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The Silurian-Devonian Boundary

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See table of contents

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conference are reported in this AAPG Memoir, and comprises 126 papers and abstracts of papers posthumously dedicated to John Charles Hazzard, a prominent pretroleum geologist and one of the conference organizers. The meeting was deemed an overwhelming success. The next Circum-Pacific conference will be held in August, 1978. In essence, this book review is equally a conference report.

The Circum-Pacific region encompasses a vast area of ocean and bordering countries representing roughly one-half of the world's surface area. This conference represents the first large-scale international cooperative effort to consolidate the potential energy and mineral resource picture of the off-shore and on-shore regions of the Circum-Pacific, with special emphasis on the exploration and development facets of these resources.

The papers in this Memoir are grouped into several broad categories: General, 17 papers; Coal, seven papers; Geothermal Energy, 15 papers; Hydrocarbons, 28 papers; Hydrogeology, 13 papers; and Minerals, 46 papers. Not surprisingly, the papers dealing with the various energy sources are featured and predominate, but the Minerals section provides many valuable review-type papers covering a broad range of mineral commodities. Most of the papers contain an abbreviated Bibliography.

The General section comprises a series of papers which acquaints and up-dates the reader on a broad range of energy and mineral resource subjects for segments of the Pacific area, and contains forward-looking conceptual topics such as the interplay of plate tectonics and metallogenesis.

The Coal section suffers from an imbalanced and skimpy coverage both in geographical coverage and subject material.

The Geothermal Energy section reflects the recognition and growth of this energy resource during recent years. The term "Ring of Fire" refers to the prolific volcanism which characterizes the Circum-Pacific countries, and the incidence of active and dormant volcanoes might serve as a rough measure of the geothermal energy potential in these countries.

The section on Hydrocarbons is lengthy, though appropriate, and reflects the considerable efforts by Pacific rim countries to evaluate this primary energy source. Numerous sedimentary basins with attractive, but poorly tested oil and gas potential exist along the on-shore and off-shore regions of many Pacific rim countries. Particularly interesting are the papers relating the importance of plate tectonics and subduction zones to the formation and localization of petroleum reservoirs. Furthermore, even volcanic rocks might serve as petroleum reservoirs, as reported by Japanese authors.

The Hydrogeology section deals mainly with the special problems of groundwater source and waste disposal, most studies relating to Australia, Indonesia, Japan and Hawaii.

The final section, Minerals, is far-ranging in subject material, mineral commodities and geography. Nodules on the sea floor, porphyry copper deposits, massive sulfide deposits, and many other general and specialized topics are fleetingly covered in this section. But the authors have done a credible job by usually confining their subject material while covering large individual segments of the Pacific area. The potential role and application of LANDSAT imagery and plate tectonics in mineral exploration is stressed in some papers, providing current and progressive insights in metallogenesis.

This Memoir is a valuable reference for all geologists and mineral economists who are interested and dedicated to the evaluation, exploration and development of the relatively underdeveloped raw materials and energy potential of the Pacific borderlands and off-shore areas.

As a member of the mining fraternity, I wish to say that for those seeking new natural resources in the Pacific area, this book provides quick orientation and insights in a vast spectrum of subjects covering a huge geographic area and will help to inspire additional successful exploration efforts.

MS received August 30, 1977.

The Silurian-Devonian Boundary

Edited by Anders Martinsson
E. Scweizerbart'sche Verlags Buchhandlung, Stuttgart.
347 p., 1977.
Price $42.20 (U.S.)

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As stated on the front cover, this attractively bound, conveniently sized book is the final report of the Committee on the Silurian-Devonian boundary within the IUGS Commission on Stratigraphy and a state of the art report for Project Ecostratigraphy. This is a more recent, comprehensive and up-to-date version of the report submitted at the International Geological Congress in Montreal in 1972. The work clearly bears the stamp of two people long associated with the problem of settling the Siluro-Devonian boundary: the editorial work by Anders Martinsson and the organizational and 'geo-political' input by Digby McLaren, which served to settle the controversial issues.

In essence, the method finally used to fix the boundary was two-fold: 1) initial guidance for establishing as precisely as possible some boundary by means of lowermost occurrence of the graptolite *Monograptus uniformis*, and 2) a 'golden spike' driven in at the boundary stratotype section at Klonk, Czechoslovakia, where *uniformis* could be found.

The most interesting aspect of the book certainly is the final report paper presented at the beginning by D. J. McLaren. It serves as an excellent case history of the problems encountered in settling a boundary and demonstrates very clearly that the art of discussion, negotiation, bargaining and democratic polling can fetch clear results even in the world of geology. Surprisingly enough, the voting for specific opinions, e.g. settling the base of the *uniformis* zone as the base of the Devonian and the stratigraphic base of the occurrence of *uniformis* itself within bed 20 at Klonk, was nearly unanimous (80 to 90% in favour). Dissenting opinions or opinions

favouring broader interpretations are outlined alongside the main decisions. In the background of the decisions certainly lie the opinions of Hollis Hedberg's 1972 International Stratigraphic Guide, which were used as a basis for settling the stratotype boundary. Although many others do not favour the 'golden spike' rountine for fixing boundaries, and for very cogent reasons, the method employed by this commission probably will be used in most subsequent cases because it is the simplest way of solving the issue.

