

Book Reviews / Critique

Joseph R. Desloges, *Geomorphology*
by Richard J. Chorley, Stanley A. Schumm and David E. Sugden / 227

B. R. Rust, *Phanerozoic earth history of Australia*
edited by J. J. Vaeyens / 227

I. Peter Martini, *Tectonic Geomorphology*
edited by M. Morisawa and J. Y Hack / 228

D. J. Cant, *The Mesozoic of Middle North America*
edited by D. F. Stott and D. J. Glass / 228

Brian Chatterton, *Invertebrate Palaeontology and Evolution, Second Edition*
by E. N. K. Clarkson / 229

Book Reviews

Geomorphology

By Richard J. Chorley, Stanley A. Schumm and David E. Sugden
Methuen, London
 605 p., 1984; \$40.00, cloth

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Geomorphology is one of at least five new or revised editions of introductory geomorphology textbooks that have been released over the last four years. It is the only one which is jointly authored, and in this case by three of the most prominent researchers in the field over the last 15-20 years. As one might expect, it is a comprehensive review of the discipline (570 pages of main text excluding appendices), including both an account of the historical development of major themes in geomorphology and an extensive introduction to the core of the discipline: processes and landforms.

The book is divided into four parts and includes twenty chapters. Part 1 (Chapters 1 to 3) is devoted to a discussion of the major approaches to geomorphological enquiry and sets out to define the geomorphic system and various rubrics of investigation (e.g., temporal and spatial considerations). Morphologic systems and denudation chronology are then introduced by tracing the origins of the discipline and the development of major theories in geomorphology over the last 100 years. Geological control of landform development is the topic of Part 2 (Chapters 4 to 8). Global-scale geologic processes are considered along with variations in landform due to variable lithologies and structures. Chapter 4 is an excellent summary of geological materials and their description hence, this chapter, along with several others in the section, is very useful reading for students who have a limited geological background.

Part 3 (Chapters 9 to 17) is a systematic treatment of major geomorphological processes and landforms. The sequence of

topics begins with weathering, mass movement and hillslopes followed by drainage basins and alluvial, coastal and aeolian processes and ends with glacial processes and landforms. Although the impact of climate on processes is documented throughout Part 3, the authors have justly devoted Part 4 to a continuing major theme in earth surface studies: climatic geomorphology. In this final section a classification of landforms and processes on the basis of global climates (morphogenetic regions), and landform development under changing climates over geologic time, provide a basis for discussion. Finally, the appendix includes a brief introduction to applied geomorphology, together with a set of photographic illustrations which have been referenced throughout the main text.

The tome is well edited and relatively free of errors. The authors have chosen to utilize diagrams, illustrations and tables extracted from a cross-section of the scientific literature, resulting in effective representation and referencing of landmark studies. I have only two criticisms of the book. Although the third author (D. Sugden) is a recognized authority in glacial geomorphology, surprisingly little text is given to glacial and periglacial processes and, what is there, is split amongst different chapters and parts of the book. Secondly, in an attempt to be as comprehensive as possible, the text, and in particular many diagrams, overemphasize detail; so much so that in places key points of the discussion are lost. For this reason lower level undergraduates in a one semester course, particularly those with little or no geological or engineering background, may find the reading is somewhat advanced. By the same token, however, senior undergraduates, graduates and researchers will find it an invaluable source covering every important aspect of geomorphology. The authors should be commended for the arduous task of encapsulating the discipline into such a coherent and informative account.

Phanerozoic earth history of Australia

Edited by J.J. Veevers
The Clarendon Press, Oxford University Press, New York
 418 p., 1984; \$75.00 US, cloth

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The *Phanerozoic earth history of Australia* is a compilation by John Veevers and ten colleagues or former colleagues at the School of Earth Sciences at Macquarie University, and two other collaborators. As might be expected of a work spearheaded by Veevers, it is a history viewed very much through its tectonic framework. In contrast with other such works, for example *Geological Evolution of North America* (Stearn, Carroll and Clark, 1979), this volume concentrates on physical aspects of earth history, and devotes much less attention to faunal and floral changes. These are discussed in a short section on biogeography, but they are not integrated into the rest of the text. Another contrast is that the level of writing is for the specialist rather than the student, and photographs are lacking, apart from a frontispiece showing part of the Cooper Creek in flood, and in a dry state. This area is of particular interest to me, but it is perhaps a bit obscure in the overall context of the continent's history.

