floodplains have to a greater or lesser degree been altered by human activity during the last 10,000 years" (p. 1).

Brown emphasizes that the relative strength of the cultural and climatic signals in alluvial sediments varies with time and place. As he remarks, "ever since there has been *any* human impact on vegetation there has been *some* human impact on catchment hydrology and sediment yield" (p. 313). Hence the alluvial record can be viewed "as being the *product* of climate as modified by human alterations of catchment characteristics *and* human land use" (p. 313). At least for the UK, "in the Mesolithic it might be accurate to regard the alluvial record as essentially a climatic signal blurred by human impact, by historical times it can be argued ... that we have a land use signal blurred by climatic variation" (p. 313). In this regard, Canadian rivers would provide an interesting contrast to the majority of examples that Brown discusses. Here, I suspect that most of the postglacial fluvial sedimentary record reflects climate and environmental factors, with the main anthropogenic impact on river systems occurring only in the last few centuries following European incursion.

Brown's examples are drawn mostly from temperate rivers that rarely experience winter freeze-up. For Canadians, the lack of consideration of winter conditions and processes connected with river ice is a significant omission. The coverage does not include lakes, which often form part of the river network, especially in glaciated areas. The discussion of the activity of beavers (p. 113-114) would have benefitted from more attention to the North American literature. Overall, I found his discussion uneven when he was dealing with North American examples, perhaps because he is not as conversant with the area and the literature. Because of the book's geographic focus, readers will need to be familiar with the terminology of British and European glacial/interglacial sequences and the broad chronology of human history and archaeology.

I did notice a few slips in the text. Canadians may be startled to find the Oldman River transposed to the "mountainous and semi-arid areas of the USA" (p. 36). I was intrigued to learn that North American floodplains are "cleared and tamed" (p. 112), which is not a description I would apply to most of the river valleys in northern Alberta! "Palaeolithic hand-axes" (p. 92) are not a component of North American lithic assemblages. Some complicated diagrams are reduced to such a small size that they are practically illegible (p. 90) and some diagrams reproduced from other sources lack supporting information, such as legends (p. 220). As a Canadian, I was irritated that Brown's definition of North America (p. 167) consists only of the lower 48 United States.

This is not a book for the faint-hearted. It is not an introductory text, nor is it a "how-to" book. Although there is some explanatory material, Brown presupposes a good deal of background knowledge of fluvial processes and vocabulary of archaeological and historical events. The many terms and site names in the text would, I suspect, confound an introductory student. Researchers contemplating studies in alluvial settings will have to look elsewhere for detailed methodologies. Similarly, readers wanting to work with environmental indicators, such as pollen, plant macroremains, molluscs, and insects (p. 134-145), will need to turn to more specialized texts. This book will mainly be of value to graduate students and professionals working in geoarchaeology. Other Quaternary geoscientists will also find it useful for broadening their perspective on alluvial sediments.

Brown has a pleasant, literate writing style with occasional excursions into humour. Reading this book is therefore a pleasure rather than a chore. This is a considerable achievement given the complexity of the subject matter. My brief review does not really do justice to the book. I found it interesting, well written, and informative. Despite its British focus, I can certainly recommend it to Canadian readers.

The Diatoms: Applications for the Environmental and Earth Sciences

Edited by Eugene F. Stoermer and John P. Smol
Cambridge University Press
1999, reprinted 2000, 469 p.
US$115.00, hardcover
ISBN 0-521-58281-4

Reviewed by David H. McNeil
Geological Survey of Canada, Calgary
3303 33rd Street NW
Calgary, Alberta T2L 2A7

Can it be true that diatoms make up 25% of the earth's biomass? Are diatoms present in almost all aquatic environments, globally numbering in excess of 10^4 species or even 10^5 species? Can diatoms be found in the wind, in the rain, in moss, and close to our very core, within the human lungs?! Apparently so, and their sensitivity to specific physical, chemical, and biological conditions makes them one of the most useful organisms on earth for assessing environmental change.

Editors Gene Stoermer (University of Michigan, Ann Arbor) and John Smol (Queen's University, Kingston) have collated 22 review papers of varying lengths aimed at summarizing the main applications and uses of diatoms within the environmental and earth sciences. This book is essentially global in coverage and is packed with 100's of references to studies providing summaries of methodologies, concepts of project design, and environmental interpretations based on diatoms. The Canadian reader will definitely feel at home, with 7 of the 38 contributors being Canadian, thus providing extensive coverage on diatom applications in many areas that are important to Canada such as the Great Lakes, Arctic ponds, estuaries, coastal environments, and lakes, streams, and rivers of the continental interior. Topics of enduring interest, such as acid rain, tree lines, water quality, and water level change are given thorough coverage.

