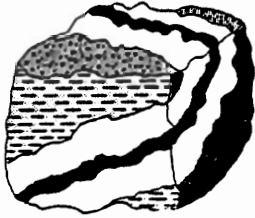


THE GANGUE



Newsletter of the Mineral Deposits Division

Geological Association of Canada

No. 7

October 1980

SPECIAL AWARD TO DUNCAN DERRY



MDD Chairman Hugh Morris (left) presents a special rhodium-plated Duncan R. Derry medal inscribed 'In Appreciation' to Dr. Derry. The special medal recognizes the Division's appreciation of Dr. Derry's many contributions to the GAC and to economic geology in Canada. The occasion was the first MDD luncheon held May 20, 1980, at the Faculty Club of Dalhousie University during the GAC Annual Meeting. Photo courtesy of Mario Coniglio, Department of Geology, University of Manitoba.

1981 DUNCAN R. DERRY MEDAL: CALL FOR NOMINEES

The Award Committee is seeking nominations for the outstanding economic geologist who has made major contributions to the science of economic geology in Canada. Nominees should preferably, but not necessarily, be members of GAC and MDD. Nominations should be made by three MDD members, either jointly or separately, and supported by relevant biographical data. Please submit nominations before January 31, 1981, to Victor F. Hollister, P.O. Box 561, Station A, Vancouver, B.C.

MDD COMMITTEE ON RESEARCH IN MINERAL DEPOSITS

A role for the MDD in mineral deposits research was first proposed by Don Sangster at an ad hoc MDD executive meeting during the CIM annual meeting in Toronto last April. A modified written proposal was submitted to the MDD executive meeting at Halifax '80. As a result of subsequent discussions, Don was asked to form and chair a committee. The following article, a review of the status of Canadian research in mineral deposits, is the first of a series. A strong reaction is expected, and respondents are encouraged to use 'The Gangue' as a forum.

Article 1: A candid review of the current status

Just prior to the field season, at an Executive meeting of MDD, I raised the question of what MDD's policy was regarding research in mineral deposits above and beyond the usual "motherhood" platitudes. I felt that, in presenting medals, holding symposia, etc. we were, in effect, recognizing and rewarding research already done rather than taking any initiative or leadership role in influencing the nature or direction of future research in mineral deposits.

A common response to my point was that, without being a funding body, there was little MDD could (or should) do. This I could not agree with as I felt that, with presumably the cream of economic geologists from industry, university, and government among our members, surely MDD could do more than just play a passive role on the issue of mineral deposits research.

Predictably, what I got for my efforts were instructions to form a subcommittee on research in mineral deposits. So far, it is a committee of one and, for a while at least, I intend to use "The Gangue" as my forum. This is in the hope that, by discussing the topic openly in this manner, it will elicit discussion and (hopefully) action.

In introducing the topic of mineral deposits research I feel I should make it clear that I begin with the premise that the status of research of this nature in Canada is, to say the least, poor. Admittedly, this is a personal opinion but I feel I cannot be neutral on the topic. In stating my own view, I may also encourage others to come forward so that, in the end, we will have a truly representative opinion from Canadian economic geologists.

To start the ball rolling, I propose, in this article, to briefly examine where, and how, economic geology research is done in Canada. I might add here that by "research" I mean the

generation of new data and from them, new ideas, not the synthesis or re-hashing of someone else's data and ideas.

We begin by examining the nature and extent of research in government, university and industry.

Government

A quick telephone survey reveals that, excluding supervisory and/or management personnel, approximately 45 economic geologists are employed in federal and provincial agencies (DIAND, CANMET, GSC, and provinces). Of these, just over half are employed at the GSC and constitute, by far, the largest community of economic geologists in a single Canadian organization with the possible exception of a very few large mining companies. When asked what proportion of their time was spent on research (according to the "definition" described above), answers from GSC geologists ranged from "nearly zero" to "about 70%". A group average, for this single largest mass of economic geologists, would be in the order of 10-15%. Expressed in "man-years" this amounts to 3. The same question was not put to provincial economic geologists (numbering about 20) but my guess would be somewhere between 5-10%. If we assume 10%, this amounts to 2 man-years for a total of 5 man-years. Think of it - 5 men doing research, in government of all levels, on Canadian mineral deposits per year!!

