Book Reviews / Critique

Book Reviews

CRC Handbook of Physical Properties of Rocks Volumes I, II and III

Edited by Robert S. Carmichael
CRC Press, Inc.
Volume I, 404 p., 1982: $78.50 US (in US), $90.50 US (outside US), cloth
Volume II, 346 p., 1982: $72.50 US (in US), $83.50 US (outside US), cloth
Volume III, 340 p., 1984: $66.00 US (in US), $76.00 US (outside US), cloth

Reviewed by R.M. Easton
Precambrian Geology Section
Ontario Geological Survey
77 Grenville Street
Toronto, Ontario M7A 1W4

Many generations of science students have grown up using the *CRC Handbook of Chemistry and Physics*, an invaluable reference guide. Consequently, one might expect that this series of volumes on the physical properties of rocks might follow in the tradition of the "Handbook", particularly as its closest counterpart, Geological Society of America (GSA) Special Paper 97 (1966) is dated and incomplete in some subject areas. Unfortunately, this series of books does not live up to its promise.

The material is presented in 11 chapters scattered throughout three volumes, each chapter written by an expert or experts in that particular subject area. Each chapter has a brief written introduction to the tables. As it is a multi-authored volume, there is considerable range in the quality of material in each chapter. According to the Preface, the material in this volume is meant to be of use to specialists as well as people from other disciplines who need access to geologic and geophysical data. This goal is not realized effectively, and in fact, these volumes may mislead the non-specialist.

Volume I contains three chapters. Chapter 1 is on the "Mineral Composition of Rocks", but includes much geochemical data despite its title; Chapter 2 is on the "Electrical Properties of Rocks and Minerals"; and Chapter 3 on the "Spectroscopic Properties of Rocks and Minerals". Chapter 1 is a complete failure; one is better off using the American Geological Institute Field Data Sheets. Some problems in this chapter include: (i) a periodic table and list of atomic weights and common mineral formulae would be useful; (ii) no viscosity data on rocks is given; (iii) ocean basalt data is antiquated; (iv) different groups of elements are given in each table, which makes it impossible to compare data between tables; (v) the igneous rock classification chart is obscure (why not use the widely used Streckeisen (IUGS) classification?); (vi) Table 92 on Metamorphic Facies is from Winkler, Table 93 on the Mineralogy of Metamorphic Facies is based on Turner. The two tables do not match, nor would they be expected to do so; (vii) the many tables of chemical compositions for rocks use obscure suites, i.e. no Hawaiian lavas included, but 1960 data on Antarctic diabases is present; and (viii) most chemical data is older than the data presented in GSA Special Paper 97.

Chapter 2 on the "Electrical Properties of Rocks" is much better organized. It has a longer, more complete introduction, and it is apparent that the author has taken some care in compiling new data tables in many instances, not just lifting them from the literature. However, this chapter is only of interest to some geophysicists, and accounts for only about 1/3 of the volume. Chapter 3 on "Spectroscopic Properties of Rocks and Minerals" deals mainly with reflectance spectra and raman spectra data. X-ray spectra data, atomic absorption data, etc. are not included, although such data may be of wider interest than that included here.

Volume II contains three chapters: "Seismic Velocities", "Magnetic Properties of Minerals and Rocks" and "Engineering Properties of Rocks". The first chapter could use a longer introduction, but at least it contains many original tables. However, much of the material in this chapter pertains to marine rather than continental seismology. The chapter on the Magnetic Properties by the series editor is excellent. It is unfortunate that the other chapters in this series did not emulate his example. The introduction to the last chapter is well-presented, but the tables are incomplete, and much of the data is for Russian rocks. How useful this data is for North America workers is difficult to judge.

Volume III contains five chapters. Chapter 1 on the "Density of Rocks and Minerals" is short, but complete. Chapter 2 on the "Elastic Constants of Minerals" consists of material compiled from the literature, presented in a table made from a computer printout, much of which is difficult to read. Chapter 3 is on the "Inelastic Properties of Rocks and Minerals". Chapter 4 is on the "Radioactivity Properties of Minerals and Rocks". It could be more extensive, containing data on gamma-ray spectroscopy, etc., or it could be retitled and focus more on isotope geology which is the author's speciality. As it is, it is adequate, but it could have been improved. Chapter 5 contains data on "Seismic Attenuation". In general, the chapters in Volume III are better organized and presented than those in Volumes I and II.

The production and printing quality of the volumes is excellent. Layout could be improved, as in some volumes, particularly Volume I, there is a lot of white space. Overall, the volumes could have been better organized. For instance, the chapters on Seismic Velocities, Seismic Attenuation and Rock Density would have been better grouped into one volume rather than scattered throughout the set. The chapters on Electrical, Magnetic and Radioactivity Properties would have also been better grouped together. The company may have sold fewer sets this way, but would have probably sold more individual volumes. As it stands now, the individual chapters and volumes resemble a popular book of the late 1970's called the *Book of Lists*, but without the entertainment value of the latter.

