimen to demonstrate the various modes of occurrence. Profusion, however, is carried almost to the point of extravagance when the same (beautiful) stibnite group is shown in Plate 2 as a representative mineral aggregate, and again in Plate 16 as a representative of a sulfide group. Comparison of these two plates draws attention to a serious weakness evident in a few, but fortunately by no means all, of the colour plates. In these two plates a difference in colour rendering is very evident, and in some other plates a degradation of colour is most disap-

pointing. Different brightly coloured backgrounds, although affording contrast, are not always well chosen, and sometimes suggest a decorative rather than a scientific treatment. Unfortunately, and unfairly, the photographer is not credited. His work is mainly excellent, frequently superb, but sometimes spoilt by poor colour printing. The colour plates could well be listed on the contents page.

The book, a first printing, has only minor spelling and typographical errors, but one must question the use of "Recognition" in the title and frequently in the text, when, clearly, "Identification" is meant. In some places "aventurine" is spelt "adventurine". The contents page should use, for Chapter 5, the word "Mineral" instead of "Crystal". These are minor matters and may well be changed in later printings.

The vast number of students of mineralogy and related subjects who "cut their teeth" on *Optical Mineralogy* (Kerr and Rogers, 1933) and who have studied Dr Kerr's many books and papers during the intervening years will be delighted with this new book.

Both authors are to be congratulated on a worthwhile addition to the literature at this level.

Harold A. Larsen

BOOK NOTICES

Armitage, E.: EDMOND HALLEY, 220 pp. London: Nelson, 1966. 42s (U.K.).

Edmond Halley was one of the band of English scientists who did much to establish the Royal Society and to explore almost every branch of the sciences of his time. Although he is best known for his work in establishing the return period of his comet, he was also a notable traveller, the editor of Newton's *Principia Mathematica*, an accomplished mathematician, demographer, Arabist, navigator and diver. His official posts included the Savilian Professorship at Oxford and the duties of Astronomer Royal and mint master. Like most scientists of his time Halley had to be his own instrument maker and he had a fine collection of astronomical equipment. He also invented a diving bell with an air supply about which he reported: "I myself have been one of five who have been together at the bottom, in nine or ten fathoms water, for above an hour and a-half at a time, without any sort of ill consequence."

In this book the genius and wide interests of Halley are well demonstrated and illustrated by numerous quotations and figures from original sources. This first full biography of Halley is most welcome.

Turner, Paul (Editor): SELECTIONS FROM THE HISTORY OF THE WORLD, COMMONLY CALLED THE NATURAL HISTORY OF C. PLINIUS SECUNDUS, 496 pp. London: Centaur Press, 1962. £4 4s (U.K.).

C. Plinius Secundus holds the distinction of being the first recorded martyr to geological science. He was asphyxiated when investigating too closely the erupting Mt Vesuvius which engulfed Pompeii in A.D.79. During his lifetime, Pliny was an indefatigable collector of information which he put together in a monumental compilation, *Historia Naturalis*. Pliny attempted to provide a general view of all that was known in his day of the universe, and of the earth and its productions, animal, vegetable and mineral. This encyclopaedia of natural history became the major source right through the Medieval and Renaissance period for information in astronomy and meteorology, geology and geography, biology and medicine. In this Centaur Press edition selected extracts from most of these fields are reprinted from the English translation by Philemon Holland, first published in 1601.

Simons, M.: DESERTS, THE PROBLEM OF WATER IN ARID LANDS, 96pp. London: Oxford University Press, 1967. 11s 6d (U.K.) (paperback).

More than a third of all the land in the world is desert or semi-desert, empty, barren, and almost useless to man. This short, excellently illustrated book first discusses the problem of water shortages and adaptations of plants and animals to them, and then the sources of water and the way in which they can be used to make settlement possible. Case studies of new developments such as the Aswan Dam, the Sind and Israel show the possibilities of future land use, and techniques of increasing water supply by climate control and desalination of water are also described.

This book is the type which will stimulate secondary school children of almost any age to read more widely and think critically about the problems of expanding population and the resources of a major part of the earth,

Chorley, R. J., and Haggett, P. (Editors): MODELS IN GEOGRAPHY, 816 pp. London: Methuen, 1967. £6 (U.K.).

In recent years more attention has been paid to the way in which generalisations are presented and a greater attempt has been made to use models, which may be defined as highly selective approximations from which "noise" had been eliminated so that the essential nature of reality may be more clearly seen. Models may be hardware, physical or experimental constructions, or they may be theoretical, symbolic, conceptual or mental.