When examined further, one finds that most government research is chemically-oriented. The reason for this is that most government surveys have facilities for rock analyses but many (most?) government economic geologists do not have easy access to microprobes, mass spectrometers, XRD equipment, cathode-ray luminescence facilities, heating/cooling stages, experimental equipment, etc. Some are lucky to even have a reflecting microscope and/or the facilities for making polished sections or slabs. Conclusion: not only is government research in mineral deposits minor, it is, by and large, unidirectional.

University

Virtually none of the comments mentioned above apply to university research on mineral deposits. The manpower is the same (40-45 give or take a few) but, with the help of graduate students, the proportion of time devoted to research is much higher. Equipment is much less of a problem and, current grumblings to the contrary, I feel most economic geology professors receive more money for research (from government and industry grants) than the average government economic geologist.

The most frequently expressed criticisms of university research, however, seem to be:

- (a) the programs tend to be more academic than practical;
- (b) they tend to be short-term and geared to a 2-4 year thesis program;
- (c) a significant portion of many research grants is not spent on research at all; travel to and from the field for professor and/or students usually comes out of research grants and so does convention travel - "overhead" items that effectively decrease the amount of research grant money actually spent on research;
- (d) by and large, the research is not done by the trained economic geologist (the professor) but untrained students who "burn up" a goodly portion of the grant re-discovering the wheel.

Added to the above is the chronic problem of getting the results of what research is done out to the consumer. Far too much research, supported by public funds, is buried in theses that are extremely difficult for the potential user to either find out about or obtain.

Conclusion: university research is better in both quality and quantity than most government research on mineral deposits but still leaves much to be desired.

Industry

This is an extremely difficult area in which to evaluate either the quality or quantity of mineral deposits research. Several large companies have elaborate research labs but how much of their manpower and budget is devoted to mineral deposits research (as opposed to metallurgy, exploration geochemistry, geophysics, etc.) is almost impossible for an "outsider" to determine. In addition, a fair amount of research, albeit spotty and in small increments, is done right at the mine-site. Another factor is that, because of the highly competitive nature of mineral exploration, virtually none of the research is published. One of the very fundamental tenets of scientific research is that both the technique and results of the research be made public so that they may be verified by other scientists. Indeed, repeated verification is the only manner by which scientific research is accepted by the scientific community. If one accepts that the ultimate objective of scientific research is to advance mankind's understanding of certain phenomena, then research which is not shared, not amenable for verification is, in a manner of speaking, not research at all.

To some this may appear to be a play on words but research results which are buried in corporate files can hardly be considered research; it does not meet the demanding level of scientific criteria. By this line of argument, most of the work done by industry "research" labs cannot be considered mineral deposits research.

Concluding remarks

1. Government research on mineral deposits is virtually nil relative to the number of economic geologists employed and the access they have to Canadian mineral deposits. What research is done tends to be unidirectional with heavy emphasis on chemical analyses. Government

facilities, including those at the GSC (the single largest group of economic geologists) are woefully inadequate to carry out modern mineral deposits research.

2. University research is somewhat better but tends to be short-term, dependent on the availability of good graduate students, and, as a result of the latter, a large part of research funds are actually spent by students learning how to do research. Much of the results are buried in theses and are not readily disseminated to the scientific community.

3. Industry research has the least impact of all because of the confidential nature of the work. Because it is not amenable to scientific scrutiny there is a question of whether it even constitutes research or not.

4. This introductory discussion on mineral deposits research in Canada has reviewed the premise upon which the MDD subcommittee on research has begun its deliberations. Before the next issue of "The Gange" I hope to have elicited your response, opinions, etc. on the subject. I urge interested readers to send their discussions either directly to the editor of this newsletter or to myself. In my next article I will summarize the response received and suggest a few ways in which MDD could take a leadership role in influencing the nature and direction of Canadian mineral deposits research. From where I sit, it badly needs all the help it can get.