In summary, the organization, content and cost of these books makes them of little use to anyone other than a few specialists. They are not even a worthwhile purchase for most libraries; and as for the casual user, they are more likely to provide an inaccurate or distorted view of the data available in these subject areas. This is particularly true of Chapter 1, Volume I, which is probably the chapter of most interest. Given the high cost of these volumes, libraries, particularly at smaller institutions, are better off spending $250 US on journals or other more reasonably priced books, or waiting for a second, hopefully improved, edition.

Precambrian and Paleozoic Algal Carbonates, West Texas-Southern New Mexico

By D.F. Toomey and J.A. Babcock
Colorado School of Mines, Golden, Colorado
Professional Contributions No. 11
345 p., 1983; $25.00 US, paper

Reviewed by Brian R. Pratt
Department of Geology
University of Toronto
Toronto, Ontario M5S 1A1

This is an unusually long and handsome guidebook, for a four-day field trip in 1983 that visited Precambrian, Lower Ordovician, Pennsylvanian and Permian reefs and associated sedimentary rocks of the West Texas-New Mexico area, surely one of the geologically most outstanding places in North America. What unites these particular rocks is that they contain a significant proportion of fossil "algae", and this trip was sponsored by the 3rd International Symposium on Fossil Algae, held in Golden, Colorado in that year. It must be admitted that what these rocks really have in common is that they are reefs, because the term "algae" as commonly used by geologists encompasses fossils that are as different as pumice is to pegmatite. So, here we see the directly precipitated skeletons of calcareous green and red algae as well as the non-skeletal organosedimentary structures and "organocements" formed in some way by the activities of micro-organisms that used to be called "blue-green algae" but are now known as "cyanophytes" or, even more accurately, as "cyanobacteria".

This book consists of detailed descriptions on 17 stops where various features are accessible and superbly exposed; many of these stops are already world renowned. The descriptions contain history of study as background, exacting lithologic observations, many maps, stratigraphic sections, cross-sections, sketches, outcrop photographs, and — this is the strength of the book — dozens and dozens of excellent thin-section photomicrographs which thoroughly document the wide variety of facies and biota in these rocks. In fact, the illustrative material can only be described as profuse. This is welcome, however, not only to those who might conduct their own field trip using this guide (well worth it especially if the nearby Mississippian mud-mounds are included), but also because much of the information in this book was hitherto unpublished, especially that on the otherwise famous Permian reef complex of the Guadalupe Mountains.

For those wishing to keep track of the best illustrations of limestone microfacies and thin-section views of limestone constituents for research or teaching purposes, this field guide can take its rightful place beside atlasses by Horowitz and Potter, Scholle, and Majewske, the journal *Facies*, textbooks by Flügel and Wilson, and the apparently discontinued E.J. Brill International Sedimentary Petrographical Series. Exalted company for a humble fieldguide! Don Toomey and Jack Babcock are to be congratulated, and I can recommend this book to all carbonate sedimentologists and paleontologists interested in limestones.

Golden Giant

By Matthew Hart
Douglas and McIntyre, Vancouver
176 p., 1985; $19.95, cloth

Reviewed by Raymond Goldie
Richardson Greenshields of Canada Limited
130 Adelaide Street West, 12th Floor
Toronto, Ontario M5H 1T8

The subtitle of this book is "Hemlo and the rush for Canada's gold: the incredible story of the largest gold find in the Americas and the men who engineered it". The book begins, "2,000,000,000 B.C. Submarine volcano erupts, spilling gold-bearing brine into the region." Unfortunately, these quotations are a fair representation of "Golden Giant". (For those unfamiliar with Hemlo, note that it is not the largest gold find in the Americas, nor are the volcanic rocks of Hemlo region 2.0 billion years old. And, as the book makes clear, at least one woman played a prominent role in the Hemlo story.) If you are looking for accurate and detailed technical information about Hemlo, don't buy this book. If you are looking for a precise narrative of the events which led to the construction of the Hemlo mines, don't buy this book. However, ***DO*** buy the book if you want to read entertaining character sketches of the principal players in the Hemlo story, written in a lively, albeit purple, prose style.

For a Hemlo story which reads like a well-plotted detective novel, I recommend Judge R.E. Holland's judgement in the case International Corona Resources Ltd., Plaintiff *versus* Lac Minerals Ltd., Defendant; March 1986 (obtainable from the Supreme Court of Ontario and currently circulating around Canada's mining community in samizdat form).

Quaternary Dating Methods

Edited by William C. Mahaney
Elsevier, Amsterdam
432 p., 1984; $75.00 US; cloth

Reviewed by L.D. Delorme
National Water Research Institute
Canada Centre for Inland Waters
P.O. Box 5050
Burlington, Ontario L7R 4A6

The objective of this symposium volume is to provide state-of-the-art information on absolute, relative, and multiple dating methods for the Quaternary. Based on these categories, the editor has compiled the papers into three sections. This allows for a ready and compact reference for each category.