The strength of the book is its firm basis in tectonics and geophysics. A section on oceanic paleomagnetism details (and I mean, details) the events that gave rise to the separation of India from Australia and Antarctica, the opening of the Tasman Sea, spreading between Australia and Antarctica, and convergence between Australia and Indonesia. Much of the book is too detailed for North American readers, but sections such as this will surely be of general interest. Other nice touches are the opening discussion of chronology and the closing "cinematograph" or potted history of the continent

I have two main criticisms. One is that the book is cramped in style. The typeface is too small, the pages too crowded, and many of the figures are over-reduced or too complex. This leads to lengthy figure captions and difficulty in deciphering what the figures are supposed to portray. The second criticism concerns Chapter V, which discusses Australia's Phanerozoic history (and a bit of pre-Phanerozoic as well). The authors have elected to tackle this subject in reverse historical order, from youngest to oldest. I find this a curious approach, because here, as in all history, events are at least partly shaped by what has happened before, and running the movie backwards does little to clarify the picture.

In summary, this book will be a useful fund of information for specialists interested in physical aspects of Australia's Phanerozoic history. Unfortunately, it is not much help for the visitor from elsewhere who is looking for a relatively simple account of the continent's development. It is too late to mention it now, but such a book, complete with simpler illustrations and photographs, would have been rather nice as a project for Australia's bicentenary.

Tectonic Geomorphology

Edited by M. Morisawa and J.Y. Hack
Allen & Unwin, Inc., Winchester, MA
 390 p., 1985; \$40.00 US, cloth

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Morphological observations can be useful tools for mapping, correlating and perhaps dating certain terrains and events. In many instances such a use is a necessary evil, full of traps for the unwary or the ambitious, who dream of formulating all embracing theories to explain similar features in different areas.

The book is subdivided into three parts. The first deals with macro geomorphic features associated with plate boundaries and movements. The second deals with more local studies in mountainous areas in North America, and the third deals with geomorphic features generated by recent earthquakes in Japan and China with the objective to establishing criteria to predict future seismic events.

In the first part of the book, the paper by Ollier is noteworthy as it stresses what perhaps should appear obvious considering the post-Precambrian history of the Earth's crustal plates, that is, that continents have depressions at the centre and raised

margins. The rising of margins which contain plateaus and escarpments is related to vertical upwarping of the boundary of plates through several possible mechanisms, some of which are rather speculative and are better left to petrologists and geophysicists to explain. The theme of continental margin uplift soon after splitting of the plates is reiterated by Sonnerfield who uses it as part of his criticism and effective repudiation of King's ideas on evolution of African landscape based on continental, perhaps global wide cycles of uplifts and planations. Active tectonism, and in particular the effect of vertical uplift is interpreted through analysis of geomorphic features such as "scarps, straths, pediments, and drainage changes" (as the editors say) in various areas such as the Dead Sea, Costa Rica and the natural tectonic laboratory "par-excellence" New Zealand, in four other papers.

Part two of the book starts off with a paper by Oberlander who criticizes the concept of "stream antecedence to structure" on major folded mountains, and, utilizing examples from the recent and active Zagros Mountains proposes an alternative superimposition hypothesis. As far as I can determine, the main point of this proposed hypothesis is that streams are indeed affected by the structural grain of the mountains, but not necessarily the one we see today, possibly one that existed in the past when the presently exhumed resistant (competent) stratigraphic units were covered by incompetent (mobile) units preferentially entrenched by the streams. The following seven papers of part two of the book deal with examples from the United States where relationships between geomorphic and tectonic features are examined. Each is a good contribution to local geomorphology. Pavich, for instance, reiterates the dynamic equilibrium concept of the Appalachian Piedmont. He is still pre-occupied by whether a tectonic uplift mechanism drives the system or the uplift is the response to denudation.