D.F. Sangster

MDD OFFICERS FOR 1980-81

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Past Chairman: A ballot is enclosed in this issue with which members are asked to vote on the establishment of the new executive position of 'Past Chairman'.

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1978-81

L.A. Clark, Saskatchewan
D.F. Sangster, Ottawa
M. Tremblay, Montreal

1979-82

J.A. Coope, Toronto
J. Cimon, Quebec
R.R. Potter, Fredricton

1980-83

A.L. Barker, Toronto
J.A. Garnett, Halifax
W.D. McRitchie, Winnipeg

FIELD TRIP REPORT: SEG TOUR OF EPITHERMAL DEPOSITS IN NORTHWESTERN NEVADA

'Epithermal mineralization in northwestern Nevada' was the topic of a four-day field trip sponsored by the Society of Economic Geologists in May, 1980. Purpose of the trip was to evaluate the proposed genesis of several deposits in light of current conceptual models for epithermal mineralization, an exercise we all found worthwhile. Participation was limited to ninety people, although the waiting list was more than double that. Organization was superbly taken care of by the United States Geological Survey and the Nevada Bureau of Mines.

Appropriately enough, the trip started off on the roof of an active hydrothermal system; *Steamboat Springs*. The rest of the time was spent studying the following deposits: *McDermitt*, *Sulphur*, *Golconda*, *Comstock*, *Seven Troughs*, *Getchell* (paper presentation only), *Battle Mountain*.

At Steamboat Springs, Donald White (USGS, Menlo Park) presented his ideas on geothermal systems and associated epithermal mineralization, based on several decades work with active and ancient geothermal systems. Application of White's model, linking the visited deposits together conceptually, was the main event missed by those who did not take the field trip. My understanding of this model along with a few observations from the deposits visited is presented below.

Sub-volcanic bodies, especially rhyolite domes or porphyry dykes, commonly are proximal to epithermal deposits and are responsible for setting up hydrothermal systems involving mainly meteoric water. Steamboat Springs itself lies on top of a subjacent rhyolite plug and is situated on a linear trend that hosts several older rhyolite domes. Wallrock alteration varies with depth, mainly as a function of temperature. Near surface, widespread argillic alteration takes place, whereas with depth the alteration becomes more propylitic and phyllic, and less widespread. For example, basalt in the Steamboat Springs vicinity is altered to massive kaolinite whereas granodiorite along the northern extension of the deeper Comstock Lode shows propylitic alteration.

The hypogene metal zonation is related to the chemistry of the hydrothermal solutions. Metals are commonly carried by chloride complexes which are stable at relatively high temperatures but break down upon approaching the surface and a lower temperature environment. Accordingly, some metals drop out of the system as the surface is approached. Near surface, low pressure allows the aqueous phase to boil off, and thus partition metals into a vapour phase, on aqueous phase and precipitated solids. Upon reaching the surface, the system discharges gas and liquid phases rich in the most soluble metal components and deposits siliceous or calcareous cap rocks.

Metals in the systems are vertically zoned from the top to lower levels in the following order: Tl, B, Hg, As, Sb, Au → Ag and minor Pb, Zn, Cu → major Pb, Zn, Cu.

The silica-rich part of the system changes from siliceous sinter (amorphous hydrosilica) at the surface to cristobalite and eventually chalcedony and then quartz at depth. At Steamboat Springs, cinnabar occurs only within 15 m of the present topographic surface and stibnite within 45 m. In the Comstock Lode, base metals accompany the silver-gold ore to a minor extent in higher levels, but are the only metals at depths below the 2700 foot level.

Epithermal deposits generally occur along faults and fracture zones. The best prospecting targets are situated where structures merge near hypabyssal intrusions. Minerals typically occur as fine grained disseminations, fracture fillings and discrete veins. Stratiform deposits can occur where an epithermal system has vented into a standing body of water. Ore at the McDermitt Mine consists of stratiform cinnabar and other mercury minerals interlayered with calcareous lacustrine sediments that overlie a siliceous sinter breccia. Indicated ore reserves are 3 million tons grading 10 lb Hg per ton. The proposed genetic model involves an epithermal system that exhaled into a moat lake on the periphery of a Miocene collapse caldera.