The main emphasis of this book is clearly focused on the use of diatoms to

decipher the effects of Recent ecological and environmental change coupled with long-term Late Cenozoic environmental change. To this extent, the largest chapter, Part II, provides seven papers on diatoms as indicators of environmental conditions in flowing waters and lakes. These papers, which range from 12 to 43 pages in length, cover the use of diatoms for assessing and indicating environmental conditions in rivers and streams, hydrologic and climatic change in saline lakes, mediation of biogeochemical silica depletion in the Laurentian Great Lakes, surface water acidity, lake eutrophication, long-term environmental change, and water-level change in freshwater lakes.

Part III is devoted to the ominous sounding "extreme environments" to which many Canadians can also readily relate. Papers in this part present reviews on diatoms as environmental indicators near the Arctic and alpine treelines, in freshwater lakes of the High Arctic, in Antarctic freshwater, and in aerial habitats (soils, wet rocks, moss, *etc.*).

Part IV is devoted to marine and estuarine environments, with papers on diatoms as indicators of coastal paleoenvironments and relative sea-level change, environmental change in brackish waters, estuaries, shallow coastal environments, and marine paleoceanography. Coverage dwindles to some extent in Part V with shorter, but interesting, articles dealing with eclectic applications in archeology, oil exploration, forensic studies, toxic effects, atmospheric transport, and commercial diatomite deposits.

The book is written in review style to compile the rapidly accumulating and scattered information on applied diatom studies in a form that is readily accessible to interested readers. Illustrations are generally simple black and white graphs, maps, charts, and tables, all of which are legible and relatively consistent in appearance. By design, the book does not contain aspects of diatom biology, morphology, ecology, taxonomy, or biostratigraphy, which must be gathered from other sources. A useful glossary of terms is included. The index is adequate but many geographical names are not cited, so there is no direct way to search out specific geographic areas of interest. Nor is there an index to specific taxa.

The editors conclude with an epilogue dealing with the all too familiar problem of how to sustain the expertise and institutional infrastructure needed for basic taxonomic studies, biological studies, and full enumerations to document population communities and structures. Sophisticated tools for statistical analysis have overreached our ability to make basic observations and produce raw data. The trend towards directed research and client-oriented service makes it very difficult to obtain long-term goals for developing the fundamental basis needed for taxonomically oriented science. Although true, this may be a digression, for Stoermer and Smol consider this a time of rich opportunities for diatom studies applied to environmental analysis.

ESSAY REVIEW
Hydrothermal Iron Oxide Copper-Gold and Related Deposits: A Global Perspective

Edited by T.M. Porter
Australian Mineral Foundation Inc.
63 Conyngham Street
Glenside, South Australia 5065 Australia
2000, 350 p.
non-members AUD$180 paperback
www.amf.com.au/amf

Reviewed by Tom G. Schroeter
British Columbia Ministry of
Energy and Mines
Geological Survey Branch
300 865 Hornby Street
Vancouver, British Columbia V6Z 2G3

The discovery in 1975 of the giant Olympic Dam deposit on the Stuart Shelf of South Australia and the subsequent realization of its significance have attracted keen interest from the world's exploration industry, as well as research institutions. In the early years, there was little knowledge in the public realm about the deposit. By 1983, with the aid of underground exploration and development of the deposit, it became referred to as an iron oxide-rich "hydrothermal breccia complex" (Smith, 1993), and was thought to represent a unique deposit type (*i.e.*, new style of mineralization not previously recognized or explored for). Consequently, a rush to find a "look-alike" began. However, by the mid- to late 1980s, researchers and exploration geologists began to realize that there were broad metallogenic similarities between Olympic Dam and other deposits around the world. This realization culminated in the seminal paper by Hitzman *et al.* (1992) that distilled information, specifically for those deposits of Proterozoic age. Over the last decade, this class of deposits has become a prime target for exploration, resulting in the discovery of two major deposits which are now in production (*i.e.*, Candelaria in Chile and Ernest Henry in Australia), and several that are currently under development (*e.g.*, Sossego and Salobo in Brazil), from both the Proterozoic and the Phanerozoic. The attraction is obvious: the prize is both large and high grade (*e.g.*, 0.15-1 billion tonnes of around 1% Cu and 0.5 g/t Au), and has not previously been the subject of concerted exploration activity. Despite increased knowledge and level of interest and exploration, however, there is still disagreement on how these deposits formed and even which deposits belong to the class. Nor has it been possible to predict which deposits may be productive, subeconomic, or barren. The aim of this new volume is "to bring together a diversity of knowledge, experience and opinion from around the globe to assist in understanding this important family of deposits and answering some of the questions they pose" (Porter, this volume, p. 3-5).

This 350-page monograph includes the papers presented at the AMF International Conference "Hydrothermal Iron Oxide Copper-Gold & Related Deposits: A Global Perspective" held in Perth, Western Australia on 4-5 December 2000, and was distributed to the delegates as a Proceedings Volume. It contains additional papers, not presented at the conference. All 24 papers, including five of a "general" nature, five from Australasia, eight from the Americas, and six from Eurasia and Africa, were carefully selected and were included by invitation only. They cover most, but not all, of the world's important IOCG provinces. In all, there are 54 authors/co-authors,