

BOOK REVIEWS

Ultrahigh Pressure Metamorphic Rocks in the Dabieshan-Sulu Region of China. Edited by Cong Bolin. Kluwer Academic Publishing, P.O. Box 989, AZ Dordrecht, The Netherlands. 1997, 224 p., US\$110 (ISBN 0-792-341635).

Ultrahigh-pressure metamorphism (UHPM) has become an "in" topic in the past ten years after a long shadowy existence on the fringe of petrology. Although the initial discoveries were made in the Alps and Norway, the Dabieshan region of China has become a prime object of study because of the quantity and quality of ultrahigh-pressure metamorphic rocks (>2.8 GPa). This book is a memoir that brings together current knowledge of this region. As such, it is uniquely useful as a single source covering a wide range of geological disciplines (regional geology, structure, petrography, mineralogy, geochronology), in contrast to massive, but maddeningly scattered documentation on the Alpine and Norwegian occurrences.

Written by a consortium of 10 authors, this is not a textbook, but a thorough up-to-date discussion of a broad range of geological data. It compares to a major memoir of the Geological Survey of Canada. The text is divided into nine chapters, an introductory review, regional geology, structural geology, petrography, geochemistry, geochronology, mineralogy, metamorphic evolution and tectonic evolution.

The Dabieshan (Dabie Mountains) lies in the central part of a Triassic collision zone between the early Archean Sino-Korean craton to the north and the Proterozoic Yangtze craton to the south. This collision zone extends more than 2000 km, wrapping around a right-angle bend, and going off-shore into the Japan Sea in the Sulu region near Weihai. Coesite-bearing rocks have been found in the central and northeastern parts, but not in the western part. As in any collisional zone, the geology is extremely complex and incompletely understood. The authors postulate that oceanic crust was consumed during the collision, but the only evidence appears to be volcanic rocks with arc signatures. The eclogite boudins, ubiquitous as in any UHPM terrane, do not give oceanic signatures. Whatever the details, the geophysical signatures clearly indicate a doubling of the crust by north-vergent overthrusting.

The treatment of various topics in the book is uneven. Regional geology is clearly presented, but suffers from maps which are far too generalized to be satisfactory. The chapter on structural geology is weak,

and virtually confined to elementary microstructural material on the local scale. The chapter on petrography is very good indeed, the best descriptions that I have read on UHPM rocks. It would be even better had the publisher printed the photomicrographs on glossy paper with high resolution. However, the real strength of the book lies in the large number of chemical and electron- microprobe analyses. In many cases, the discussion of these results is simplistic or incomplete, but the data are there for the taking. The chapter on geochronology illustrates the minefield posed by high-pressure – relatively low-temperature metamorphism. U–Pb ages generally give the (Precambrian) ages of the protolith. The author is an apostle for the Sm–Nd method on garnet, but admits that the results are somewhat scattered, and that Nd disequilibrium is a factor. Ar–Ar methods give good results in some cases, but excess argon is common; Rb/Sr dates only late retrogression. The chapter on mineralogy is relatively brief and contains no material on crystal structure or unit-cell sizes, concentrating instead on compositions determined by electron microprobe. The section on metamorphic evolution is the longest in the book (37 p.). The main conclusion is that UHPM passed into granulite-facies metamorphism, and eventually into post-metamorphic magmatism. The timing of both run-up to and run-down from the UHPM remain unclear. The final chapter has a clear and concise explanation of current theories of exhumation of UHPM rocks, which is the critical problem in this field. The authors emphasize the *mélange* nature of both the UHPM rocks, and the mixture of UHPM and more common metamorphic rocks. They favor a three-stage process with an initial "corner-flow" mechanism, transporting hot coesite eclogite upward in a cool subduction zone, followed by slower uplift by extension on low-angle extensional faults, analagous to present processes in the Himalayas. The final process, which may be continuing, is thermal buoyancy and erosion.

Technically, the volume is uneven. Typos are numerous, and although the English is generally good, there are numerous slips that should have been caught by the editors. A random example: "Among the scientists who work on UHPM rocks, Dr. ZHANG, R., a member of our group three years ago, is the most fruitful one, because she knows geology of Dabieshan–Sulu region very well, and got much support from her Chinese colleagues when she has become an overseas Chinese." (p.1).

This volume invites comparison with "Ultrahigh Pressure Metamorphism" edited by R.G. Coleman and X. Wang (Cambridge University Press, 1995), particularly since two of the authors of this volume contributed to the earlier one. In fact, the two volumes are complementary rather than competitive. The Coleman-Wang volume is stronger as an introduction and overview. The present volume is notable for its detailed coverage, and particularly for the wealth of analytical material. The reader who is looking for one volume to cover UHPM would undoubtedly do better with the Coleman-Wang volume, the editing of which is far superior. However, for detailed calculation, the present volume contains much more usable data. Both books are reference works written by experts for experienced geologists. They would be heavy going for undergraduates and are not really intended as textbooks. I doubt that many geologists will wish to lay out US\$111 for a personal copy of the Bolin volume, but geologists and geophysicists who ponder metamorphism and kinematics in the internides of collisional zones should have access to a copy. The price is not extreme for a current scientific book, but if you cannot afford your own copy, make sure that your library gets one.

