Geoscience Canada

Book Reviews / Critiques

Volume 18, numéro 4, december 1991

URI : https://id.erudit.org/iderudit/geocan18_4br01

Aller au sommaire du numéro

Éditeur(s)

The Geological Association of Canada

ISSN

0315-0941 (imprimé)
1911-4850 (numérique)

Découvrir la revue

Citer ce compte rendu

(1991). Compte rendu de [Book Reviews / Critiques]. *Geoscience Canada*, *18*(4), 179–184.

Book Reviews / Critique

Book Reviews

This Was Our Valley

By Earl K. Pollon and Shirlee S. Matheson
Detselig Enterprises, Calgary, Alberta
401 p., 1989; $26.95, cloth, $17.95, paper

Reviewed by W.A.S. Sarjeant
Department of Geological Sciences
University of Saskatchewan
Saskatoon, Saskatchewan S7N 0W0

This book is an examination of the history of the Peace River country near Hudson Hope; of the turmoil in that community when the construction of the W.A.C. Bennett dam was projected; and of the effects upon it when 640 square miles of land were submerged under what came to named "Williston Lake". As a whole, then, it should be of interest to all engineering and environmental geologists who are sensitive enough to be concerned about the social and political effects of their activities.

In addition, however, vertebrate paleontologists and historians of geology will find special interest in Chapter 26, "Beneath these Waters", which discusses the dinosaur bones discovered in the Peace River valley and, in particular, the wealth of dinosaur trails submerged under the waters of the reservoir. Despite the Alberta Provincial Museum's cross-provincial-border forays to map and preserve some of these trails, a wealth of scientific information has been irrecoverably lost through this submergence. This short history of the work done on the bones and tracks — and of the local attempts to ensure that some, at least, should be saved — forms an episode in the story of Canadian geology which is at once stimulating and saddening.

This book is attractively produced and well illustrated. It deserves to be in all collections of works on western Canadian science and history.

Leduc

By Aubrey Kerr
Available from: S.A. Kerr, 912 – 80 Ave. S.W.
Calgary, Alberta T2V 0V3
312 p., 1991; $35.95

Reviewed by W.A.S. Sarjeant
Department of Geological Sciences
University of Saskatchewan
Saskatoon, Saskatchewan S7N 0W0

When the Leduc No. 1 Well went into production on a wintry day in 1947, the history of Alberta — and, indeed, of Canada — was about to be changed forever. Over the ensuing forty-five years, the production of Canada's oilfields has attained and, by now, passed its peak; Alberta has been transformed from just another poor Prairie region into perhaps Canada's richest province *per capita*, while Calgary has grown from a small town to a city of international stature. Even our national politics have been modified, as the newly rich Albertans have come increasingly — and justifiably — to resent the condescending paternalism of central Canada and have used their economic power to give expression to that resentment.

Leduc has, of course, found a place in subsequent histories of the Canadian petroleum industry, from Eric J. Hanson's *Dynamic Decade* (1958) onward. However, it has not hitherto been the subject of a detailed study. This exhaustive account, quite lavishly illustrated by photographs, by figures and by maps on endpapers and in text, is certain to become a major sourcework for all subsequent such histories. It is quite handsomely produced on good white bond, with a section on the "Personalities" involved in Leduc's development distinguished by being printed on green paper and with appendices expanding on a series of particular themes. The text is a somewhat eclectic mixture of factual detail and anecdote; however, those anecdotes serve to give life to a story that could easily have become dull. The author's own involvement in the story gives it an immediacy; though, oddly, his index does not include references to himself!

This book constitutes a unique and valuable document. All persons whose interest in the history of the Alberta oilfields surpasses the superficial will find this volume rewarding, both for reading and for consultation when facts are being sought.

Dinosaur Stamps of the World

By Stuart Baldwin and Beverly Halstead
Baldwin's Books, Witham, Essex, England
Available from: Fossil Hall, Boars Tye Road, Silver End, Witham, Essex CM8 3QA England
128 p., 1991; £ 8

Reviewed by W.A.S. Sarjeant
Department of Geological Sciences
University of Saskatchewan
Saskatoon, Saskatchewan S7N 0W0

Most geologists were collectors in childhood, often of stamps; and quite a number of us continue to be so. Indeed, quite a few of us have become collectors of stamps having geological themes. For such persons, this book cannot fail to be a delight. It is richly illustrated, taxonomically sound — the absurdities introduced by ignorant postal authorities are discreetly, but firmly, pointed out and unacknowledged sources of illustrations are indicated — and quite probably comprehensive. (Personally, I could spot no omissions).

