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# BOOK REVIEWS

## Geoarchaeology: The Earth Science Approach to Archaeological Interpretation

By George (Rip) Rapp Jr.  
and Christopher L. Hill  
*Yale University Press*  
*New Haven and London*  
*1998, 274 p., US\$40, hardcover*  
*US\$22.50, paper*

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*Geoarchaeology* is intended first for "archaeologists in the formative stages of their careers," then "geologists who ... are assisting in the solution of archaeological problems," and for others whose "scholarship requires some understanding of the physical context of the remains of past material culture, as represented in the artifactual record" (p. xi). It has been written as "an introductory textbook for advanced-level undergraduates and graduate students in archaeology and geoarchaeology" (p. xii). Rapp and Hill define geoarchaeology as "the use of geologic concepts, methods and knowledge base in the direct solution of archaeological problems." They see a distinction between this and archaeological geology, that is, "geology performed with at least the partial objective of being useful to archaeology" (p. xi). To this end, they frame "each geologic concept or knowledge base ... within an archaeological context," by "tak-

ing an earth-science approach to the examination of diverse archaeological settings" (p. xi).

Following a Preface, the book is arranged in nine chapters, followed by an Appendix, Notes, Glossary, Bibliography and an Index. The text is organized thematically, and each chapter covers a series of topics. In Chapter 1, "Theoretical and Historical Overview," Rapp and Hill review the origins of geoarchaeology. They emphasize that earth science techniques and perspectives have been a component of archeology throughout its development as a discipline. "Sediments and Soils and the Creation of the Archaeological Record" are covered in Chapter 2. Rapp and Hill examine different sedimentation products, such as sands, muds, and chemical precipitates, and review sedimentary structures. They introduce concepts of soil development and classification, and include a brief survey of palaeosols. Next Rapp and Hill turn to the "Contexts of Archaeological Record Formation," looking at the various depositional locales, such as alluvial systems or caves, where archeological materials are found. They note the contribution made by an earth science approach to an "understanding of the sources of variability and patterning" (p. 52) in these materials. Disturbance factors, such as mass wasting and bioturbation, which may affect materials after their initial deposition, are also considered. Chapter 4 concentrates on the biotic components of soils and sediments in "Paleoenvironmental Reconstructions: Humans, Climates and Ancient Landscapes." Among the proxy environmental indicators discussed are pollen, plant macroremains, phytoliths, diatoms, ostracodes, molluscs, insects, and various vertebrates.

Chapters 5 and 6 consider "Raw

Materials and Resources" and "Provenance Studies" of materials that may be found associated with sites, used to produce artifacts, or used as building materials. Rapp and Hill's discussion of raw materials focusses primarily on geologic and inorganic materials, such as rocks, minerals, and metal ores. Some other materials, such as shell and water (but not bone), are briefly mentioned. People often transport raw materials or finished products far from their place of origin. Thus establishing the raw materials' provenance can give archeologists important information about resource exploitation and trade networks. Rapp and Hill discuss the complexities of sourcing raw materials, such as obsidian, copper, or amber, and review some archeometric methods, such as petrographic analyses or trace element analysis by INAA, that can be used for this purpose. "Estimating Age in the Archaeological Record" (Chapter 7) is always a concern for archeologists. Rapp and Hill review dating methods from classic relative techniques that rely on stratigraphy and on biotic remains (paleontology and dendrochronology) to those that rely on specific physical properties of geologic and biologic components, including amino-acid racemization, radiometric methods (*e.g.*, K-Ar and <sup>14</sup>C), and newer methods such as thermoluminescence (TL) and infra-red stimulated luminescence (IRSL).