The first section, on absolute dating, comprises 60 percent of the book, which is as it should be. These are the methods that are constantly being refined and tested. These are the methods that are in the forefront in Quaternary geochronology. Most of the papers in this section contain considerable detail on methodology and excellent references. This will be an asset to students of Quaternary geology and other environmental sciences.

Relative dating is the basis for stratigraphic sequences. As students of geology, we have all been taught the principles of uniformitarianism and superposition. By and large we take these for granted in our thinking. It is good to be reminded of them. H.B.S. Cooke, in the panel discussion, has provided an excellent summary of both absolute and relative dating.

With the multiple dating techniques we read how relative dating is augmented by absolute dating. In Quaternary stratigraphy, absolute dating provides additional and specific information as to when an event occurred. Several excellent papers dealing with stratigraphic problems were presented. The authors have skillfully interwoven both relative and absolute dating into the resolution of stratigraphic problems.

Perhaps it is fitting that D. Coates presented the last remark in the panel discussion when he said: "The one item missing is environmental relevance". Dating is as critical to the environmental sciences as mortar is to building a brick wall. Dating provides the structure onto which paleoenvironmental interpretations are hung. To this end, this symposium volume will be an asset to environmental scientists. One of the shortcomings of this volume is absence of any mention of bioturbation in lacustrine sediments. This is a serious problem for palynologists and others working with lake sediments.

Geology and Ore Deposits of the Highland Valley Camp

Edited by W.J. McMillan
Mineral Deposits Division
Geological Association of Canada
121 p., 1985; $22.00, paper

Reviewed by M.J. Osatenko
Cominco Ltd.
700 - 409 Granville St.
Vancouver, B.C. V6C 1T2

This paper is the first in a series of publications by the Geological Association of Canada (Mineral Deposits Division) aimed at providing manuals, primarily for field use, of major ore deposit camps in Canada. The information for this paper is from extensive studies by numerous private companies, students and the author of this paper who has added his own wealth of experience in the geology of the Highland Valley to provide an excellent summary of the most economically important porphyry copper camp in British Columbia. Past production and reserves in this camp are listed at about two billion tonnes at 0.45% copper.

The paper is divided into four parts, the first two deal with the geology and ore deposits of the Highland Valley while the last two are road log descriptions. In the first part the petrology and geochemistry of the various intrusive phases of the Guichon Creek batholith are discussed. Of most interest are variation diagrams, depicting major and minor element trends, which show intriguing geochemical discontinuities between older and younger phases. These discontinuities have implications as to the timing of the separation of the hydrothermal fluid from the silicate melt and suggest a separation early in the evolution of the younger phases. The latter half of the first part provides an overview of the deposits. These deposits are interpreted to be of dominantly orthomagmatic origin with the metals deposited in structural traps adjacent to subvolcanic cupolas. Initially, the ore fluid consisted primarily of magmatic water but later, as the hydrothermal system collapsed, a large component of oceanic water was involved. A model of relative depth and temperatures of formation of the deposits is presented, based on tectonic setting, alteration patterns, temperature information, presence of porphyry dykes and intrusive breccias, and their present locations and elevations.

Part 2 is a description of the principal deposits in the Highland Valley Camp, which include the Bethlehem Copper, Highmont, Lornex, J.A. and Valley Copper deposits. In each case the geology, structure, alteration, mineralization and genesis are reviewed. The last two parts of the paper give road logs and field tours of the Guichon Creek batholith and adjacent lithologies.

The publication contains 36 excellently drafted figures plus a coloured geological map of the Guichon Creek batholith. The particular attention paid to the figures is also seen in the clear, well-organized text. The paper is a must for porphyry copper geologists and for students of economic geology.

The Geology and Ore Deposits of the Sudbury Structure

Edited by E.G. Pye, A.J. Naldrett and P.E. Giblin
Ontario Geological Survey Special Volume 1
603 p., 1984; $30.00, cloth

Reviewed by David H. Watkinson
Department of Geology
Carleton University
Ottawa, Ontario K1S 5B6

The Ontario Geological Survey has prepared a comprehensive volume on the geology of the Sudbury Igneous Complex and enclosing rocks to coincide with Ontario's bicentennial and Sudbury's centennial celebrations. In spite of the major contributions of Sudbury's nickel, copper and platinum-group elements to the Ontario economy, and the wealth of scientific information and inspiration that the Sudbury-area rocks and structures have given geologists over the century that these rocks have been examined, no comprehensive survey of the voluminous literature existed. This book clearly fills a major gap for the geologist who wishes to update his/her knowledge of Sudbury geology, not only with over six hundred pages of text, but also with a new, coloured, geological compilation and other maps.