Although the chapters of this book have been especially written for it by 18 contributors, most of whom are geographers in British universities, much of the material has been previously published elsewhere. What is new about this book is the collecting of examples to illustrate the many types of models and their uses in geography. The book has five parts. In part 1 two papers discuss the nature and use of models, in part 2 three papers discuss models in geomorphology, meteorology and climatology, and in hydrology. In part 3 the six chapters are concerned with demography, sociology, economic development, urban geography and settlement location, industrial location, and agricultural activity. Part 4 discusses mixed systems and particularly regions, ecosystems, evolution of spatial patterns and networks. Part 5 is concerned with information models; maps, hardware, and teaching models.

With over 200 diagrams, more than 2000 references and an extensive index, this book is more than a compilation. It is a coherent work of scholarship which will be invaluable to teachers, senior university students and research workers. One might foresee a revolution in the nature of courses on "The Nature of Geography" now that *Models in Geography* is available.

Wanless, H. R.: AERIAL STEREO PHOTOGRAPHS, 99 pp. Northbrook, Illinois: Hubbard Scientific Company, 1965 (paperback).

This book contains a set of stereograms, some in pairs and others in triplets. Each stereogram is approximately 20 x 17 cm. and the scales vary from about 1 : 9000 to 1 : 130,000. Each margin has a reference scale, and with each set there is a brief description of the features shown, an indication of the location, scale, date, agency and map reference. All of the examples are taken from United States Territories and the topics covered are: wind action, ground water, mass movements, modern glaciers, effects of glaciation, lakes, marshes and shorelines, deserts, fluvial erosion and cycles, volcanic features, lithology, structure, soils, mining and urban settlements. All of the prints are clear and this selection is a very cheap and convenient way of obtaining a variety of examples of geological features useful in teaching programmes.

Willis, J. C. (Revised by H. K. Airy Shaw): A DICTIONARY OF THE FLOWERING PLANTS AND FERNS, 7th Edition, 1214 pp. London: Cambridge University Press, 1966. £5 (U.K.).

This seventh edition of "Willis" is a completely rewritten work and the first new edition since 1931. Because of the shortage of space and the increase in knowledge the entries have been confined to generic and family names and common and vernacular names and economic products have been omitted, even so this edition is twice the size of its predecessor and has 40,000 entries. It attempts to cover all published generic names from 1753 onwards and published family names from 1789. The work has been made possible by the co-operation of the staff of the Kew Herbarium and a considerable number of people in other institutions. Most of the entries are one line but a major term like "Acacia" has a whole page devoted to it. At the end of the book there is a key to the families of flowering plants and a statement of the Systems of Bentham and Hooker.

Fenner, P.: LABORATORY MANUAL FOR COLLEGE GEOLOGY, 138 pp. New York: Appleton-Century-Crofts, 1965. \$US4.00 (paperback).

This manual is designed to serve introductory courses in geology. It deals with minerals, rocks, geomorphology, structures, sections, correlation and historical geology. Each section has an introductory statement, a set of working tables and sheets and some sections have sets of questions. The manual is mainly concerned with giving the factual outline upon which work can be based using any set of samples or maps.

Chilingar, G. V.; Bissell, H. J.; and Fairbridge, R. W. (Editors): CARBONATE ROCKS, 471 pp. Amsterdam: Elsevier, 1967. £7 10s (U.K.).

This book is volume 9A in the series "Developments in Sedimentology". There is an introductory chapter by the editors and then seven others: Modern Carbonate Sediments by Taft; Petrology and Petrography of Carbonate Rocks by Gubler, Bertrand, Mattavelli, Rizzini and Passega; Classification of Sedimentary Carbonate Rocks by Bissell and Chilingar; Origin and Occurrence of Limestones by Sanders and Friedman; Origin and Occurrence of Dolostones by Friedman and Sanders; Carbonate Oil Reservoir Rocks by Harbaugh; Carbonate Rocks and Palaeoclimatology in the Biochemical History of the Planet by Fairbridge. Limestones are defined and the environments in which they were formed are discussed in relation to their composition. A recurring theme is the importance of limestones as oil reservoirs and the varying significance of past climates.

Shepard, F. P., and Dill, R. F.: SUBMARINE CANYONS AND OTHER SEA VALLEYS, 381 pp. Chicago: Rand McNally, 1966.

This book is the result of considerable research from surface ships, scuba diving and observations from bathyscaph and diving saucer, with the support of the Office of Naval Research to the Scripps Institution of Oceanography. In the introduction the eight main types of submarine valley are described and seven of the succeeding chapters are taken up with well-illustrated accounts of the valleys and canyons off North American, Japanese, European and other coasts. The next six chapters discuss the types of valleys and their features. Some of the valleys appear to be explained by fault movement, some by slumps and slides, some by creep and sand flows and others by the drowning of subaerially eroded valleys. The turbidity current hypothesis is regarded as having a dubious basis. The trough valleys occur off glaciated coasts and many shallow water valleys like those of the Hudson River and English Channel have been greatly modified by tidal erosion. It is emphasized that this is an interim report and that most of the answers are still being sought.

