

# The Application of Ichnology to Palaeoenvironmental and Stratigraphic Analysis

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# REVIEWS

## The Application of Ichnology to Palaeoenvironmental and Stratigraphic Analysis

Edited by D. McIlroy

*Geological Society Special Publication 228, 2004.*

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Since the 1960s, ichnology—the study of trace fossils—has grown impressively, to the point where it has its own journal, sub-disciplines, and meetings. The published proceedings of some of those meetings, notably the seminal volume *Trace Fossils* (Crimes and Harper 1970), have played no small role in advancing the discipline. *The Application of Ichnology to Palaeoenvironmental and Stratigraphic Analysis* publishes papers presented at the Geological Society's 2003 Lyell Meeting. As the title indicates, the nineteen contributions are mainly concerned with the use of trace fossils in stratigraphy or palaeoenvironmental interpretation. The resulting volume is a worthwhile contribution to the ichnological literature, but one that ultimately aims higher than it reaches.

An interesting feature of the book is that it is split between case studies and review articles, with case studies accounting for slightly more than half the contributions. The review articles are useful—many could be assigned as readings in advanced undergraduate or

graduate courses—but the coverage of subjects is not especially consistent in emphasis or approach. For example, Buatois and Mángano provide a thorough, thought-provoking overview of the ichnology of freshwater environments, in which they emphasize facies analysis and sequence stratigraphy. Palaeosols are covered by Genise and coauthors, who focus on ichnofabric analysis. Deep-marine ichnology is ably reviewed by Uchman, but here the focus is on the evolution of deep-marine trace fossils. Shallow-marine environments are covered in a paper by Pemberton and coauthors, who are concerned with the role of trace fossils in delineating stratigraphic surfaces. Four depositional settings, four distinct emphases. This is no criticism of the individual papers, but it does re-emphasize that this is a collection of conference papers, not a textbook. A few review papers step away from the focus on depositional environments. These include treatments of early Palaeozoic ichnofabrics, the trace-fossil record of mass extinctions, climatic controls on trace-fossil distribution, and the stratigraphic ranges of borings.

The case studies are similarly varied in what they address. Bann and coauthors contribute two detailed papers that integrate ichnology with sedimentology to characterize and distinguish palaeoenvironments (estuarine vs. off-shore-marine; non-deltaic shoreface vs. subaqueous delta). Other sedimentology focussed papers deal with trace fossils in Triassic lacustrine deltas, Jurassic tide-dominated deltas, and Carboniferous tidal settings. Baldwin and coauthors incorporate palynology into a palaeoecological study of the Cambrian Bright Angel Shale, and Manning contributes an interesting experimental paper on the production of vertebrate tracks. The

only paper with a strong ichnotaxonomic bent is by Genise, who discusses the classification and stratigraphic distribution of traces produced by coleopterans, ants, and termites.

Essentially, the volume deals only with siliciclastic deposits and there are no free-standing papers on carbonate-dominated environments. A number of papers are based on ichnofabric analysis, an approach to documenting the relative chronology and intensity of infaunal tiering that is enjoying a vogue among ichnologists, but papers that maintain the traditional ichnological emphasis on Seilacherian ichnofacies are also represented.

The volume is sturdily bound and lies agreeably flat when opened. The typeface is readable, the paper of good quality, and the index serviceable. Some of the illustrations are excellent. However, a number of photographs are poorly focused, lighted, or reproduced. In a number of core photographs, it is virtually impossible to make out sedimentary textures or burrows, even when the photographs are annotated with arrows. Many diagrams appear to have been prepared for an 8.5" x 11" (or A4) publication format and are not served well by the reduction required for the production of this book.

Although this book contains interesting case studies and useful reviews, uneven coverage of topics may keep it from becoming a standard reference work. Students or professionals seeking a concise introduction to ichnology should probably start with the textbook by Bromley (1996). Working ichnologists will probably want to purchase a personal copy but should view a library copy first to ensure that topic coverage matches their needs and interests.