The book consists of 25 chapters of text, four pages of glossary to help the unfamiliar reader through some of the peculiarities of Sudbury nomenclature, 29 pages of index, two coloured maps (geological at 1:5000, and aeromagnetic at 1:1 000 000) and three charts (Bouger gravity maps at 1:1 000 000 and 1:100 000, and three geological plans, Onaping-Levack area). The text is arranged in groups of chapters under the following headings: History and Regional Studies, Whitewater Group, Mineral Deposits of the Sudbury Igneous Complex, Geophysics, Geochronology, Origin of the Sudbury Structure, and Suggestions and Synthesis. Individual chapters are written by experts or groups of experts of various aspects of the problem of Sudbury geology; some of the most interesting to me were chapters on such enigmatic subjects as The Onaping Formation, by Muir and Peredery, The Contact Sublayer of the Sudbury Igneous Complex, by Naldrett, Hewins, Dressler and Rao, Ore Deposits of the North Range, Onaping-Levack area, Sudbury, by Coats and Snajdr, and Precise U-Pb Zircon and Baddeleyite ages for the Sudbury area, by Krogh, Davis and Corfu. There is much new data in these and many other chapters.

The Sudbury Volume committee has chosen an interesting manner in which to present the argument on possible meteoritic impact or volcanic triggering events in the Sudbury area; two authors with opposing interpretations of the evidence on the Onaping-Formation (ash-flow tuffs and lavas or impact fallback breccias and impact melt) have combined to write a chapter that is objective enough that each could live with it, thereby clarifying considerably the descriptive material to be considered by the less "prejudiced" reader. Each, however, made his own interpretation of the data. As might be expected, much of this controversial material is repeated throughout the volume, leading to inevitable repetition of data and interpretation.

The book uses medium brown tones, in addition to black and white, to highlight some aspects of the text and many figures and photographs. This provides some help to the reader in deciphering some geological maps inserted in the text (although it has been omitted from the legend for the "Whitewater Group" in Fig. 2.2, and patterns interchanged in Fig. 3.2d). On the other hand, the brown shades detract from the photographs, which in many cases have insufficient contrast, even in black and white. The brown printing might prove to be problematical for those with poor lighting or failing eyesight.

It is quite clear from the many points of view expressed by the authors that the dilemma of exogenic or endogenic origin of the Sudbury structure is far from resolution. Also, the new data on not only the "offset" and "footwall" ore bodies, but also the more typical "contact-sublayer" deposits reveal that these are not the simple units that might be inferred from other textbooks. In conclusion, I recommend this book very strongly to students, teachers, practising geolgists, both specialist and non-specialist; it offers very good value at $30.00, especially as a comprehensive treatise on the geology and geophysics of the Sudbury area and its deposits. The geological map is worth almost that, itself.

Tree Rings and Telescopes: The Scientific Career of A.E. Douglass

By George E. Webb
University of Arizona Press, Tucson
242 p., 1985; $19.50 US, cloth.

Reviewed by William A.S. Sarjeant
Department of Geological Sciences
University of Saskatchewan
Saskatoon, Saskatchewan S7N 0W0

One of the prime tools for late Quaternary geochronology and for the sequencing and dating of geological sites is dendrochronology — the comparison and counting of tree-rings. It is used also by paleobotanists and paleoecologists to gain an impression of the degree of seasonality and annual variability of ancient climates.

Though earlier scientists, such as George Louis Leclerc, compte de Buffon (1707-1788) and Carl von Linne (1707-1778) had counted tree-rings to determine the ages of trees and the Dutch astronomer Jacobus Kapteyn had recognized in 1881 the relationship of ring sizes to rainfall variation, it was a US astronomer who demonstrated their relevance to archaeology and geology. Outside Arizona, where he worked for much of his life, he is a little-known figure; this biography serves to set the record straight.

Andrew Ellicott Douglass (1867-1962) was born into a distinguished Vermont family; his paternal great-grandfather and namesake was the pioneer American surveyor Andrew Ellicott (1754-1820). Douglass' interest in astronomy originated during his student days at Trinity College, Hartford, Connecticut and grew during his work with the astronomer brothers Edward and William Pickering at Harvard College Observatory. He accompanied a Harvard astronomical expedition in 1893-1896 to the Andes of Peru and Bolivia, making studies of Mercury, Venus and Neptune and writing notes on the geology of those countries.

On return, Douglass became for a while a protégé of the wealthy amateur astronomer Percival Lowell, establishing observatories for Lowell at Flagstaff, Arizona, and in Mexico. However, Lowell was a firm believer in the canals of Mars; when Douglass had the temerity to express doubts about these phenomena, Lowell fired him.