Chapter 8 provides an overview of "Geologic Mapping, Remote Sensing, and Surveying." Remote sensing and geophysical survey methods (*e.g.*, GPR and electrical resistivity) can be used prior to excavation to identify buried structures or anomalies that might repay investigation. These non-destructive and comparatively low-cost methods play an increasingly important role in archeology, particularly in cultural

resource management. Such methods can help pinpoint areas where excavation, which is expensive, may yield most data. Finally, Rapp and Hill examine "Construction, Destruction, Site Preservation, and Conservation" in Chapter 9. They describe engineering practices and structures, such as dams, canals, and roads, and their expression in and impact on the landscape, and review weathering and erosion processes that may be implicated in site or artifact destruction.

I approached this book with high hopes but I was disappointed, especially considering the reputation of the senior author (the Geological Society of America has an award named after him). The text is marred by numerous examples of poor writing, which often obscure the meaning and confuse the reader, or at least confused this reader. There are some sentences and phrases that I find quite baffling. Consider this: "the Incas were able to forge an empire in a land that would inspire only small enclaves" (p. 201). The lack of precision and clarity in the writing, and frequent over-generalization, often gives rise to misleading statements. For example, they state that "[d]istinctive postdepositional features like patterned ground, frost heave, or ice wedges in palaeosols may be an indication of taiga settings" (p. 36). The listed features are characteristic results of periglacial processes, which are not restricted to northern coniferous forest (taiga).

Unfortunately, Chapter 2, the heart of the book, is especially flawed. The discussion of soil classification needs more explanatory background and detail. Rapp and Hill describe soil classification (Entisols, Mollisols, *etc.*) without indicating its derivation from the American system of soil taxonomy. Although widely used, other national systems are different. Canadian students, for example, will look in vain for familiar Luvisols and Brunisols. Equivalent terms, such as chernozem under Mollisols, could have been mentioned and defined. A brief historical comment, explaining why many terms have Russian origins, would have been useful. Further, the hierarchical nature of the system should have been explained; the soil types are described at the Order level. Cold climate soils (Cryosols) and the impact of cryoturbation are missing from the discussion. Although mentioned later (p. 82-83), in this chapter their discussion

of processes causing convolutions (p. 44) lacks mention of cryoturbation, a common process in high latitudes and elevations.

Sections of text are contradictory. For example, the caption to Figure 2.6 notes the "unaltered parent material (*R*) decomposes, forming a *C* horizon," while the adjacent text describes "bedrock (*R*) or unaltered parent material (*C*)" (p. 31). There are some sentences that I find completely mystifying, such as "[a]nother generalization is that red soils are older than yellow soils, and they indicate the presence of drainage" (p. 37). Other sentences or phrases are frankly wrong, such as "botanical remains like seeds, flint and obsidian" (p. 25), or the associated Glossary definition of eluvial as "[d]eposited by the action of wind" (p. 238).

Throughout the book, many diagrams are so poorly labelled that they are difficult to understand or relate to the text. Several site-specific diagrams lack scales (e.g., Figs. 6.3 and 8.5). Schematic diagrams (e.g., Fig. 2.4) need some indication of vertical and horizontal dimensions. I found several figures incomprehensible. There are errors in some diagrams and captions. There are few photos. Instead, the book is illustrated by pen-and-ink line drawings. Some drawings of specific objects (dendrites, concretions, and a *Murex* shell) need scales.

The text is under-referenced. For example, Figure 2.8 is an adaptation of the well-known Hjulstrom diagram, yet its source is not given. In part, this is a conscious decision of the authors, explained in the Preface, to include "only the specific references from which significant data, unique ideas, or quotations were drawn." This can be frustrating; I often found myself playing "guess the reference." The organization also makes the book difficult to use. Instead of the usual (author, date) scheme, Rapp and Hill put numbered endnotes for each chapter in a combined section (p. 227-235) at the back of the book. These only give the author and title for each citation; for the full reference, the reader then has to go to the bibliography. This forces the reader to flip constantly from chapter to endnotes to bibliography and back.

The authors have drawn on studies from throughout the world for examples. Withal, the text is rooted in the authors' backgrounds and thus many examples

are drawn from Rapp's extensive experience in Mediterranean areas. Case-studies often concern the archeological signature of buildings and structures associated with permanent settlements. These are remote from the western Canadian situation, for instance, where the older archeological record was left by people with mobile lifeways.