The book was conceived jointly by Stuart Baldwin and Beverly Halstead, Beverly's wife Jenny designing the book and providing the attractive cover artwork. Beverly, alas, died in a tragic accident on April 10, 1991, but his notes were used by Mr. Baldwin in completing the text and captions.

This is a most attractive work, meriting a place on the shelves of any geophilatelist, young or old.

A History of Geology

By Gabriel Gohau
Revised and translated from the French by Albert V. Carozzi and Marguerite Carozzi
Rutgers University Press, New Brunswick, New Jersey
259 p., 1990; (price not indicated)

Reviewed by W.A.S. Sarjeant
Department of Geological Sciences
University of Saskatchewan
Saskatoon, Saskatchewan S7N 0W0

When *Histoire de la Géologie*, the original French edition of this work, was published in 1987, I acquired a copy early and soon began reading it, intending a review. However, I found that the scope of the work did not match its title — always an annoyance. I found also that I could not accept many of the opinions expressed and, moreover, that too many statements were unsupported by adequate footnotes or other references. In consequence, no review was written.

The appearance of an English translation, and the high competence as geological historians of the translators, made me hope for better things. Indeed, this edition *is* better since, as the Carozzis state in their "Translator's Foreword" (p. xiii), "... a more scholarly approach has been achieved by providing complete bibliographic references, by sharpening discussions and concepts, by updating topics, and by adding new illustrations and an extensive glossary". Thus it was that I began reading this revised version in a spirit of optimism.

Alas! I was soon to find that too many of the problems encountered earlier still remained unresolved. First of all, the title is misleading. This is by no means a history of the whole of geology, as were the pioneer studies by Zittel (1899) and Adams (1938) or the slim but well-balanced volume by Henry Woodward (1911). As Gohau admits (p. 4) "the history worked out in this book is that of historical geology alone. ... I have chosen ... to emphasize philosophical debates among theoreticians rather than the work of practitioners." In other words, many of the subdisciplines of geology are to receive scant treatment or none at all, while the contributions of the bulk of geologists are to be ignored! Moreover, though the discussion of the expanding intellectual horizons within geology is adequate up to about 1850, later developments are summarized with increasing selectivity and little indeed is said of developments after 1900. A more honest title, though still overcomprehensive, might have been *The Early Development of Geological Concepts*. When major themes like mineralogy, mining geology, invertebrate and vertebrate paleontology, geomorphology, geochemistry and geophysics receive scant treatment and other — micropaleontology, paleoichnology and extraterrestrial geology are examples — receive none at all, the title promises infinitely more than it fulfills.

A recurrent problem is the citation of studies out of chronological order. When particular themes are being successively treated, it is of course perfectly permissible to begin a new topic by harking back to works earlier than those last mentioned under the previous theme. However, when again and again the contribution *within* themes are treated out of order, it is both irritating and confusing. For example, in discussing the origins of the word "geology" (p. 2-3), it is initially implied that the work was first used "at this turning point" (presumably 1778, though the previous paragraph would suggest 1800) by Deluc and Saussure of Geneva. Yet thereafter it is admitted that they were only "the first to use it professionally" — whatever that means! — and that not only had the Latin word *geologia* been used as early as 1473, but "geology" was employed by Benjamin Martin in 1735 and "géologie" by Denis Diderot in 1751! Why, on later pages are the profound insights of Steno treated *after* the imaginative theorizings of Burnet, Woodward and Descartes (p. 56 *et seq.*)? Why is the name of Duhem cited on p. 25 as if he were one of the Brothers of Purity of AD 980? Only on p. 34 do we discover that he was not and, indeed, lived at a much later time! Why is Bertin's mere suggestion of a French school of mines given priority (p. 100) over the actual founding of the one at Freiberg, Germany?

Another recurrent problem, despite the hard work of the Carozzis, is that too many flat statements and generalizations are presented without citation of references. On p. 11 we are told that "several authors believed" — by implication, during the flourishing of the early Greek philosophers — that the "splendid Minoan civilization" had been wiped out by a tsunami. Since I had thought this to be a modern concept, I was frustrated when no source was quoted. On p. 24, it is stated that the 36,000-year star cycle was known to medieval philosophers, which again surprised me; again, no source was quoted. Who were those "observers" of the erosion of mountains mentioned in paragraph 1, p. 27? Who, after Bernard Palissy, mentioned "lost species" during the 18th century (p. 59)? What direct evidences are there that Buffon borrowed so much from earlier sources, as is alleged on p. 95? Who, in the years after 1865, discovered that "authentic Precambrian fauna" (p. 170) — and where?