The next few years were difficult. Unable to secure any immediate scientific employment, Douglass served for a while as a probate judge in Arizona and, after his late marriage (at 38), worked as a teacher of Spanish and history in that state. His appointment to the University of Arizona faculty in 1906 enabled a return to science. Thereafter he began to press for the establishment of a world-class astronomical observatory in Arizona. This was made possible through the generosity of Mrs. Lavinia Steward, widow of an amateur astronomer, but it took years of effort. Eventually, after many delays and difficulties caused as much by the inexperience of manufacturers in the US as by the problems brought about by the First World War, Douglass had the great pleasure of seeing the Steward Observatory opened, with himself as director, in 1923.

Paradoxically, however, Douglass' interest was shifting by then from the skies to the earth. As early as 1901 he had begun his study of tree-rings. He found that, in the arid climate of Arizona, their size was controlled primarily by precipitation. In the yellow pines near Flagstaff, the winters were dry; the wood cells became emaciated and ended in a distinct, hard, pitchy ring. He began the cross-dating of trees of different ages. This was not always easy; he found that different trees varied in climatic sensitivity, so that some woods could not be dated reliably. Nevertheless, by 1921 he was able to date archaeological sites in the southwest to within a year — an incredible advance upon the previous imprecision of chronology. Ultimately he was able to produce tree-ring correlation charts spanning almost 2000 years.

In his later years, Douglass became increasingly interested in tree-rings as evidence of past climates. He recognized also that they reflected sun-spot cycles and came to suspect a longer-term cyclicity, whose accurate recognition might enable more precise long-range forecasting of weather. Even after his retirement, at the age of 91, from the Directorship of the Tree-Ring Laboratory he had brought into being at the University of Arizona, he continued his researches into this topic, meeting many frustrations but confident that success was attainable. However, the manuscript setting forth his conclusions was uncompleted when his final illness overtook him.

Webb's biography stresses explicitly the work of Douglass and, indeed, this theme is well and lucidly covered. However, though Douglass' problems and struggles are set forth clearly enough, the portrait of him is rather two-dimensional. Too little is said of his personality and private life for the portrait to be rounded out and given flesh. After having read this book, I feel I know well enough what Douglass did, but not what he was. One reason for this may be that there are so few direct quotations from Douglass' letters and writings; but only rarely does one gain any impression of Douglass's feelings about the various situations that confronted him during his hard-working, and often far from tranquil, life.

Nevertheless, this is an important and thoroughly-researched study, which deserves to be read by anyone interested in the history of geochronology. Douglass' monuments are not only the three massive published volumes of *Climatic Cycles and Tree Growth* (1919-1936) and the continuing work of the Tree-Ring Laboratory, but also the whole structure of archaeological correlation and paleoclimatic knowledge for which he laid such excellent foundations.

Petroleum Stratigraphy: A guide for nongeologists

By R.L. Brenner
IHRDC, Boston
193 p., 1984; $27.00 US; cloth

Reviewed by Michael P. Cecile
Geological Survey of Canada
3303 - 33rd St. N.W.
Calgary, Alberta T2L 2A7

This book is a concise introductory geology text which focusses on stratigraphy with a slant toward petroleum geology. It is a small format book (14 × 20 cm) with double-spaced type, and an abundance of easy-to-understand illustrations. It is written for persons with the understanding and background of a high school graduate.

The book has six chapters: "Genesis of Sediments and Sedimentary Rocks" - weathering, transport, classification, sedimentary structures, fossils; "Geological Time and Correlation" - radiometric dating, use of fossils, paleomagnetism, seismic stratigraphy, etc.; "Stratigraphic Nomenclature" - stratigraphic terms and the geological time scale; "Sedimentary Domains and Facies Concepts" - definition of facies terms, various clastic, carbonate and evaporite facies, and a discussion of dolomitization; "Stratigraphic Petroleum Traps" - definitions, examples from facies types, salt domes and unconformities; "Tectonism and the Stratigraphic Record — a Guide to Basin Analysis" - a general discussion of tectonic cycles, geosynclines, plate tectonics, types of basins and tectonic regimes. It ends with a very concise glossary of terms.

This book is up-to-date, well-organized, and covers most of the important aspects of petroleum stratigraphy. This text will provide the nongeologist with a basic understanding of stratigraphy and stratigraphically controlled hydrocarbon traps. Any petroleum company purchasing this text for their nongeological employees should note, however, that it deals only with stratigraphy and thus should be supplemented with other texts on structure, geophysics, etc. A good supplementary text would be an introductory geology textbook. In fact, an introductory geology text may be all that employees require unless their company's activities involve mainly petroleum occurences in undisturbed stratified successions.

Plankton stratigraphy

Edited by H.M. Bolli, J.B. Saunders and K. Perch-Nielsen
Cambridge University Press, Cambridge 1032 p., 1985; $245 US, cloth

Reviewed by Wiliam A.S. Sarjeant
Department of Geological Sciences
University of Saskatchewan
Saskatoon, Saskatchewan S7N 0W0

In the period since 1950, the expansion of stratigraphical knowledge has been enormous. Up to that time, the only microfossils in regular use for stratigraphical zonation were foraminifera, ostracodes, and (in the Carboniferous and Quaternary only) spores and pollen. Those groups remain important, of course; but nowadays a number of other groups are in regular use as zonal indices; in particular the dinoflagellates, acritarchs, radiolarians and calcareous nannofossils.

