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Trilobites of the Upper Cambrian Sunwaptan Stage, Southern Canadian Rocky Mountains, Alberta.

James H. Stitt

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Much amusement can be obtained from this text, then, and quite a bit of instruction gained painlessly. Yet geological historians will encounter too many imprecisions and irritations for their enjoyment to be unalloyed.

A great asset of Owen's work is that it did not concentrate wholly on the United States, but treated with the whole world. This new book is less broad in coverage, perhaps simply as a consequence of the availability of photographs. Much of it treats with the United States, but Mexico is well covered (p. 47-49, 51, 75-79, 90-92) and Colombia also (p. 116-132, 164-171). A number of other countries gain briefer treatment — Peru (p. 49), Venezuela (p. 93-95), the Caucasus, USSR (p. 51), Borneo (p. 51), Belize, Honduras and Guatemala (p. 162-164) and Turkey (p. 109-114). Canadians will be pleased by the fact that Logan's discoveries in the Gaspé gain proper mention (p. 11), less pleased that the discovery in Ontario (p. 23-24) is treated after, and less fully than, that in Pennsylvania. All in all, for whatever reason, the geographic coverage is very unequal.

Some inclusions are equally puzzling. Why that vague mention of Edward Hitchcock's work (p. 11)? Florence Bascom was not a petroleum geologist; is her inclusion (p. 183) a defensive nod to the feminists? Why that photograph of a glacial erratic, on p. 32? Why treat with mining in Mexico (p. 158-159) or volcanic geology in Hawaii (p. 133-134)? Surely there was enough else on petroleum geologists and their doings, without there being need for such irrelevancies?

There are a number of errors and misleading statements. That early offensive weapon called "Greek fire" was not merely crude petroleum, as the text states (p. 3), but prepared from a much more complex recipe that proved extremely dangerous because it was spontaneously inflammable in sunlight. We do not owe the term "Uniformitarianism" to James Hutton, as is implied on p. 4; it stems instead from the much later work of Sir Charles Lyell. Misprints are tiresomely numerous — "Pennyslvania" (p. 24); "Cecil Rhoads" (p. 61); "Kirtley F. Matther" (p. 94); and the several-times-repeated "Elwin Theodore Dumble" (p. 29, 47). Quotes are missing in several places, sometimes at the beginning of paragraphs (*e.g.*, last paragraph, p. 158), sometimes at their end (paragraph 2, p. 113). Lorand Eötvös's name (p. 101) has lost its accents and, on the same page, one needs to be aware that "Turner Valley, Canada" is the famous Turner Valley of Alberta. Worst of all is p. 98, whose text begins in mid-paragraph. Such errors could have been eliminated very readily — and *should* be eliminated, before any second printing is made.

I am not sure whether the photograph reproduced on p. 104 was badly trimmed in the original or during reproduction. As it stands, one can only presume that the persons depicted in line on the snowfield were skiers, since their legs are chopped off!

The captions generate problems and irritations also. Undoubtedly, many must have been so inadequately labelled in their original form that little could be done. However, in other cases, more precision could have been obtained with minimal effort. A good gazetteer or an enquiry would surely have tied down "Victoria, South America" and "Loma Corredor, South America" (p. 122) — and did Kessack Duke White *really* investigate *all* of that continent? (p. 126). A large task, if so! Surely it would have been easy to locate more specifically "Pence Rock" and "Pence, Canada" (p. 178, 181), especially since the IUGS went there? And, whilst it is interesting to know that Everett Carpenter was chief geologist (p. 175), it would have been nice to know of what! (Perhaps Cities Service Co., in view of the photo credit; but not necessarily, when there have been so many changes and amalgamations). All in all, one is left feeling that, in formulating the captions, much valuable information has been suppressed or simply not sought.

The "Select Bibliography" is an amateurish abomination. It is rife with inconsistencies. Sometimes publishers' names are given; quite often, they are not. Journal citations sometimes give pagination, sometimes only the volume and issue number, in one case only the name of the magazine! Such entries as:

"Wallis, William E. " *Oil is Where you Find It* ". Notes."

are scarcely helpful. Its inclusion into a bibliography implies that this work was published; but there is no date, no place of publication, no publisher. Unpublished notes, then? If so, where stored?

There is no least attempt to tie in the numerous quotations in the text, either with this bibliography or with the contributors of material listed on p. 190-191. Serious researchers, trying to track down sources, will encounter only frustration.