Though the translation is, in general, very good, some major problems have probably arisen through minor mistranslations. After reading on p. 13 that Gohau had "chosen to present Epicurus through the poem by Lucretius", I expected to find that poem directly quoted; it was merely used as source. Lactantius's ridiculing of the concept of a spherical earth (p. 20) was scarcely a "doctrine"; and it is not truly the "effervescence" of pyritous and combustible materials that ignites fires! (p. 91). The debate on continental drift in England in 1926 is stated to have ended "without any better conclusion" (p. 196); surely "any more favourable conclusion" was meant? Nor, I imagine, did Gohau intend to imply (p. 113) that geologists use angular unconformities to *date* orogenic movements, except in the broadest of relative fashions.

On that last point I am not sure, however, that the translators are responsible; for this work contains all too many statements that are vague, superficial or actively misleading. On p. 21, for example, Gohau firmly denies that the Christian Middle Ages were a time of enlightenment, after earlier paragraphs that gave no reason for thinking that they were! The claim that it was "precisely at the beginning of the sixteenth century that people began trying to trace their origins" (p. 48) is absurd, when one remembers the long genealogical lists in the Bible. Steno's life after his brief return to Florence (p. 57) is not mentioned; had it been, the reason for his failure to complete that great work would have been made clear, instead of left vague. It is not true that Steno's work had any immediate success (p. 61) and questionable whether it influenced de Maillet (p. 72). Leonardo da Vinci (omitted, incidentally, from the "Index") was not trying, as is stated on p. 58, to convince his contemporaries of his geological ideas or indeed of *anything*; quite the contrary when, as is admitted on p. 32, he went to such great lengths to keep his ideas secret. It is doubtful whether Celsius was the "inventor" of the scale that bears his name (p. 78); rather was it a flagrant purloining of an idea from Carl von Linne (Linnaeus). "In the 18th Century", we are told on p. 99, "mining became much more important." Not so; more widespread, perhaps, but it had long been extremely important in human affairs; what, indeed, *can* be more important than one's means of livelihood, as mining had long been for many people, and the sources of the principal materials for weapon-making since the end of the Stone Age? It is untrue that, in Werner's time, superposition was "a well-established fact in science" and it is profoundly misleading to call the Catastrophists "the real founders of biostratigraphy" (p. 149). Alexandre Brongniart did not *coin* the name "Jurassic" in 1929 (nor, even, for that matter, in 1829), as p. 159 indicates; he was merely modifying Alexander von Humboldt's "terrains jurassiques" of 1799. Arthur Holmes is stated to have been Scottish (p. 197), but, though holding a Chair in the University of Edinburgh, he was certainly English. Despite the comment on p. 143, Goethe knew of the conflict of Geoffroy Saint-Hilaire and Cuvier at the Academy of Sciences and was not distressed by it. Quite the contrary; as Appel (1987) has shown, Goethe relished it!

Moreover, some of Gohau's pronouncements leave me bewildered. Why should the discovery that the Atlantic was of Miocene age show that Plato's Atlantis was not a myth (p. 181)? Why should Termier's lyrical style dissaude persons from becoming geologists (p. 184)?

What is clear, is that Gohau is trying again and again to persuade us that the French and Swiss, not the English, Scots, Germans and Americans, were the true pioneers in the formulation of most major geological concepts. Perhaps this attempt might be viewed by some as praiseworthy, even salutory; but it is bad history. I remain wholly unpersuaded that Soulavie was "one of the founders of paleontologic stratigraphy" (p. 66); when his work lay so long unrecognized, how can he be considered a founder? Nor can I view Prévost, on the evidence presented (p. 140-141), as a pioneer of Uniformitarianism. In contrast, the work of British geologists such as Buckland, Murchison and Sedgwick is undervalued, that of Greenough, Charles Lapworth and many other eminent British figures not mentioned at all. As for Gohau's treatment of William Smith's work (p. 134), it is so unjustifiably adverse as to be positively scurrilous!

Nor does this imbalance extend merely to the British pioneers of our discipline. Leonardo da Vinci's work and that of Giovanni Arduino gain mention, but their contributions are seriously undervalued; the important German stratigraphers of dates later than Lehmann and Werner — examples are Quenstedt and Oppel — gain no mention at all.

Yes, there *are* some useful features in this work. The discussions of the little-known concepts of Buridan (p. 27 *et seq.*) and John Needham (p.19-20) are enlightening and many contributions by little-known French geologists are brought forth for the reader's inspection. Serious geological historians will gain from this book some new information, as well as some unexpected viewpoint. Yet it is a work so fraught with prejudices and inexactitudes that this reviewer, at least, considers it unsuitable reading for students. French reviewers, of course, may view it differently!