Finally, in part three of the book, the effects of modern earthquakes on geomorphic features and active faults in particular, provide a better understanding of the seismic history of Japan and part of China, such that the long range prediction of seismic events can be attempted.

In conclusion, the book successfully brings to the forefront modern research in tectonic geomorphology, or "morphotectonics". Much new information is now available, but somehow proposed new hypotheses appear as much debatable as those supposedly replaced ones. Perhaps this type of geomorphology, as many other sciences, is at the stage of "mopping up" after the brilliant insight on continental drift of more than half a century ago.

The format of the book suffers for the modern paranoia of typewritten, ready made, quick publications. The figures are

good and informative, but I sympathize with the editors for the frustration they must have suffered in having various contributors not following pre-established guidelines, thus leading to different type faces and slightly different ways of reporting references. This does not come cheap either. Unfortunately, these types of book do not have a large market and publishers try to get back their investment and make some profit from relatively few copies sold to libraries and fans. Parts of the book are certainly worth reading, and a copy should be in each major library as reference for students.

The Mesozoic of Middle North America

Edited by D.F. Stott and D.J. Glass
Canadian Society of Petroleum Geologists
Memoir 9
 1984, 573 p.; \$34 members,
 \$39 non-members, cloth

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This book consists of a collection of 32 papers presented at a CSPG conference in Calgary in May, 1983. They are grouped as follows: Regional syntheses and concepts, Biostratigraphy and chronostratigraphy, Sedimentology, Specific field studies, and Coal geology. The stratigraphic contributions in the book range from classical descriptive work to comparative analysis of large-scale sequences. Biostratigraphic contributions consist of studies of Jurassic ammonite zones, Lower Mannville palynomorphs, and Cretaceous foraminifera. About 12 papers address the sedimentology of various units. Two papers discuss generation and trapping of petroleum. Some papers essentially stand as single contributions in their fields: subjects such as ichnology, magnetostratigraphy, modelling of circulation in the Cretaceous seaway, carbon isotope analysis, and structural geology of a coal-bearing unit are each represented.

The collection of papers probably fulfils the editors' intent in that large amounts of data are provided about different aspects of Mesozoic sediments. No central theme is apparent in the book. To me, the most comprehensive and interesting parts of it concern regional stratigraphy. However, at least some of this has been published previously in various government reports. Perhaps the most interesting stratigraphic paper is by W.G.E. Caldwell who considers large-scale,

composite sequences, whether they are interpretable as the result of eustatic variation or not. In light of recent developments in seismic stratigraphy and modelling of basin subsidence, this kind of analytical approach to the stratigraphy of a well-known basin is very useful. Some of the lithostratigraphy and biostratigraphy of the Jurassic Fernie Group of Alberta and British Columbia are particularly interesting to those working on the tectonic evolution of the foreland basin. The reports by Hall and Stronach clarify the response of the basin to the initiation of tectonism in the Cordillera. Perhaps the weakest section of the book is the sedimentology. Few of the papers break new ground, and some interpretations appear to be made by comparison to generalized facies models. However, the subsurface examples do integrate the facies work with mapping, stratigraphy, and petroleum geology.

In spite of the title of the book, most of the papers are concerned mainly with the Early Cretaceous (a few about the Jurassic) of western Canada. The book is well produced with few typographical errors. Perhaps it would have benefitted by more rigorous editing — some of the papers have rather long sections describing the lithologies, nomenclatures, and regional relationships of various units. Much of this is essentially repeated from other publications. I believe that an editor with a thicker red pencil would have made some of these contributions more readable. The collection also demonstrates that a "boundary fault" still exists along the 49th parallel. Only one or two papers attempt to cross this psychological, logistic, and political boundary, even though in the Early Cretaceous the basin was not subdivided by Laramide tectonism. In these days of free trade, perhaps ideas and data about the rocks of this area could be extended across the international border.