This massive volume is a laudable attempt to bring together all the available information on the whole range of groups in present use. Or rather, I should say "in use in Mesozoic and Cainozoic stratigraphy", for virtually nothing is said about pre-Jurassic plankton. Radiolarians have been utilized in stratigraphy in the paleozoic also, while chitinozoans and acritarchs have been employed from Mesozoic to Triassic and are present also in Jurassic to Holocene sediments; yet these are all ignored. A more honest title would have been Plankton stratigraphy of post-Triassic sediments.

Within this closer circumscription, the coverage is good. The texts are in general lucid, the tables clear and the photographic illustrations never less than adequate. It is a little bewildering to find, on many tables, that the generic abbreviation A. or B. might apply not to one genus, but to two or even a host of genera, but the captions clarify this approach, which was no doubt dictated by considerations of space and expense.

The balance of coverage is reasonable. Almost one-third of the volume (328 pages) is devoted to the foraminifera; but then, these are the microfossils that have been studied longest and about which the most detailed information is available. Some 226 pages are allocated to the calcareous nannofossils; 139 pages to the radiolarians; 118 pages to dinoflagellates; 96 pages to the planktonic diatoms; and the balance of the volume to three groups still relatively minor, but of grow ing importance, in stratigraphy — the calpionellids, the silicoflagellates and the ichthyoliths. Personally I feel that otoliths deserved a chapter, but the recent death of F.C. Stinton may have meant that there was no one qualified to write about them. Otherwise — within the stratigraphical limitations I have noted earlier — this coverage cannot be faulted.

A word that always causes me to blench is that wretched adjective "planktic", and it is one, unfortunately, that appears on very many pages. The word "planktonic" is very suitably derived from the Greek planctos, wandering, roaming, whereas "planktic" can only be derived from the Latin planca, a board or slab - and, even then, represents an inappropriate alteration of spelling. I suppose that this vile word was created by someone — someone devoid either of classical knowledge or aesthetic sensibilities — as an abbreviation of "planktonic"; but did the saving of two letters justify such a nomenclatural abortion? If this is to be a future trend, then let us be consistent: after all, a change of "paleontologic" to "paleontic" and "geologic" to "geolic" would be just as logical, or should I say "lical"? And why not "biolic", "zoolic" and "botic"?

Each specialist will, naturally, turn first to the chapter on the micro-organisms that are the subject of his own study. For me, this was the dinoflagellates; and I was pleased to find the chapter by Williams and Bujak to be, in general, excellent. Naturally I differed from a few of their taxonomic decisions — personally, I can see no good reason for retaining the generic names *Dimidiadinium* and *Shublikodinium* — but this is to be expected, since no two taxonomists ever wholly agree. However, I was saddened, in their historical introduction, to find that my own pioneering efforts to correlate Jurassic dinoflagellate ranges with ammonite zones (1960, 1961, 1962a,b, etc.) gained no least mention; nor was credit given to my attempts to bring together stratigraphical information on dinoflagellates, for the Jurassic (1964) and for the whole world (1967). Yet these all preceded the work of Clarke and Verdier (1967), who gain more credit as innovators than they deserve, for their contribution was only in extending this work to the Cretaceous. Nor is there even any passing mention of the later international reviews of stratigraphical information on the Jurassic by Riley and myself (1972) and on post-Jurassic strata by Harker and myself (1975), either in the introduction or in the subsequent text.

In summary, this is a well-conceived and well-executed work, for which the authors and editors deserve great credit. It is one, moreover, that will surely be on the shelves of all biostratigraphers utilizing microfossils, whether in the companies, the governmental surveys or the academic milieu.

The text is attractive, the tables clear, the plates never less than adequate in quality. What a pity it is, therefore, that the volumes are so inadequately bound and destined so soon to disintegrate; mine was already splitting at the head and foot of the spine even before I opened it.

Buy this work, then, despite the high price, for it will be very useful. But,if you are going to be using it intensively, you will need to set aside some money within the next few years to have it rebound.

References

Harker, S.D. and Sarjeant, W.A.S., 1975, The stratigraphical distribution of organic-walled dinoflagellate cysts in the Cretaceous and Tertiary: Reviews In Palaeobotany and Palynology, v. 20, p. 217-315, 68 charts.

Riley, L.A. and Sarjeant, W.A.S., 1972, Survey of the stratigraphical distribution of dinoflagellates, acritarchs and tasmanitids in the Jurassic: Geophytology, v. 2., p. 1-40, tabs. 1-4.