REFERENCES

Adams, F.D., 1938, The Birth and Development of the Geological Sciences: Williams & Wilkins, Baltimore, Maryland, 506 p.
[Reprinted 1954 by Dover Books, New York]

Appel, T.A., 1987, The Cuvier-Geoffroy Debate. French Biology in the Decades Before Darwin: Oxford University Press, Oxford, Monographs on the History and Philosophy of Biology Series, 305 p.

Gohau, G., 1987, Histoire de la Géologie: Éditions la Découverte, Paris, Collection "Histoire des Sciences", 259 p.

Woodward, H.B., History of Geology: Watts, London, 154 p.
[Facsimile reprint 1977 by Arno Press, New York]

Zittel, K.A. von, 1899, Geschichte der Geologie und Paläontologie bis Ende des 19. Jahrhunderts: Oldenbourg, Munich, Germany, Geschichte der Wissenschaften in Deutschland, Neure Zeit., v. 23, 868 p.
[English edition, 1901, History of Geology and Palaeontology to the end of the 19th Century: Walter Scott, London, 562 p., translated by M.O. Gordon, reprinted 1962]

The Continental Mantle

Edited by Martin A. Menzies
Clarendon Press, Oxford
184 p., 1990; $98.00 US, cloth

Reviewed by Richard A. Stern
Geological Survey of Canada
601 Booth Street
Ottawa, Ontario K1A 0E8

The continental mantle is that portion of the mantle beneath the continental crust which, relative to the rest of the mantle, is cooler (<1200°C), is depleted in basaltic melt components, and is buoyant. The continental mantle and the overlying continental crust appear to be "attached" to each other, and they may also be genetically related; together, they constitute the continental lithosphere which extends to depths of 200 km. In a series of eight chapters, each authored by experts in the field, this book summarizes our past and present understanding of the geophysical, petrological, geochemical and isotopic characteristics of the continental mantle.

In Chapter 1, entitled "Geophysics of the continental mantle: an historical perspective", Don L. Anderson considers mainly the seismic velocity structure of the mantle, including tomographic maps of shear wave velocities, and also discusses the evidence provided by heat flow, gravity (geoid), electrical conductivity and seismic attenuation data. Anderson addresses the controversy over the rooting of continents to very deep parts of the upper mantle (>400 km), the continental "tectosphere". He argues that seismic velocity, seismic attenuation, flexural strength and electrical resistivity all change rapidly at depths of 100-200 km and that this is the effective depth of the continental lithosphere.

Chapter 2, entitled "Petrology and geochemistry of the continental mantle: an historical perspective" (M.A. Menzies), is a very readable and thorough history of mantle petrology and geochemistry beginning in the late 1800s and extending to the present. Research into mantle petrology and geochemistry is historically tied to the occurrence of peridotite, eclogite and pyroxenite mantle xenoliths in the diamond-bearing kimberlite pipes of South Africa. As in other areas of petrology, Bowen made a lasting contribution to mantle petrology by suggesting that barren peridotite would result from extraction of basaltic magma, a suggestion that revolutionized the theories on the origin of the xenolith suites, and which continues to be fundamental to understanding the subcontinental and suboceanic mantle. The highlight of the chapter is Figure 2, which presents a series of cross-sections illustrating the changing perceptions of continental crust - mantle relationships since 1925. An extensive reference list at the end of the chapter is extremely useful for those interested in following up certain topics.

Chapter 3, entitled "Age and early evolution of the continental mantle" (S.H. Richardson), considers the implications to continental mantle structure provided by the diamonds found in the kimberlite pipes of South Africa. The diamonds enclose peridotitic minerals which record equilibration pressures of 150-200 km and temperatures of <1200°C. The Nd isotopic compositions of garnet inclusions in diamond indicate that they crystallized at about 3.5 Ga. This is powerful evidence that the continental mantle beneath Archean crust of South Africa extends to 200 km depth and was itself created in the Archean. Kimberlites erupted through adjacent Proterozoic belts are barren of diamond, and therefore the continental mantle beneath the Archean crust is thought to extend to greater depths than that below the Proterozoic crust.

Chapter 4, entitled "Archaean, Proterozoic, and Phanerozoic lithospheres" (M.A. Menzies), emphasizes the geochemical and isotopic (Sr, Nd, Pb) differences between Archean, Proterozoic and Phanerozoic continental mantle as evidenced by xenolith suites from basalts and kimberlites. The Archean crust is underlain by a strongly refractory and depleted mantle lithosphere which is not present beneath post-Archean continental or oceanic crust, and which probably formed as a result of the extraction of high-temperature komatiitic melts in the Archean. This Archean depleted mantle has a complex history of overprinting by later fluids and melts from the underlying mantle. Menzies makes extensive use of the acronyms developed by Zindler and Hart (1986) to characterize the isotopic domains within the continental mantle (*i.e.*, DMM, HIMU, EM1, EM2).