Brown, D. A.; Campbell, K. S. W.; and Crook, K. A. W.: THE GEOLOGICAL EVOLUTION OF AUSTRALIA AND NEW ZEALAND, 409 pp. Oxford: Pergamon, 1968. \$A8.75 (hardcover), \$A6.00 (paperback).

This book attempts to summarise the geological history and regional stratigraphy, as known by January 1965, of Australia and New Zealand. The emphasis throughout is on interpretation of the available data and the authors frequently indicate the gaps in knowledge which may cause revisions of their conclusions. The 12 chapters deal with the Systems of the: Precambrian, Cambrian, Ordovician, Silurian, Devonian, Carboniferous, Permian, Triassic, Jurassic, Cretaceous, Tertiary and Quaternary. The references are numerous and the text is well illustrated. A typical chapter discusses the stratigraphy of Australia and New Zealand, then the palaeontological and climatic record, and finally tectonism and igneous activity. In this way the material is well organised although readers concerned with one country at a time may find the breaks rather a nuisance. As this is the first text to give a summary of the advances made since 1945, it is bound to be widely read.

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 borders 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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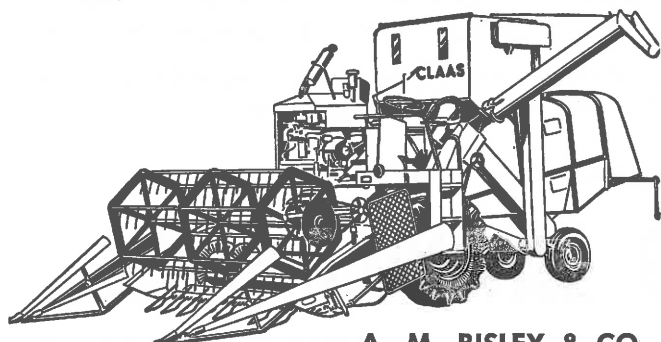
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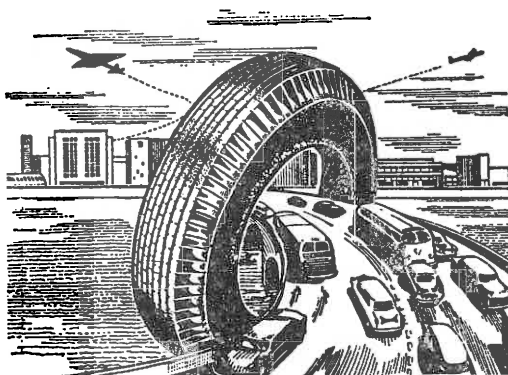
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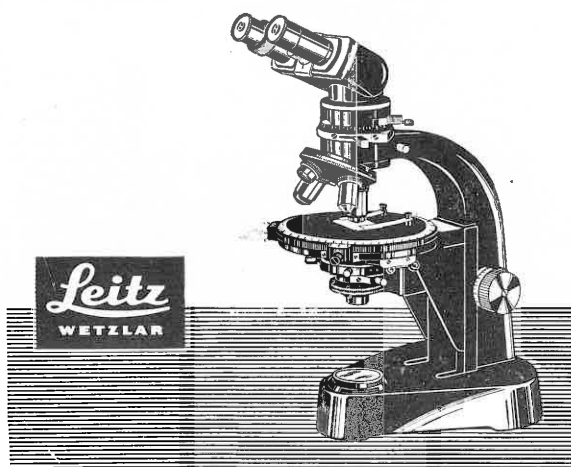
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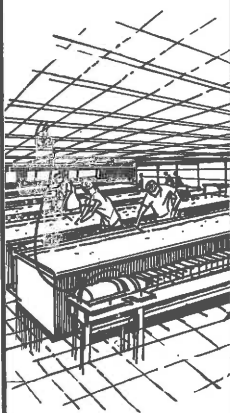
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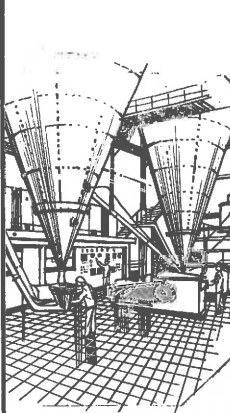
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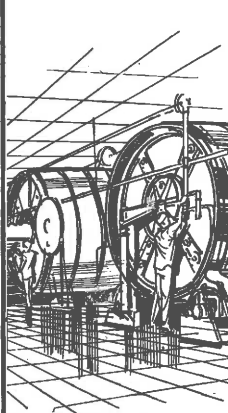
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