Given the target readership, how well does the book perform? Quaternary geologists probably won't find much here, dealing with sediments and stratigraphy, that they don't know already, but the focus differs from traditional earth science. For these readers, it is the introduction to the overall geoarcheological approach that will be valuable, rather than any data. Quaternary geologists, in my experience, are often focussed on the minutiae of sedimentary process or long-distance correlation and mapping. These are lesser concerns to the geoarcheologist, who is concerned with the site as the context for archeological materials, and thus is interested in depositional sequences and postdepositional alteration and soil development. Anyone who has watched a geologist and an archeologist discussing the same hand-specimen of rock will be familiar with the different approaches: the archeologist assesses knapping qualities, while the geologist evaluates degree of metamorphism! For archeology students, the discussion of sedimentary processes and soil development will be useful, while the raw material and provenance chapters may be familiar territory. In contrast, the evaluation of rocks as raw materials for stone tool production and lithic sourcing will likely be a novel perspective for Quaternary geologists. Geologists collaborating with archeologists will find the book helpful background reading, especially for understanding the kinds of questions that archeologists ask of their sites and materials. The relatively modest price puts this text within reach of a student readership.

For Canadian students, this book will be useful as supplemental reading, although I would not recommend it as a foundation text. For our environment, the sparse discussion of cold climate processes and their geoarcheological impact is a drawback. The discussion of artifact *versus* geofact or ecofact (p. 19 and 24) could have been expanded. This is often a matter of mutual incomprehension between geologists and ar-

cheologists, especially where the identification of a site relies on what appears, to a skeptical earth scientist's eye, to be some broken rocks. A summary of the processes inducing natural fracturing and flaking and review of the criteria for distinguishing human agency in the production of flake scars *etc.* would have been useful.

I liked the authors' overall approach, demonstrating how various earth science techniques may be integrated into archaeology. However, despite the work that has clearly gone into producing this book and the value of much of it, I found it unsatisfactory. In a text from such a prestigious publishing house, I was surprised to see so many basically editorial deficiencies. With better editing, proofreading, and attention to detail, it could have been a much more useful book. One can hope that a second edition will clean up the text, improve the illustrations, and allow the experience of the senior author to shine through as it deserves.

## Geologic Applications of Gravity and Magnetism: Case Histories

Edited by R.I. Gibson and P.S. Millegan  
*Society of Exploration Geophysicists Geophysical Reference Series No. 8*  
*American Association of Petroleum Geologists Studies in Geology No. 43*  
1998, 162 p., US\$59.00

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*Geologic Applications of Gravity and Magnetism: Case Histories* is an atlas-style volume jointly published by the Society of Exploration Geophysicists and American Association of Petroleum Geologists. The atlas (in 11" x 17" ring-bound page format) presents a collection of overview and case history studies on the use of gravity and magnetic data in basin analysis and petroleum exploration and, to a lesser extent, min-

ing and environmental applications. The publication of the atlas is particularly timely given the recent increase in the use of high-resolution aeromagnetic data in petroleum exploration. The atlas covers a range of topics dealing with advances in acquisition and processing of potential-field data, although the main thrust of most presentations is directed to geologic-framed data interpretation. Indeed, one of the objectives of the atlas, as noted by the editors (R. Gibson and P. Milligan), is to reveal the "diversity of philosophies that gravity and magnetic interpreters embrace, as well as common threads to which all interpreters aspire." The atlas succeeds in meeting this objective.