In Chapter 5, entitled "Redox state of the continental lithosphere" (S.E. Haggerty), the reader gets a sense of the complexities and difficulties in assessing the oxygen fugacities of the mantle. This field of research, more than any of the other fields of mantle study, is hampered by problems and controversy over the analytical techniques used to

acquire the data. Measurements on mantle xenoliths and melts indicate that the continental mantle has a great deal of heterogeneity in its oxidation state, ranging from the Fe-FeO buffer to the Ni-NiO buffer. Haggerty views the continental mantle as being stratified with respect to oxygen fugacity, with the metasomatized zones being more oxidized.

Chapter 6, entitled "Distribution of fluids in the continental mantle" (E.B. Watson, J.M. Brenan and D.R. Baker) summarizes the experimental basis for understanding fluid metasomatism in the mantle. The types of fluids present depend largely on the depth at which they occur, with CO_2 fluids prevalent at shallow levels and H_2O fluids at greater depths. Also presented here are the theoretical and experimental bases for understanding the mechanisms of fluid migration in the mantle.

Chapter 7, entitled "Stable isotopes in the continental lithospheric mantle" (T.K. Kyser), gives a thorough summary of O, S and H isotope data on minerals from Alpine peridotites, mantle xenoliths and mafic lavas. Compared with the oceanic mantle samples, the continental mantle samples are characterized by much larger variations in their stable isotopic compositions, reflecting contributions mainly from fluids and melts from subducted components as well as the addition of pieces of the oceanic crust itself, and asthenospheric melts and fluids. Kyser provides a useful diagram (Figure 23) summarizing the processes that can influence the isotopic composition of the continental mantle.

In the final chapter, entitled "Continental volcanism: a crust-mantle probe", M.A. Menzies and P.R. Kyle provide two case studies of the petrogenesis of continental volcanic rocks. The data are not new, but are effectively used to bring out the well-known controversy over the extent of crustal *versus* mantle contributions to these lavas. It is evident that crustal contamination cannot explain all the isotopic variations in the rocks, and the authors further consider whether the source of the lavas was in the mantle lithosphere, asthenosphere or in a deeper mantle plume.

This book has a strong scientific influence from the editor, M.A. Menzies, who is also a primary author on three of the eight chapters. Although he is clearly a leader in the field of mantle research, I found this level of contribution from one author excessive. Thus, the reader does not get the diversity of approaches and opinions that a book of this sort demands, especially on the subject of mantle geochemistry. The preface, also written by Menzies, is really not a preface at all, but an abstract packed with conclusions which the non-specialist will find daunting and discouraging. I also felt that the paper by Watson *et al.* (Chapter 6), although very interesting by itself, was too specialized and off topic in this book. This book would be useful for postgraduate courses in mantle petrology, and should be acquired by most libraries.

REFERENCE

Zindler, A. and Hart, S.R., 1986, Chemical geodynamics: Annual Reviews of Earth and Planetary Science, v. 14, p. 493-571.

Geology of the Mineral Deposits of Australia and Papua New Guinea

Edited by F.E. Hughes
The Australasian Institute of Mining and Metallurgy (AusIMM), Monograph 14
Order from: Publication Sales, Australasian Institute of Mining and Metallurgy, P.O. Box 122, Parkville, Victoria, 3052, Australia. Price per two-volume set: members A$200; student members A$100; non-members A$250. Approximate cost of packing and post to North America: in range A$31 (surface mail) to A$101 (first class air mail); delivery time: approximately 10 days (air mail) to 14 weeks (surface)

Reviewed by Paul Gilmour
Consulting Mining Geologist
a3838 Calle de Soto
Tucson, Arizona 85716

Monograph 14, dedicated to the late Haddon F. King, represents the fourth in a series of publications on the mineral deposits of Australasia that began with the *Geology of Australian Ore Deposits* (Edwards, 1953). Successive publications appeared at roughly 10 year intervals (McAndrew, 1965, Knight, 1975, 1976). This is a highly commendable achievement for a country with a population of 17 million. (Relevant "rest of world" organizations kindly note!).