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John William Dawson, Faith, Hope and Science. By Susan Sheets-Pyenson. McGill-Queen's University Press, Montreal and Kingston, 1996, 274 pages, CDN\$45.95, hardbound (ISBN 0-7735-1368-X).

John William Dawson was one of those hard Scotsmen whose drive and intensity did so much to mould the early years of this country. Within living memory, their own Scottish society had been defeated. Their ambition modulated by loss, with one eye focused upon Britain the victor, they were driven not so much to prove as to vindicate themselves. They wouldn't build a Canada, but out of the snow desert grimly wring a replicate Britain, only a better one, built by Scotsmen.

We learn from Susan Sheets-Pyenson that Dawson's father James and his mother Mary Mercer had come from Scotland to practice the mercantile arts as book sellers in the new land. At first, they prospered in the then boom port of Pictou, Nova Scotia. But the vicissitudes of colonial commerce left them in debt. This, over thirty long years, they faithfully discharged. From the photographs reproduced on the first pages of Sheets-Pyenson's biography, father and mother Dawson stare out into the world with eyes as fierce as pitchforks.

Dawson himself for much of his life was not only the leading figure in Canadian geology, but also for many years principal of McGill University. The designation by which he became universally known as "Principal Dawson" is diagnostic: not likely to be accorded to someone less than wholly orthodox. And therein lies the thread of his life.

Overall, this book is both fascinating and frustrating. Fascinating because of the picture of Dawson which emerges; frustrating because the author will not paint it clearly. As a young man growing up in Pictou in the 1820s, in the midst of coal fields, fossils and rock exposures, favored by fortune with a (for the time) very high quality education at the Pictou Academy, Dawson fell in love with the new science of geology. He devoted himself to its study with familial and Scottish application. One outstanding result was the publication of *Acadian Geology*, a thoroughly delightful classic account of the geology of the Maritime Provinces. This is the most pleasant period of Dawson's life. Thereafter the flaws begin to flower.

Sheets-Pyenson relates how, on the strength of *Acadian Geology*, Dawson attracted international attention, most gratifyingly, from the leading figures of geology in the Mother Country. Alas, the Mother Country did not fully requite his affection. His application for the professorship of geology at the University of Edinburgh was, after much internal university politicking, turned down. Later, in a slight which rankled even more, the Royal Society declined to publish his Bakerian lecture. Always it was a close thing, but still a rejection.

Stung, Dawson became increasingly contentious and shrill in his scientific positions while at the same time venturing increasingly into less critical fields. Long after the geological world had concluded that it was not one, he continued to insist on the fossil nature of the famous "*Eozoon canadense*", an inorganic banded structure he had discovered in ancient Laurentian rocks. Other positions, popularly and publically proclaimed, such as his striving to reconcile geology and revelation and his refusal to accept evolution, brought him the esteem of the conventionally "good" in this age when conspicuous Christianity was conspicuously rewarded. It also brought him the offer of a lucrative professorship at Princeton. But he turned it down, choosing instead to remain in Montreal. Money held no allure for Dawson. It was otherwise for esteem and approval.

Sheets-Pyenson recounts how Dawson put his immense capacity for work and his talents on the public stage into harness on behalf of the new and struggling McGill University. As "Principal Dawson" he pressed, cajoled, charmed, and persuaded the English financial elite on behalf of the University, which in large measure owes its present form to his work. But even here, at the height of his influence, it seems clear that he suffered the sting of esteem denied, for instance when the

extensive collections of the recently formed Geological Survey of Canada were housed in Ottawa, not Montreal.

Reader be warned, this is an academic book. While this means gratifyingly full footnoting, it also brings in train a full share of apologetics and hedging. It comes as something less than a revelation to read in Sheet-Pyenson's introduction, quoting historian Thomas Hankins to the effect that "A decision to describe personality without science or science without personality, or philosophy, or political and social activity, is a decision that robs biography of most of its significance."

But if no revelation, it does constitute a signal, particularly in conjunction with a previous introductory passage: "Although this study of Dawson started out as a scientific biography some years ago, it has evolved in the course of research and writing into a portrait of a man of science. It seemed to me that unless Dawson's personality and character were evoked, this tale could become one of those "curiously bloodless affairs"...works about Dawson's life, but themselves without life."