The atlas opens with a brief account (by R. Gibson) of the history of gravity and magnetism in petroleum exploration. The next section contains a number of general or large scale studies, including an overview (by E. Johnson) of the diverse utility of gravity-magnetic data in addressing petroleum-related issues, and an excellent presentation (by C. Prieto) on gravity-magnetic signatures of commonly encountered geologic situations. The third section includes six basin-specific case histories, with presentations on such geologically diverse areas as the Mississippi salt basin and East China Sea arc basins. One of the more interesting presentations (by D. Chapin and others) is a "costly lesson" story of how a dry exploration well in the Alaskan St. George Basin may have been prevented with proper analysis of available gravity-magnetic data. The fourth section presents several case histories on gravity-magnetic studies in areas of known oil-gas fields. Two of the studies, on the Morecambe fields in the United Kingdom (by R. Morgan) and on the Sierra-YoYo fields in western Canada (by J. Peirce and others), demonstrate some of the recent advances made in using high-resolution aeromagnetic data to map subtle intra-sedimentary features. The fifth section encompasses two mining and two environmental case history studies. Although interesting, the accounts of the use of resistivity and spectrometry data in environmental case histories (on acid mine drainage and nuclear waste sites) seem out of place relative to the atlas title and introduction. The final atlas section includes several presentations on state of the art and specialized applications, including gravity and magnetic gradi-

ometry. In one informative case history (by J. Phillips and others), an integration of high-resolution magnetic and seismic data leads to an interpretation of remanent magnetization in sedimentary rocks beneath the Alaskan coastal plain.

*Geologic Applications of Gravity and Magnetism: Case Histories* is an excellent publication, providing a wealth of information on potential field studies in sedimentary basin areas. The atlas is enhanced by the inclusion of editor's summary notes at the beginning of each case history, a glossary of potential-field terminology, and an annotated bibliography. In a unique arrangement, the atlas also includes a series of brief discussions from numerous potential-field experts (compiled by D. Chapin) dispersed throughout the atlas, each presenting individual approaches or experiences in gravity and magnetic data analysis. Typical of most atlas-style publications, the volume contains an abundance of illustrations, many of which are in colour. This modestly priced atlas would be of considerable value to geoscientists involved in petroleum exploration or sedimentary basin research, whether they be potential-field specialists or not.

## West Coast Fossils: A Guide to the Ancient Life of Vancouver Island

By Rolf Ludvigsen and Graham Beard  
*2nd Edition, Harbour Publishing*  
*Madeira Park, British Columbia*  
1998, 216 p., \$19.00

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Vancouver Island yields a wealth of fossils the true variety and abundance of which is only recently being understood as professionals and amateur collectors alike inspect carefully every accessible rock outcrop. After 150 years of collecting, specimens of scientific and exhibition value continue to come to

public attention because of the recognition of their importance by a growing number of geo-sleuths.

This book is a testament to the efforts of the authors of this book, among others, to provide for liaison between the island's professional and amateur paleontological communities. Rolf Ludvigsen, formerly paleontology professor at the University of Toronto, is a globally recognized expert on trilobite fossils with many major scientific publications, more recently concerned with bringing the wealth of often-inaccessible scientific knowledge to the public. Graham Beard is a West Coast resident expert on the local fossils, having collected fossils there for 30 years and becoming a regional legend, who now runs the Vancouver Island Paleontological Museum in Qualicum Beach. Collaboration between the professional and amateur paleontological communities at the level developed in the Vancouver Island area has been the result of much hard work, particularly by Dr. Ludvigsen. The payoff is in public displays, contributions to scientific knowledge, and a sense of camaraderie seen in only a few other places in the world.

This local level of enthusiasm is somewhat ironic, given the current declining situation in which professional paleontology everywhere finds itself. As populations increase, the public is increasingly informed and appreciative of fossils, resulting in a shift in emphasis toward the amateur community to get the collecting and basic identifications done. This is undoubtedly the way of the future for all parts of Canada, as has been the case for decades if not centuries in Europe. The variety and significance of recent finds on Vancouver Island is astounding and points out how much there is yet to turn up about our fossil heritage.

This book covers the essential introductory concepts (geologic time, classification of fossils, etc.) briefly, and I would guess adequately. It also touches on the building of the Cordillera and of British Columbia, together with a brief summary of the history of Wrangellia in the context of west coast terrane accretion.