McLaren (p. 27-29) comments personally on his reasons for favouring boundary stratotypes as the most practical solution to such difficult and vexing problems. These relate to stratigraphic position, the subjectivity of defining species and range zones of species, and the need for accurate definition of boundary stratotypes. Many paleontologists and stratigraphers have pointed out that settling the fossil species problem by means of a holotype and type locality, is no different than settling a major boundary by means of a specific level in type locality. Although the stratotoype boundary is technically accurate to within a centimetre, correlating this fixed boundary even in a section a kilometre away can be as much of a major problem as comparing two specimens of fossils a kilometre apart. The problems of correlation by no means disappear magically with boundary stratotypes. McLaren recognizes this fact by stating that boundary stratotypes are not necessarily sacrosanct.

The remainder of the book is divided into two sections, regional reviews of the boundary problem, and fossil occurrences within the range of the boundaries. There are contributions from around the globe, with the exception of representation from the People's Republic of China. The geologist 'China watcher' anxiously awaits fresh data from this unknown part of our planet. Contrary to the nearly unanimous decisions on the boundary, the remaining contributors offer a host of stratigraphic and paleontological opinions, some not much in agreement even on a national level. For example, Soviet authors differ on their interpretation of the brachiopod genera *Lissatrypa* and *Atrypella*, with Biske *et al.* (p. 233) stipulating that the Silurian genus *Atrypella* occurs in the Lower Devonian in Tien-Shan. As the 1967 Calgary Symposium did for the Devonian in general, this book summarizes the critical boundary sections in a clear, consistent manner for the best available transitional sections.

Paleontological summaries of the fossil groups crossing or stopping above or below the boundary are started with acritarchs (Cramer and Diez), ending with the vertebrates (Turner). Nearly all fossil groups contain at least a selection of species that can be used for boundary definition. Groups unfortunately omitted in the summaries are the stromatoporoids, tabulate and rugose corals, nautiloids, gastropods and tentaculitids. Illustrations of boundary fossil species and subspecies, which would be very useful to a broad range of stratigraphers were only provided by Ormiston (trilobites - *Warburgella rugulosa*)and Jaeger (graptolites). Jaeger's contribution is especially appreciated in its clear definition of the subtle morphological differences in species and subspecies of *Monograptus*. With a hand lens, identification may be carried out in the field

In general, all those interested in geological boundary problems of the Paleozoic probably should acquire this volume, and those teaching senior courses in stratigraphy could well use it as a guideline for principles and practice of the fine art of correlation.

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Geological Survey of Canada Report of Activities Part C, 1976

Geological Survey of Canada
Paper 76-1C
Ministry of Supply and Services Canada, 334p., 1976.
Canada $5.00; other countries $6.00

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It is my opinion that less than a half of the 57 articles in this volume warrants publication. The few good papers are hidden between contributions that are mere catalogues of problem logistics, methodology, and instrumentation with few if any results and little interpretation. Comments such as "the results . . . . are not yet available" (p. 266) or "at the time of writing, compilation of the survey results is incomplete" (p. 271) prompt the question: then why publish at this time? There appears to be no minimum requirement for acceptability; the result is an unfortunate mélange. This issue of *Report of Activities* provides no solace for those concerned with the "alarming inflation of geological literature" (see *Geosci. Can.*, v. 4, p. 100-101 and p. 114-115, 1977), or, as David Suzuki recently put it, the growing deflation of the value of words (*Sci. Forum*, v. 10, no. 2, p. 13, 1977).

The editorial performance leaves much to be desired. Many papers are marred by numerous typographical and / or printing errors; all references cited in the text do not appear in the reference lists (e.g., Article 47); one paper entitled, "Distribution of foraminifera . . . . " is concerned solely with sediments (p. 19) - a mistake that is repeated in the "Table of Contents" as well as the Chief Editor's "Introduction"; and the rationale for separate categories on "Marine Geoscience" and "Quaternary Marine Geology", when all but one of the papers in the former are concerned with Quaternary phenomena, escapes me. Surely, a GSC publication with such an international exposure merits more efficient workmanship than this.

We are told that the Survey's program is concerned with communicating the results of its work effectively (p. vii). Could not this be accomplished better by separating mere reports of activities from short research communications - the former being published informally by title and the latter in a format comparable to the present *Report of Activities*, but more rigorously refereed and carefully edited?

Many of the contributions to this volume relate to the Quaternary Earth Sciences; the bulk of the remainder is concerned with geochemical reconnaissance surveys for uranium in western Canada and geophysical techniques that are suitable for remote-sensing of permafrost and sea-ice.