Objectively, the monograph comprises two volumes with an aggregate of 1,828 text pages plus tables of contents and indices, for a total of nearly 2,000 pages measuring 210 by 295 mm (8 by 11.5 inches). In the mailing carton, the volumes weigh 6.3 kg (13.9 lb.). Pockets at the back of volumes 1 and 2 contain colour-printed maps of mineral deposits in, respectively, Australia (scale = 1:5,000,000) and Papua New Guinea (scale = 1:2,500,000). Separate copies of the maps can be purchased from the Institute (for A$25 each, including postage). Subjectively, the two volumes are very handsome. The covers are colour photographs of a locality in the Hamersley Ranges and a vertical airphoto of the Ladolam gold occurrence, Lihir Island. To those familiar with the cloud formations of the region, the latter will seem a priceless gem. Pages have a pleasing format with print that is small, but legible. While the standard of draughting is very high, the reduction of a few figures has been slightly overdone (although that reaction may say more about my tired, old eyes than objective reality!). Thanks to grants from the authors' employers, many of the figures and photographic illustrations are in colour. In short, Monograph 14 creates an excellent first impression.

Volume 1 opens with a preface by J. Collier, Chairman of the Australasian IMM (publications) Steering Committee. This is followed by an editorial in which F.E. Hughes explains the rationale behind the organization of the volumes, notes differences from previous volumes, and defines and explains the use of certain terms (*e.g.*, classification of reserves).

These remarks are succeeded by general papers on mining and geology in Australia by authorities from research organizations and private companies (Papua New Guinea is treated separately, see below). The first, compiled by the Resource Assessment Division of the Bureau of Mineral Resources, shows that the Australian mineral industry remains the largest single factor in that nation's overseas balance of trade, earning, as J. Collier notes in the preface, 43% of national income. (I believe that figure includes coal, oil and gas, although these are not described in the monograph.) Useful summaries of the structural and stratigraphic framework of Australia and of subdivisions of the Australian Precambrian are complemented by correlations with Precambrian formations in other continents. A paper on "lineament tectonics of Australian ore deposits" by E.S.T. O'Driscoll follows. Based on experience, I have some reservations about this approach, but O'Driscoll is a highly regarded explorer with a distinguished record and the examples presented are very persuasive. These introductory sections are followed by reviews of selected commodities, including a concise "overview" of gold by R. Woodall, well known to Canadians as the first (1984) Joubin-James lecturer, and an excellent survey of diamonds by W.J. Atkinson and coworkers.

Three papers on ore genesis follow. They make no attempt to be encyclopedic, but focus on mineral occurrences in layered rocks. The first, by R.L. Stanton, opens with a brief history of the evolution of ideas concerning "exhalative" deposits associated with volcanic rocks, correctly emphasizing the importance of studies by German-speaking geologists and of the dissemination of their ideas. In the latter connection, I think the contribution of G.C. Amstutz deserves recognition. (On the succeeding point, regarding the diversity of massive sulphides,

a couple of publications by the present writer pre-dated, or were contemporaneous with, two or three of those cited, but that is a detail!) In the second paper, J.N.W. Elliston presents a thought-provoking essay on mechanisms for concentrating metals in sediments. Those working in Australia still have much to teach the rest of us. Coincidentally, after writing the comments on Dick Stanton's essay, I noticed that the first entry in Elliston's bibliography (arranged alphabetically) refers to a certain "Amstutz, G.C.". The third paper in this section, by A.W. Mann and J.W. Webster, is on gold in the so-called "exogenic" environment. This commentary was of interest to me for a number of reasons, not the least being the fact that, in the late 1950s, I worked in Canada for an Australian called Frank A. Moss who, on empirical grounds (*e.g.*, the existence of wire gold), believed that the yellow metal must be mobile in the zone of weathering. It seemed Moss belonged to a very exclusive minority. Another prominent member was R.W. Boyle (forgive me, Bob, if I misrepresent your views!). It would have been interesting to have seen a note on the behaviour of PGEs (*cf.* J.F.W. Bowles' work in Sierra Leone), but the authors evidently regarded that subject as outside their scope.

The bulk of the remainder of the two volumes describes individual deposits and districts. The many papers are arranged, on lithostratigraphic and structural grounds, into chapters with such titles as: "Chapter 2: Archaean gneiss and granite greenstone domains of Western Australia" and "Chapter 3: Proterozoic orogenic domains and Precambrian cover sequences in Western Australia". Chapters are, in turn, subdivided using like criteria, into sections made up of individual papers on districts and single deposits (and groups of deposits). This organization allows diamonds, for example, to be discussed twice, specifically, both as *in situ* and as alluvial occurrences (one of the latter being described by Editor F.E. Hughes and C.B. Smith).