The major part of the book treats "most of the fossils that a meticulous collector can reasonably expect to find in the rocks of Vancouver Island." The fossils are mainly presented at the genus level, with a black and white photo-

graph and a paragraph of discussion including appropriate context. They are organized by geological system, each of which includes a brief summary of its rocks with a small distribution map. The book hits the interesting highlights of each fossil, with some background commentary. But it also documents occurrences of many fossils on Vancouver Island for the first time, as specimens that were never before published have been retrieved from the drawers of many museums and collections across the country. This feature will make the volume attractive to the professional paleontologist.

Appropriately, this book gives special attention to the Upper Cretaceous marine and plant fossils for which the west coast is well known. There are enough fossil animals illustrated from these units to fill several museum dioramas with a large range of swimming and bottom dwelling animals. Indeed artist Tina Beard has contributed several small but informative drawings precisely to that effect.

Another essential feature of public-level paleontology books is a section on collecting techniques and etiquette, cataloguing, photography, and local societies and sources of information. One item that could have been larger: as the professional and amateur communities become more collaborative, it is more likely that material of scientific value will come into scientific hands from amateur collectors. It is the provenance of these materials that is critical to the scientist: very detailed locality and stratigraphic information, that will allow the occurrence to be placed in its geological context in detail and perhaps be re-visited.

Particularly valuable is a note on the value of fossils as irreplaceable records of past life; collectors are stewards of a natural heritage that belongs to everyone, and important materials should be communicated to inventories that are more widely available, especially to the scientific community. Finally, the book concludes with a very brief list of a few accessible localities, a glossary of technical terms, and a list of references providing access to the scientific literature in considerable detail.

It is difficult, especially for a professional paleontologist, to judge whether a book intended for the public has hit its audience and carried its message effectively. I would guess that this one

has; at any rate it is in its second edition, is well produced, and I find it useful. The authors do not avoid scientific jargon entirely, but back it up with explanations, creating a relatively painless learning experience. The book is a must for fossil collectors from all over western Canada and the United States, not least because its illustrations will permit identification of fossils that are not commonly figured. It is comprehensive for its size, necessarily very short on documentation. No obvious errors of fact were noted, but the simplified presentation of terranes and other contentious geological interpretations will undoubtedly raise some eyebrows.

The price is right!

## Earth: Evolution of a Habitable World

By Jonathan I. Lunine  
Cambridge University Press  
Cambridge, United Kingdom  
1999, 319 p., US\$29.95, paperback

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If you want an impressive romp through all the different scientific disciplines that have a bearing on our understanding of the Earth, then this is the book for you. The author is from a background in planetary sciences (not Plantery Sciences as the back cover would have us believe) and he has provided a remarkably broad view of the history of the Earth. The volume is aimed at those who have relatively little background in earth science, although it would clearly be helpful to have a science background before reading it. Despite this broad appeal, there are chapters in the book that will reveal new ideas to every practicing geologist or planetary scientist. In other words there are chapters on such diverse topics that some will be useful to all those trying to communicate a "whole" Earth perspective to students or the public.

The book first puts Earth in its local cosmic setting and deals with some of the physics and astronomy that provide

that context. It then moves to a section that deals mainly with how to measure parameters that help decipher the history of the Earth and other planets: radiometric dating, stable isotopes, and cratering patterns. From here it delves into the Earth more specifically in terms of geological processes, time scale, stratigraphy and plate tectonics. A third section of the book deals with the Earth and Solar System through time, providing an excellent systems approach to the history of the Earth. It looks at the origin of the solar system and provides "comparative planetology," enabling a much clearer understanding of how the Earth developed the way it did, and how and why the other planets are so different. It then provides reasonable detail on the series of events that make up Earth history: evolution of the internal structure of the planet, origin of life, evolution of the atmosphere and oceans and then a substantial treatment of the Proterozoic and Phanerozoic evolution of the Earth. This section culminates with discussion of climate change and the appearance of humankind on the Earth. The fourth part of the book looks at what is called "the once and future planet". It details climate change over the last 100,000 years and a section on human-induced global warming. It then deals briefly with the limited nature of our resources, the expanding population and where we might be, both on and off the planet, in the future.