It is a pity that so well-conceived a work, with such a lively and readable text, should be so badly flawed. May I trust that AAPG will produce a second edition, in which these problems are remedied?

In the meantime, one should not analyze this book too profoundly, for it will not stand up to such analysis. Nor should one view it as a text suitable for educational use. Instead, treat it simply as a coffee-table book — as something by which to savour the flavour of a past period, for the photographs and text evoke that flavour very well. And, for the facts, turn back to Owen!

Trilobites of the Upper Cambrian Sunwaptan Stage, southern Canadian Rocky Mountains, Alberta

By Stephen R. Westrop
Palaeontographica Canadiana No. 3
(a monograph series sponsored jointly by the Geological Association of Canada and the Canadian Society of Petroleum Geologists and administered by a joint committee appointed by both societies
179 p., 1986; $25.00, paper

Reviewed by James H. Stitt
Department of Geology
University of Missouri-Columbia
101 Geology Building
Columbia, Missouri 65211

Stephen Westrop has made a very important contribution to our knowledge of the paleontology of the Upper Cambrian strata of the southern Canadian Rocky Mountains. Over 9000 trilobites were collected and identified from six measured sections located in these rugged mountains, beginning near Banff, Alberta and extending northwestward to Chaba Creek. The trilobites were assigned to 81 genera and more than 130 species, including three new genera and 21 new species. Most of the trilobite collections came from the Mistaya and Bison Creek Formations, but a few collections were recovered from the upper part of the underlying Lyell Formation and some collections came from the Basal Silty Member of the overlying Survey Peak Formation. The biostratigraphic interval studied begins in the Upper Cambrian Middle Franconian Stage (*Elvinia* Zone) and continues through the upper Franconian, traverses the entire Trempealeauan Stage to the top of the Cambrian, and ends in the lower part of the Lower Ordovician Ibexian Stage (*Symphysurina* Zone). Most of the interval studied is usually called the Ptychaspid Biomere; Westrop and his mentor Rolf Ludvigsen have proposed that this interval be called the Sunwaptan Stage, which is the term used in the title of the paper.

Westrop made a special effort to collect large samples from the fossiliferous beds, so that he would have a sufficiently large number of specimens for most species in order to perform some statistical manipulation of the data. He used Q-mode and R-mode clustering analysis to define twelve biofacies, which are discussed within a regional framework of seven biostratigraphic zones. Many of the numerically dominant taxa that define the biofacies have occurrences that are restricted to particular lithologies. These biofacies-lithofacies associations in the Bison

Creek Formation are interpreted to be the result of local sorting during storms, which created storm-lags that contain mostly specimens of about the same size that belong to a single species. Similar species associations in the overlying Mistaya Formation are related to the preference of some taxa for algal buildups, and the preference of other coeval taxa for carbonate sands and other shallow-water shelf lithologies. Westrop also argues that although some species and genera have widespread geographic distribution, and can therefore be used for interregional correlations of the widely scattered outcrop belts of Upper Cambrian rocks in North America, each area of Upper Cambrian strata is best described biostratigraphically by using local zonations that may be influenced or controlled by local ecologic factors.

Taxonomic descriptions occupy the bulk of this paper, as they should in a monographic series such as this. The descriptions are clearly written using standard nomenclature, and new taxonomic groupings are carefully explained and defended. The citations in the taxonomic discussions attest to the author's worldwide knowledge of taxa for this interval, and there are many comparisons with taxa from other continents. The photographic plates are very well done, with nice large pictures of the specimens being described. Many previously poorly illustrated holotypes are re-illustrated, as a part of Westrop's careful re-evaluation of some of the described taxa. Species range charts are presented for each section, the number of specimens collected for each species is given with the taxonomic discussions, and the total number of specimens in each collection is given in the appendix.

Westrop's contention that the occurrences of trilobite assemblages are lithofacies controlled is controversial, as is his belief that changes in assemblages up-section reflect major shifts in lithofacies. Similar conclusions have not been reached in equally detailed studies elsewhere. Other studies in progress will have a chance to test his models. Some of the generic assignments to families, and families to superfamilies are new and challenging, and may draw comment in future taxonomic studies in this interval.