Entries on individual deposits in Australia number approximately 200. (Since many describe more than one, the total figure for occurrences discussed in differing amounts of detail, not counting references in general chapters and sections, must be at least two or three times that number.) About 100 (50%) of the entries refer to gold. (I write here "approximately" and "about" deliberately, because several reports and occurrences might be counted more than one way.) Roughly 33 (±15%) deal with polymetallic base- and precious-metal deposits; 12 (±6%) each are on uranium, steel alloy metals (Cr, Mo, Mn, Ni, W) and "miscellaneous" occurrences (alkaline-associated Nb and rare earths, beach sands, residual deposits); eight (±4%), non-metallic minerals (other than gems, *e.g.*, talc, magnesite and barite); five (±2.5%) each, iron and gemstones; two (±1%) each focus on PGEs and copper-molybdenum (or Cu-Au). All of the papers are accompanied by up-to-date bibliographies.

The fourth quarter of Volume 2 is devoted to Papua New Guinea (PNG). Allowing for obvious differences, *e.g.*, land-area and age of formations, the organization of this section is similar to that adopted for Australia. Coverage begins with a section on mining in PNG (T.C. Welsh), followed by one on the relationship between regional geology and mineral deposits (R. Rogerson and C. McKee). Of the 21 individual papers on districts and deposits, 15 are on gold, including alluvial deposits; four describe large, low-grade (porphyry) copper-gold deposits and one each is devoted to a polymetallic massive sulphide deposit and PGM occurrences in PNG. Reports cover the spectacular Porgera (G.A. Handley and D.D. Henry) and Ladolam (A.J. Moyle *et al.*) deposits; the historically significant Wau (J.T. Carswell) and the deservedly famous associated alluvial gold deposits (A. Wangu) which were the scene, in the 1930s, of the world's first large-scale air lift; and, of course, the Panguna (G.H. Clark) and Ok Tedi (P.M. Rush and H.J. Seegers). All entries include bibliographies. The inimitable Sandy Renwick, credited with setting up the Geological Survey of PNG, was a contemporary of mine at Edinburgh and, writing as one who has long been interested in mineral occurrences in the southwest Pacific, I must say that the papers on the mineral endowment of PNG alone are worth the price of admission!

In a limited compass, no reviewer can do justice to so many technical papers. All that can be done is to offer a few general observations and personal reactions to examples chosen more-or-less at random. First, the generalizations. In contrast with many previous publications of the same type (which could, but will not, be identified!) *all, or virtually all, of the papers present a clear statement of what is surely the most important attribute of geological phenomena studied mainly for economic reasons, namely,* ***reserves***. All concerned are to be highly commended. The majority of the papers are short, crisp accounts, made about as descriptive as the vocabulary of geology, with its proclivity for genetically derived terms, permits (*cf.* in a Geological Association of Canada publication, Duncan Large's colourful coinage "genetic descriptors"). Genetic models are given for most deposits, but descriptions are admirably short and free from undue speculation. A few of the reports are accompanied by comments on applicable technology. Especially where geologic features dictate or allow the use of innovative methods, that should be standard practice, even (or particularly?) in "purely" geological periodicals, some of which seem to have lost their economic bearings. A valuable feature of the coverage — which, again, contrasts with most symposia on mineral deposits — is the inclusion of prospects. This treatment presents a better idea of the distribution and range of mineralization than is conveyed by restricting coverage to producing mines. For those engaged in exploration, it also reveals something about potential.

Second, some random personal reactions. Early in Volume 1, C.B. Jones presents a report on the Archean-age Coppin Gap copper-molybdenum deposit (112 Mt that average 0.105% MoS_2 and 0.152% Cu) located in the Pilbara craton. This is of special interest to me, because in 1962, on behalf of my then employer, I staked 20-odd claims in the Precambrian Bourlamaque "stock" in Québec, on what I thought was a disseminated ("porphyry-type") copper-moly occurrence. (I know, of course, about Tribag.) Other porphyries described include the Devonian (same age as Gaspé?) Goonumbla deposit, located near Parkes, New South Wales (Heithersay *et al.*) and, of course, the several Tertiary-age deposits in PNG and nearby archipelagos.

In 1971, I spent upward of two weeks with A.M. Goodwin and the late D.R. Derry in the Broken Hill district on behalf of CRA Exploration. This personal experience provides background to my regard for three reports in the monograph on the district, one of which was authored by D.H. Mackenzie and R.H. Davies (the former another colleague from Edinburgh). Combined, these papers give an excellent, up-to-date account of one of the most important mining camps in the world.