In an age when book prices seem to be going through the roof, the price for the paperback version of this book is reasonable and production standards are high. The illustrations are of good quality, mainly in black and white. The only colour illustrations in the book are concentrated on eight consecutive pages and they add little to the value of the book. It might have been best to avoid the cost of using even such limited colour and make the price even more reasonable.

This book is eminently readable and engaging. Even though the author covers a tremendous range of subjects, the book remains a coherent whole and it is truly fascinating reading. I guarantee that virtually all professional earth science readers will find something of interest in the book because it is so wide ranging. For the non-professional (undergraduate student or general reader), this book represents an economical opportunity to find out a great deal about

the Earth. The book would make an excellent basis for an introductory course in Earth Sciences or for an exciting course in Historical Geology. From Alpha Centauri to the Appalachian Mountains, from quarks to quantum mechanics, from fossils to fusion reactors, and from granites to global warming, there is a treasure trove of information in this book. The many scientific threads are masterfully woven into a single coherent story. The synthesis achieved by Lunine in this book is truly remarkable and I highly recommend the book to professional and non-professional alike. In this time of increasing integration of the various branches of earth science and a more system-based approach to understanding and researching the Earth, this book is a welcome addition to the library.

## The Complete Dinosaur

Edited by James O. Farlow and M.K. Brett-Surman  
*Indiana University Press*  
1997, 752p., \$83.95

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"These are exciting times for those of us who study dinosaurs," says one of the 47 authors of this work, and no one can disagree. In times of rapid change a comprehensive overview becomes all the more valuable, and this volume aims to summarize the present state of dinosaur knowledge. Sections cover Discovery of Dinosaurs (5 papers); Study of Dinosaurs (8); Groups of Dinosaurs (11); Biology of the Dinosaurs (13); and the evolution of dinosaurs in the Mesozoic (5), followed by a single paper on Dinosaurs and the Media. Appendices include a chronological history of dinosaur paleontology, a glossary, a list of contributors, and an index. Reference is made to many publications and a few websites. The word "Complete" challenges the reviewer, and one omission is immediately obvious.

The editors do not offer a clear definition of "dinosaur," yet today (more than at any time since the dinosaurs were named), the boundaries of the dinosauria are a matter of controversy. Currie's theropod paper unequivocally regards birds as dinosaurs (p. 230), yet other contributions treat birds as if they were something else. If birds are in fact dinosaurs, surely post-Mesozoic fossil birds deserve discussion from this perspective. Brief references to curation and collection management could usefully have been expanded to wider issues of dinosaur resource management. And while dinosaurs in popular culture deserve attention, so do those in serious literature and documentary film.

Recent research on the more obvious topics is summarized (although the reader might find problems in the inconsistent treatment of the various groups of dinosaurs), while a dialogue between Dale Russell and Peter Dodson presents different perspectives on extinction. Other chapters, such as Technology and the Study of Dinosaurs, Dinosaurs as Museum Exhibits, Land Plants, What did Dinosaurs Eat, and Dinosaurian Paleopathology, provide valuable information not readily available outside the specialist literature. Canadian readers will note the inclusion of papers by Currie, Dale Russell, Sarjeant, Sues, and Darla Zelenitsky; as well as others who have worked extensively on Canadian material, such as Peter Dodson. Sarjeant and Sues present papers on European dinosaur discoveries; Currie writes on Theropods; Sues on Early Mesozoic tetrapods; while Dale Russell co-authors two papers on late Mesozoic dinosaur faunas and extinction.

The mainly black and white illustrations include portraits of dinosaur hunters, fieldwork in progress, drawings of dinosaurs, their bones and tracks, diagrams, maps and site plans, and even radar scans. Quality is very variable; some are poorly reproduced photos, or the sort of sketches one might make on a blackboard. A 16-page colour section is largely of restoration paintings, but also includes stamps, models, comics, and cartoons. Only the artists of the colour illustrations are acknowledged.