## References

- Bromley, R.G., 1996, Trace fossils: biology taphonomy and applications (2<sup>nd</sup> ed.): Chapman and Hall, London, 361 p.  
 Crimes, T.P., and Harper, J.C., eds., 1970, Trace fossils: Seel House Press, Liverpool, 547 p.

## Okanagan Geology

**Edited by M.A. Roed and J.D. Greenough**

*Kelowna Geology Committee, 2005  
 Sandhill Book Marketing Ltd, Kelowna, BC  
 ISBN: 0-96997-952-5  
 \$24.95, paperback, 220 p.*

**Reviewed by E.R. Ward Neale**

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This guidebook is an enlarged and modified version of "*The Geology of the Kelowna Area*" which was published in 1993 and very favourably reviewed ten years ago in this journal (v.22, no.3, p.143). The original lived up to this and other reviews as it became a Canadian best-seller (locally outselling Danielle Steele!) and a model for similar public awareness of science projects elsewhere in Canada. Editors Roed and Greenough are also the major authors but about half of the text is contributed by an expanded Kelowna Geology Committee representing a wide variety of natural history disciplines. Profits from the first book were used to establish the Committee's Bursary Endowment Fund in earth sciences. This fund is expected to grow with sales of the new edition. Again, the Canadian Geological Foundation leads a long list of the publication's sponsors.

"Nothing succeeds like success" so the editors of *Okanagan Geology* have maintained the same chapter headings in the same sequence as in the original. Only one, short new chapter has been inserted - it deals with the geology of Okanagan wines. As before, the text begins with a history of geological studies and then introduces readers to geological time, the local geological column and the physiographic divisions of the area. This is a prelude to the interesting and picturesque geology with which the region is blessed. Okanagan bedrock includes the Precambrian Shuswap Complex, remnants of transported(?) Paleozoic/Mesozoic terranes and an abundance of Tertiary volcanic and sedimentary rocks. The Ice Age deservedly receives extensive coverage for many of the pleasing landscapes of the region and Okanagan Lake itself are products of glaciation. The attractive silt bluffs and erosional scarps were formed as

ancestral Lake Penticton drained in distinct intervals. Okanagan Lake, 120 km long and 3.5 km wide, is in a depression carved out by repeated glaciations and partly owes its site to the melting of the last bit of glacial ice. In a sense, it is a gigantic "kettle lake". Deepest bedrock at the bottom of the lake is 640 m below sealevel so that local bedrock relief exceeds that of the Grand Canyon! Again, the last half of the book is devoted to applications of geoscience and comments on and examples of its relevance to society. Many superbly illustrated, local examples of landslides, floods, building foundation problems, watershed management and mineral deposits history are repeated in the new text. But much new is added to all chapters.

As the editors state in the preface: "Geoscientists are continually making new observations.... our views of how Earth arrived at its present state are therefore constantly changing". So an updated map of the region shows Pennsylvanian/Permian rocks of probable North American origin in place of the far-travelled exotic Mesozoic terrane shown in the earlier book. The section on the plate tectonic origin of the Cordillera has been modified to incorporate the conclusions and cross-section of the Lithoprobe Project. This has led to some modification of the cross-section through the Kelowna Basin. Mount Boucherie, a favourite landmark for tourists and locals because its toppled columnar structures resemble Roman ruins, was given scant description in the earlier book. It has now been mapped in detail by the editors/authors who provide a fascinating, illustrated story of the formation, extinction, burial and final erosion of this Eocene volcano. The columns are now interpreted as dacite pipes that cut through the older rocks in the last stages of volcanic activity.

The Chapter on Mineral Deposits has much added interest, e.g. the site clean-up of Brenda Mines. It operated successfully for 21 years as the lowest grade Cu-Mo mine in the world - terminating with a rock slide in 1990. Following decommission, the owner, Noranda Mining, has spent about \$50 million on closure and reclamation. Its water treatment facility still contributes to the local economy - costing over \$1 million per annum to operate! There is