Sarjeant, W.A.S., 1960, Microplankton from the Corallian rocks of Yorkshire, Yorkshire Geological Society, Proceedings, v. 32, p. 389-408.

Sarjeant, W.A.S., 1961, Microplankton from the Kellaways Rock and Oxford Clay of Yorkshire: Palaeontology, v. 4, p. 90-118.

Sarjeant, W.A.S., 1962a, Upper Jurassic microplankton from Dorset, England: Micropaleontology, v. 8, p. 255-268.

Sarjeant, W.A.S., 1962b, Microplankton from the Ampthill Clay of Melton, South Yorkshire: Palaeontology, v. 5, p. 478-497.

Sarjeant, W.A.S., 1964, The stratigraphical application of fossil microplankton (dinoflagellates and hystrichospheres) in the Jurassic: Colloque du Jurassique, Luxembourg, 1962, v. C. r. et Mem., p. 441-448, tabls. 1-4.

Sarjeant, W.A.S., 1967, The stratigraphical distribution of fossil dinoflagellates: Reviews in Palaeobotany and Palynology, v. 1, p. 323-343, tabs. 1-13.

Geology in Engineering

By Robert Bowen
Elsevier Science Publishing, New York 411 p., 1984; $57.75 US, cloth

Reviewed by S. Thomson
Department of Civil Engineering
University of Alberta
Edmonton, Alberta T6G 2G7

In the preface, the author points out that this text is not intended to add to the numerous works available that discuss the interrelationship between civil engineering and the earth sciences. The text uses the first 5 chapters to outline some fundamental areas of geology, *viz.*, rocks, rocks in time and space, minerals, water and permafrost. Of necessity, each of these topics is briefly considered. Often the terminology is British and some facets of the subjects, for example optical crystallography and twinning in crystals, are discussed in more detail than would appear warranted. The area of permafrost is superficially covered and some material, such as the steaming in of piles, is out of date. A statement is also made that boulder clays (which this reviewer has interpreted as synonymous with till) are most unsatisfactory from an engineering standpoint. In the reviewer's experience

in the western Canadian Arctic, till is a satisfactory foundation material and is generally not ice-rich. The latest reference at the end of this chapter is 1970. There have been three international conferences on permafrost since that time.

In the remaining 5 chapters the author deals with foundations, earth movements and non-diastrophic structures, tunnelling, large-scale hydraulic structures (dams) and remote sensing. In the chapter on foundations, there is an odd mixture of SI and "Imperial" units (e.g. Table 6.2). There is also an apparent anomaly dealing with footings. At one point (page 177), the author states that there is no differential settlement if all footings exert the same unit pressure independent of the size of the footing. However, subsequently (page 189) it is stated that "the larger footing settles more than a small one". There is an interesting discussion of Zaruba's work in Czechoslovakia and a useful summary of borehole investigation techniques. The historical geology of the UK is summarized and the details of UK maps are presented.

The chapter on earth movements and non-diastrophic structures contains useful sections on water content changes in soil masses and weathering effects. There is also a very brief review of slope movement classification. The chapter on tunnels presents some case histories including two instances of unforeseen circumstances encountered during construction. Study points for tunnel investigation are presented and discussed and water pressure is considered. Both are interesting and useful.

A brief historical summary of dams built by the Egyptians, Romans, Mongols, and Spanish opens the chapter on "Large-Scale Hydraulic Structures". This is followed by short sections on geologic appraisal and geophysical methods. Useful case histories are briefly presented that serve to illustrate the care that must be exercised in dam site investigations. These case histories include cases of sites abandonned due to adverse geologic factors. Reservoir-induced seismicity at several sites is noted. The section on results of construction presents some interesting topics. These cover such aspects as failure, silting of the reservoir, leakage, failures of the slopes of the reservoir and hydrogeologic effects.

The final chapter considers Remote Sensing and starts with a review of mapping schemes for various uses. The author discusses black and white and colour photography, the use of radar images and thermography giving a brief summary of the role each plays in mapping. There is an interesting note on coverage provided by the space shuttle when radar images disclosed buried channels in the Sahara Desert. A review of satellite imagery and its uses is given followed by a few examples of the use of remote sensing data in construction.

In general, it is the reviewer's feeling that the book attempts to cover an enormously broad and diverse area and hence can only do so in a rather cursory fashion in a single text. The reader may well be spurred to a more detailed study of some of the areas the author considers.