Here, even as Sheets-Pyenson announces her intention to evoke Dawson's character, she seems to be apologizing for doing so. She thus begins and remains hesitant and defensive in contending with Dawson's character. Yet just because character is a diffuse and complex quality, clarity and conviction are required to bring it into focus. In consequence, the character grappling, such as it is, stays tentative and academic, precisely the anaemia she'd hoped to avoid.

Geological historian James R. Moore's assessment of Dawson, which Sheets-Pyenson quotes and calls "ungenerous", stands out in contrast: "that most provincial of Presbyterians,...a solitary figure holding forth from the heights of Montreal until he and his century expired". Ungenerous it may be, but it does at least have substance, definition and clarity. It is, in fact, a conclusion. But it takes courage to come to a conclusion. Someone might criticize you for it.

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Macmillan Encyclopedia of Earth Sciences. Edited by E. Julius Dasch. Available from: Prentice-Hall Canada Inc., P.O. Box 9549, Station A, Toronto, Ontario M5W 2K3. 1996, 1273 pages (2 volumes), US\$200 (ISBN 0-02-883000-8).

At least five geological encyclopedias and numerous mineralogical, geological, geophysical, and environmental dictionaries have been published over the past three decades. The encyclopedias, including the work here under review, are listed in Table 1.

TABLE 1. EARTH-SCIENCE ENCYCLOPEDIAS

Title	Date	V	E	P	Illustrated?	Comments
<i>Encyclopedia of Earth Sciences Series</i> (Halsted Press; Van Nostrand Reinhold)	1966 to 1988	9	100s	8958	Profusely, no color	Still in production; several more volumes are expected
<i>McGraw-Hill Encyclopedia of the Geological Sciences</i>	1978	1	560	915	Modestly, no color	List of contributors; table of accepted mineral species
<i>The Cambridge Encyclopedia of Earth Sciences</i>	1981	1	27	496	Profusely, with color	Glossary and suggestions for further reading
<i>Encyclopedia of Earth System Science</i> (Academic Press)	1992	4	230	2825	Modestly, with color	Glossary of terms at the end of each chapter
<i>Macmillan Encyclopedia of Earth Sciences</i>	1996	2	359	1273	Modestly, 16 color plates	A short bibliography concludes each entry; detailed index

Symbols: V number of volumes, E number of entries, P number of pages.

Following a brief preface by the editor, the *Macmillan Encyclopedia of Earth Sciences* opens with three background (?) subjects in the Introduction: 1) Geologic time, 2) Measurements and their conversion in the Earth sciences, and 3) Estimates of the bulk compositions of different portions of the Earth and primitive meteorites (two tables list the elements alphabetically and by atomic number). Why these subjects weren't included as entries in the body of the encyclopedia itself eludes this reviewer. Lists of entries ("Articles"), contributors, and abbreviations then precede the encyclopedia *s.s.*, which begins with "Abrasive materials" on p. 1, and concludes with "Women in the Earth Sciences" on p. 1186.

The 359 entries are ordered alphabetically and range in length from one to about 12 pages. Each concludes with a short bibliography of from one to a dozen citations. Authors of the entries were well chosen and drawn from a particularly broad spectrum of backgrounds. Entries, according to the editor, "can be grouped into five organizational categories" that "carry roughly equal weight in terms of number of entries". Strangely, nowhere is the link between entry and category given, and the reader is thus left to decide (if necessary) whether a given entry falls under: 1) Solid Earth processes, 2) Surficial Earth processes, 3) Earth resources and stewardship, 4) Earth sciences in the public eye, or 5) Earth in space. A detailed 82-page index closes the encyclopedia.

No less than 64 (nearly 20%!) of the entries are biographies (mostly individual, but also multiple, as for the Apollo astronauts, the Braggs, and the Herschell family). Most choices are obvious, but was Daly (included) more noteworthy than Buddington (excluded)? Or did Rossby (included) leave a more

lasting impression than Köppen (excluded)? This topic can become quite subjective, and although personally I enjoyed the biographic entries greatly, I am not wholly convinced that they belong in this encyclopedia. Perhaps a suitable sixth entry to my table would be a "Biographical Encyclopedia of the Earth Sciences".

To summarize: the entries are mostly well written overviews with limited depth. The *Macmillan Encyclopedia of Earth Sciences* will be of little use to practising mineralogists or geologists, but will be helpful to their teen-aged children. I wholly concur with the editor when he states (in the preface) that the work is "designed to serve both the advanced high school student and the university undergraduate student. Additional targeted audiences include decision-makers, such as politicians, municipal leaders,

and community activists, along with journalists, educators, and the interested public".

Finally, the publishers are to be congratulated for particularly clear, double-column typography printed on non-glossy paper of far better-than-average quality. Typos are rare. Among those I caught were misarranged and omitted references (p. 294), the 50 m (should be 5 m) Hale telescope on p. 467, the photo of a "natural iron mine" on p. 600, a jumbled liaison between pages 680 and 681, and 1933 instead of 1993 on p. 1186.

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