To summarize, this collection of papers is of interest to geologists working on Jurassic and Cretaceous sediments in the foreland and cratonic basins of North America. It presents considerable amounts of new data but few new geological concepts are advanced.

Invertebrate Palaeontology and Evolution, Second Edition

By E.N.K. Clarkson
Allen & Unwin, London
382 p., 1986; \$25.95 US, paper

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This is one of the two main contenders for the introductory paleontology market. It is also a modestly priced basic reference for non-paleontological earth scientists seeking terminology and classification of common groups of invertebrates.

The first edition (1976), when used as the principal text for an introductory class, needed to be supplemented by other books or reference materials. It lacked information on microfossils, and had little theory of evolution and systematics. It was, however, an excellent introduction to the morphology and classification of all common groups of macroinvertebrates, with attractive illustrations and an organized and well-written text.

The second edition does everything the first edition did (with most of the same illustrations) and more (revised, enlarged text and additional figures). It has grown by about 61 pages. Several areas of paleontology have been the subject of interest and controversy in recent years. These include phyletic gradualism *versus* punctuational evolution, cladistic *versus* stratophenetic displays of relationship and classification, and mass extinctions. Dr. Clarkson provides a balanced view of the first topic, leans toward the more traditional stratophenetic approaches (or at least somewhat anticleadistic) in the second; but in the third, although discussing impacts of extraterrestrial objects as causes of extinction, ignores the controversial papers written on periodicity of impacts and/or the extinctions.

The first three chapters, where these more theoretical discussions are, have grown 30%. Chapters 4-11 include illustrations, descriptions and classifications of important groups of macroinvertebrates. Figures have been rearranged, some redrawn and new figures added. The changes are for the better. In the second edition, the bold face terms are unfortunately less bold (needed in these days of bright yellow and pink marker pens). The text is more up-to-date (e.g., in classification, trilobites are treated as a phylum), and some theoretical sections have been added and others expanded. As might be expected in an introductory text these are interesting but incomplete. The chapter on trilobites, the group closest to Dr. Clarkson's heart, contains new sections on the functional morphology of the heads of trinucleid and harpid trilobites. While interesting, the explanations offered are incomplete or contentious. Alternate explanations are ignored. The last chapter, on preservation of exceptional faunas, has also been expanded. The Burgess Shale is treated more thoroughly and a section on the phosphatized Upper Cambrian faunas of Sweden has been added.

How does this text compare with the main opposition, its North American equivalent written by Boardman *et al.* (published by Blackwell Scientific Publishers)? It is about half the size and half the price, containing fewer photographs but illustrations of comparable quality. By comparison, Clarkson's book lacks information on some groups of microfossils and provides fewer details on others (e.g., at one extreme, Clarkson gives less than one page to the Class Rostroconchia and Boardman *et al.* over twenty pages). Both books contain similar proportions of theoretical information to information on morphology and classification. Both are good texts and, relative to one another, you get roughly what you pay for.

Clarkson's first edition of this text was good, the second is better. Text books on introductory paleontology have improved over those of twenty years ago. This is one of the better texts of the latest generation.



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In the fall of 1989, a major symposium focussing on all aspects of the gold mining industry of North America and Australia will be sponsored jointly by the Society of Mining Engineers of AIME and Australasian Institute of Mining and Metallurgy. The Technical Symposium will be held in Reno, Nevada, on November 5-8, 1989, with a pre-meeting field trip in Australia and, following the meeting, a field trip in North America.

Four sessions (20 papers) will be devoted to gold exploration. Papers are hereby solicited in the following areas:

- New Discovery Case Histories
- Hydrothermal/Metamorphic Fluid Concepts and Gold Mineralization
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Previously unpublished papers are requested and will be published in a high-quality Conference Volume that will be available at the Conference.

Those interested in presenting papers in Reno are invited to submit a 200-word synopsis in care of:
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