Holocene Marine Sedimentation in the North Sea Basin

Edited by S.D. Nio, C.T.E. Shuttenhelm and Tj. C.E. van Weering
Blackwell Scientific Publications, Palo Alto
International Association of Sedimentologists
Special Publication Number 5
524 p., 1981; $70.00 US, cloth

Reviewed by R. John Knight
Petro-Canada Inc.
P.O. Box 2844
Calgary, Alberta T2P 3E3

The North Sea Basin has been the basis of many important contributions about tidal sedimentations in nearshore and shelf settings from such workers as Van Veen, Van Straaten, Postma, Schafer, Evans, Reineck, Houbolt, Boersma, Terwindt, Caston and McCave to mention only a few between the mid-1930's and late 1960's. In the roughly fifteen years since then, research activities have increased tremendously in the North Sea as a consequence of both exploration for hydrocarbon and its socio-economic implications to the countries surrounding the North Sea, and the growth of research on the hydrodynamics of bedforms, their internal sedimentary structures and comparative sedimentology between modern and ancient deposits. Special Publication Number 5 of the International Association of Sedimentologists is the most recent important contribution to come from the North Sea.

The publication is a product of a successful meeting with the same name which was held on the island of Texel, the Netherlands in September, 1979. The objective of that meeting and this book was to provide a forum and medium to ascertain the current status of research about Holocene marine sedimentation in the North Sea. The book contains 35 technical contributions preceded by a brief introduction by the editors. The research papers cover a variety of topics ranging from the dynamics of nearshore and intertidal bedforms (6 papers), to nearshore sedimentary sequences (3 papers), to nearshore sediment dispersal and transport (3 papers), to general Holocene stratigraphy resulting from sea level changes (4 papers), to shelf sediments, bedforms and transport (8 papers), to the distribution of suspended sediment and associated environmental pollutants (4 papers), to faunal zonation distribution (2 papers), to a mixture of papers dealing with fluvial input, grain-size distribution, sediment transport on the mid-Atlantic Bight of North America, storm deposits in the Gulf of Mexico and rheological properties of estuarine muds in Virginia (5 papers). Although these last five contributions are technically interesting, they seem completely out of place in this publication. Overall, the technical content of the papers is very good and the book is well edited as you might expect of a publication with which the International Association of Sedimentologists is involved.

The major pros of the book include: (i) it summarizes the current state of sedimentary research in the North Sea basin; (ii) there is a lot of new data with amplification of several old interpretations plus presentation of some new ones; (iii) it brings many diverse sedimentological aspects about the North Sea together in one place; (iv) the papers are generally concise and to the point, well organized and of good technical calibre; and (v) the book is generally well edited. The cons, albeit few, include: (a) several of the contributions do not fit the overall theme of the book; (b) the order of the individual papers is poorly organized leaving the impression that the book contains a "pot-pouri" of topics which it does not; and (c) the somewhat prohibitive cost of $70 US which will undoubtedly put this publication beyond the reach and interest of many, particularly students.

The book should be essential reading for anyone working on modern and ancient marine or marginal marine sediments in or around the North Sea Basin and for others working in tidal settings elsewhere. The book's content reflects the current state of research in the North Sea at the beginning of the 1980's and indicates some exciting sedimentology continues to be produced from this well-studied basin. In spite of its price, it is still a good read and a worthwhile reference to have in one's personal library.

Atlas of Sedimentary Rocks under the Microscope

By A.E. Adams, W.E. MacKenzie and C. Guilford
Academic Press (Longman), Toronto
104 p., 1984; $29.95, paper

Reviewed by G.V. Middleton
Department of Geology
McMaster University
Hamilton, Ontario L8S 4M1

This relatively inexpensive, handsome book consists mainly of 217 colour photomicrographs of sedimentary rocks. The book attempts to cover almost as much ground as the two AAPG volumes produced by Peter Scholle, the total price is lower, and the quality of the colour reproduction is better. There is also a rather fuller and more informative commentary on the photos than Scholle gives. There are short appendices on making and staining thin sections, but no descriptions of other techniques (cathodoluminescence, SEM, etc.: Scholle's books do cover these techniques). The authors present Folk's classification of sandstones, and Folk's and Dunham's classification of limestones. Besides photos of sandstones and carbonates there are a few of ironstones, cherts, phosphates, coals and evaporites. Volcaniclastics are covered (inadequately) in the volume on igneous rocks, so they are not included in this volume. What more could one ask, for the price?

Well, I do have a complaint or two. Students studying undergraduate petrography need to be told that it is better to observe, and draw, just a few grains carefully, than it is to try to sketch a field containing more than a hundred grains. Many of the photomicrographs of sandstones in this volume show more than a hundred grains. One sees a pretty pattern but it would be more instructive to focus on a few grains (Scholle is much better in this respect). Carbonates are given more space and are better treated than sandstones: for example, the student will look in vain for an illustration of secondary porosity in sandstones. The perfect atlas of sedimentary rocks remains to be written: it should combine photomicrographs with cathodoluminescence and SEM photos, as well as including a fair number of explanatory line drawings. It sometimes seems that atlas compilers think that photos and line drawings do not belong in the same book. A pity, because the best way to explain something is often to illustrate it schematically with a line drawing before showing what it really looks like with a photo. Nevertheless, the book is probably the best there is available for the price, and several copies should be in every laboratory where sedimentary petrography is taught.