There are a few typos and some minor errors: for instance, a suggestion that Lawrence Lambe lived to be 99, in confusion with Tyrrell. Minor carping aside,

this volume succeeds admirably. Its authors have written lucidly about their topics at a level that will neither insult the scientist or baffle the layperson.

## Toronto Rocks: The Geological Legacy of the Toronto Region

By Nick Eyles and Laura Clinton  
*Published by the University of Toronto  
at Scarborough  
1998, 40 p., \$8.00, paperback*

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It is gratifying to see the preparation and publication of a concise and well-organized booklet that outlines the geological features and history of the Toronto region for a wide audience. Compact (size is 6" high x 9" wide), reasonably priced (\$8), and profusely illustrated in colour, the booklet will be both accessible and useful. It was prepared to commemorate the annual meeting of the Geological Society of America in Toronto in October 1998.

The booklet is organized stratigraphically and thematically from the basement, through the Paleozoic, to the Holocene, which is itself divided into the natural and human geological impacts of the Pleistocene and post-glacial intervals. Each of the four stratigraphically oriented sections is married to themes, often presented as sidebars and vignettes that link the stratigraphic units under discussion to both processes and points of interest. Major principles, including geological time, superposition, climate change, and faunal succession are introduced effortlessly and seamlessly into the narrative by use of these sidebars and vignettes. Within each of the chapters there are clear references to localities in and around Toronto where people may travel to see the features and relationships mentioned in the text. These are often illustrated to provide the greatest possibility of finding the points of interest and understanding the relationships and features observed.

The strong emphasis on the Pleistocene is both appropriate and useful for the general public. These materials are the ones most commonly observed by local residents and it is good to see that their perspective and experience is well accommodated. Most interesting is the addition of Layer IV, Landfill: The Artificial Landscape. The authors should be congratulated for adding this chapter and for the great contribution it will provide to the public understanding, both historically and environmentally. This chapter serves to emphasize human impact on the environment and to successfully link it to the geology and geomorphology of a region, where that impact can only be expected to increase.

The booklet is, however, not without its problems. Probably on account of brevity and flow in the narrative, some geological features are either simplistically or incorrectly portrayed. As an example, consider the references in the Layer II chapter, Hot Stuff: Mountain Building at the Equator, in which the origin of the Michigan Basin is simplistically related to Taconian orogeny. This and other simplifications may be more troubling to the professional or the student than to the general public, but they shall present opportunities for improvement in subsequent editions.

Throughout the booklet the quality of the profuse and useful illustrations is poorer than expected for such a publication. Opposite the chapter title for Layer II on page 10 is a paleogeographic reconstruction of Paleozoic North America that is so small as to be indecipherable, even with the help of its caption. Elsewhere the quality of photos, many of which are important for the location of features and relationships on the ground, is generally of less than desirable quality, while the multitude of fonts and colour schemes result in pages that are busier and more distracting than they need be.

Thoughtfully, the authors have provided an extensive list of resources and references to pursue additional information and elaboration of the materials and themes presented in the booklet. Although my long distance telephone budget did not allow me to check all the telephone numbers, the majority of them were current and accurate. The same cannot be said of the world wide web URLs, but this is not the fault of the authors, as I find that even my own organization's URLs change with such

rapidity that it significantly impairs their usefulness.

On balance, the authors are to be congratulated for the preparation of a concise, inexpensive and useful booklet that will serve members of the public, teachers and pre-college students with a most useful resource to enrich their knowledge and experience of the landmass and landscape around them. Without a doubt, I expect the booklet to move quickly into the bookcases and packsacks of people throughout south-central Ontario. However, when the authors find themselves in the enviable position of being out of print, I suggest that they turn some additional attention to the editorial layout and detailed content of what is an important instrument of public outreach.