Writing as one who has published on the association between gold and iron formation — or, as I prefer to phrase it, "ferruginous sediments" — and especially with the carbonate facies (typically erroneously identified as carbonated or ankeritized greenstones, *etc.*!), hosted by or interbedded with felsic pyroclastic rocks, I naturally was intrigued by the large proportion of the gold deposits in Western Australia that lie in or close to "BIF", "jaspilite", "carbonated chlorite schist", and the like. If they do not already know, Canadian workers might be interested to learn that the Big Bell gold deposit (G.A. Handley and R. Carey), situated in the western part of the Yilgarn craton, has been compared to Hemlo as well as Barberton (one of several camps in South Africa where, of course, gold is intimately associated with ferruginous sediments).

Sensibly, both volumes contain identical, comprehensive indices to "authors" and "subjects". In some ways, the latter might more accurately be called an index to localities and deposits. I was unable to find, for example, "porphyry copper deposits" (*i.e.*, as a type or class). Perhaps the editors felt that the already considerable length — reflecting the sheer scope of the volumes — necessitated some limitations.

Having written for textbooks and worked closely with editors, my sympathies go out to members of that group. The idea of marshal-

ling 200-odd papers — and three or four times as many geologists! — boggles the mind. The editorial staff, steering committee of the Institute and others responsible for Monograph 14 deserve great credit for the way in which they have handled that daunting task.

By way of compensation for their efforts, every student of mineral deposits will find something of interest: mineral economics; regional studies; Precambrian stratigraphy; ore genesis; porphyry copper mineralization (of widely diverse ages); massive sulphide deposits (ditto!); carbonate-hosted lead-zinc; uranium; metals and minerals associated with ultra-alkaline rocks, including carbonatite; gemstones; residual materials; beach sands and much, much more. Customarily, publications such as this are not read from cover to cover, but are consulted for specific answers. For this and related purposes, Monograph 14 is warmly recommended. The 1953 publication on Australian ore deposits is one of my most valuable reference texts. Unfortunately, I missed the 1965 and 1975 versions when they appeared, and they have long been out of print. Those who wish to add Monograph 14 to their libraries should act without delay. They will not be disappointed.

REFERENCES

Edwards, A.B., 1953, ed., Geology of Australian Ore Deposits: Australasian Institute of Mining and Metallurgy, 5th Empire Mining and Metallurgical Congress, Melbourne, 1290 p.

Knight, C.L., 1975, ed., Economic Geology of Australia and Papua New Guinea. Volume 1, Metals: Australasian Institute of Mining and Metallurgy, Melbourne, 1126 p.

Knight, C.L., 1976, ed., Economic Geology of Australia and Papua New Guinea. Volume 4, Industrial Minerals and Rocks: Australasian Institute of Mining and Metallurgy, Melbourne, 423 p.

McAndrew, J., 1965, ed., Geology of Australian Ore Deposits: Australasian Institute of Mining and Metallurgy, 8th Commonwealth Mining and Metallurgical Congress, Melbourne, 547 p.

History of Geology of Westernmost New York State (Niagara, Erie, Chatauqua and Cattaraugui counties) (1604–1899)

By Irving S. Tesmer
Omnipress, Madison, Wisconsin
Available from the Buffalo Society of Natural Sciences, Humboldt Parkway, Buffalo, New York 14211
215 p., 1989; $19.95 US

Reviewed by W.A.S. Sarjeant
Department of Geological Sciences
University of Saskatchewan
Saskatoon, Saskatchewan S7N 0W0

This work constitutes a history of the growth of geological understanding in a region bordering so closely upon Canada — after all, it's only just across the Niagara River from the Ontario "banana belt" — that it will be inevitably of great interest to Canadian stratigraphers and geological historians. Its author wrote this work around the time of his retirement from State University, New York in Buffalo, intending to make a master copy and send out only a few photocopies. However, the demand warranted publication. Dr. Tesmer comments *(in litt.)* "Had I realized that my original master copy was to be published, I might have done a few things differently, but by the time that decision was made, I decided to leave things as they were." Whether his decision was right or wrong, the reader must judge. The entire lack of illustration, apart from a regional sketchmap on the front cover, is certainly a liability. A work with so strong a stratigraphical and paleontological content positively begs to be illustrated!

The publishers have been most remiss in that neither their name nor the place of publication are anywhere indicated; this will inevitably cause confusion among librarians and bibliographers. Moreover, the lack of a spine title will bring problems in location, in any but the best organized libraries, after the book has been shelved.

On the positive side, the thematic organization is lucid; the type-face and size make for easy legibility; and the references are presented fully and accurately — not a common virtue nowadays, alas! In consequence, all persons concerned with the geology and geomorphology of this region, and of regions adjacent to it, are certain to value highly this product of Dr. Tesmer's detailed knowledge and long labour in the region that was, for so long, his particular geological backyard.