In summary, Westrop is to be congratulated on this significant contribution to Upper Cambrian paleontology. Most if not all of the outcrops studied occur high in the mountains, and just making the collections was an arduous task, as was preparing and identifying the 9000+ specimens used in this study. The text is clearly written and easy to read. Whether one agrees with all of Westrop's interpretations or not, he has clearly done a monumental job, and provided a solid data base for future reference on the Upper Cambrian of the southern Canadian Rocky Mountains.

Gold and Copper-Zinc Metallogeny Within Metamorphosed Greenstone Terrain, Hemlo-Manitouwadge-Winston Lake, Ontario, Canada: A Compendium

Edited by R.H. McMillan and D.J. Robinson
a joint publication of the Mineral Deposits Division of the Geological Association of Canada & the Geology Division of the Canadian Institute of Mining and Metallurgy
91 p., 1985; $25.00, paper

Reviewed by Roy Y. Watanabe
Consulting Geologist
Roy Y. Watanabe & Associates Inc.
1792 Sherwood Forest Circle
Mississauga, Ontario L5K 2H6

This publication arose from the CIM Geology Division - District 4 Fall field trip to the area in 1984, stimulated mainly by the considerable interest and excitement generated by the discovery of the Hemlo gold camp. The massive sulphide deposits in the general Hemlo area were incorporated into the field trip to provide balance and fill out the program. The guidebook initially prepared for this field trip was updated and revised for publication. The subtitle, "A Compendium" serves as a warning to the reader that this publication is a brief summary, and generates an accommodating spirit in the reader. This reviewer is unable to refrain from referring to this publication as a guidebook.

Part of the reason for publishing this guidebook was to provide individuals with essential information to conduct their field trips in the Hemlo camp, particularly along the Trans-Canada Highway and paved secondary roads (permission to view field stops on private property is necessary): this publication serves this purpose admirably. The mine operators Teck, Noranda, and Lac Minerals each provided details in separate papers on their respective portions of the main orebody, and government geologists Muir and Patterson each contributed papers which describe the regional and local geologic framework of the Hemlo camp. Historical perspective is provided by most of the Hemlo papers in this publication, and taken together, provides an interesting chronology of events which resulted in the discovery of one of the great gold camps in Canada. For those who wish to undertake an unsupervised field tour, Patterson's paper is particularly useful by virtue of its well-illustrated, well-described field stops (some field stops have been eliminated by construction), and the highly organized format.

The mining companies generously provided numerous highly informative surface tours during the exploration and preproduction stages of their respective properties, and government geologists coincidentally provided numerous high quality geologic tours during this same period. The guidebook is a fitting tribute to the dedicated efforts of the many tour guides. Appropriately, the field trip relating to this guidebook occurred within the shadows of the new headframes, at a stage when underground tours were just starting, and responsibility for further tours was being transferred mainly to the underground geologists.

The geologic setting of the Winston Lake and Geco volcanogenic massive sulphide deposits are very briefly described in two separate papers. The editors infer that visits to these massive sulphide properties provide a basis for comparison with gold deposit settings, but other than a few general comments in the Introduction and Overview paper, this aspect was virtually ignored by the various authors. The Winston Lake paper alludes to successful application of alteration geochemistry and volcanology as search tools in the discovery of a "blind" massive sulphide deposit in an area that had already been extensively explored. The Geco mine paper illustrates how alteration patterns associated with a highly metamorphosed volcanogenic massive sulphide deposit can still be identified, although in this case, alteration studies did not contribute to the discovery of the deposit. Explorationists seeking volcanogenic massive sulphide deposits would be well advised to look at alteration geochemistry as a powerful tool, and both Winston Lake and Geco should comprise important case histories.

Overall, this publication appears to have been too rushed, resulting in editorial, grammatical, and spelling errors: most obviously, the list of MAPS (page iii) shows only two maps, giving the reader the impression that the list is incomplete, or a footnote explanation is required. Otherwise, this publication is somewhat dated: epigenetic, structural controls for Hemlo mineralization have somewhat displaced syngenetic controls; and full production has been achieved by each of the three operators who share the main zone deposit at Hemlo.

This publication is recommended for purchase by those who intend to visit the Hemlo camp, those who have visited the Hemlo area and would like to refresh their recollection, and those who are seeking historical information about the events leading to the discovery of the Hemlo orebodies. Geologists who would like to improve their awareness and understanding of alteration patterns associated with volcanogenic massive sulphide deposits would also benefit from this publication.