A 'Shield' geologist would feel quite at home at McDermitt, and would probably interpret these deposits as volcanogenic sub-aerial exhalative systems with accompanying roots.

J.A. Morin

GEOTHERMAL FIELD TRIP TO THE MEAGER CREEK, B.C. AREA, NOVEMBER 1, 1980

Sponsored jointly by the Mineral Deposits Division and Cordilleran Section, G.A.C., the trip to Meager Creek, 140 km north of Vancouver will review geology enroute, visit the site of most recent volcanism in southern B.C. (2400 years ago), and visit a geothermal exploration drill site.

Buses will depart from Park Royal Shopping Centre (near theatres and Eaton's) at 0800 and return at about 2200. Supper at Whistler. Bring a hag lunch, boots, appropriate gear for a short hike in the bush, and swim suits, if you wish, for a swim in the hot springs.

Cost for bus and supper, \$25.00, payable in advance to: Cordilleran Section, Geological Association of Canada. Send cheque to V.F. Hollister, P.O. Box 561, Station A, Vancouver, B.C. V6C 2C8.

PROPOSED FIELD TRIPS FOR 1981-82

Several field trips are under active consideration, including:

- (a) Northern Cordillera stratiform PbZn deposits
- (b) Mexico silver deposits
- (c) Nevada gold-silver deposits

Comments and suggestions on these, or any other proposed field trips are welcomed by "The Gangue".

PUBLICATIONS

The Ore Deposit Models series in Geoscience Canada, edited on behalf of MDD by J.M. Allen, was launched in the June 1980 (vol. 7, no. 2) issue with a paper by McMillan and Panteleyev on porphyry coppers. The next paper, the first one of three by Tilsley on uranium, is in press. Other papers are in various stages of editing and writing. This series is expected

to serve the same purpose of addressing a general audience and will achieve the same critical acclaim as did the sedimentary facies series.

A Booklet Series on Ore-Deposits Geology to be edited by Alex Brown (Ecole Polytechnique) has been under serious discussion and debate by MDD for almost two years. The Division has agreed to accept major responsibility in this project and has formally approached the Robinson Committee for funding. The MDD executive do not believe that there is an overlap with our Geoscience Canada series which would be detrimental to either project as they are aimed at different audiences.

The MDD is laying plans for a guidebook series on important mineral camps in Canada to be produced in a standard and distinctive format. The purpose of this series is to provide readily available information for GAC members who may be travelling to these areas and may wish to see and learn more about the ore deposits there. David Strong (Memorial University), our Program Chairman, has investigated all aspects of this project and has provided the following detailed proposal for presentation to the Robinson Committee and GAC Council.

A PROPOSAL TO THE GAC FOR A GUIDEBOOK SERIES ON CANADIAN MINING DISTRICTS

The MDD executive believe that the time has come when GAC members, as well as other Canadian and International organizations and geologists, should have readily available guidebooks of consistent format and quality for as many as possible of the great mining districts of Canada. At present there are high-quality guidebooks for a few districts, but most are represented only by variable quality notes quickly prepared on an ad hoc basis by different individuals or groups. We believe that the MDD could readily correct this situation and provide a useful service - to the mining industry in particular and the geological fraternity in general - through such a series. Its long-lasting value would be assured by a method of binding which would allow for the addition and up-dating of material. D.F. Strong is currently working on the format, publication plans, and method of financing the Guidebook series.

ANNOUNCEMENTS

Correlation of Caledonian stratabound sulphides

As part of the I.G.C.P. project 60, 'Correlation of Caledonian stratabound sulphides', a symposium on this theme will be held at the University of Strathclyde on 1 May, 1981. The meeting will be organized by the Department of Geology of the University in association with the Institution of Mining and Metallurgy. A pre-symposium field excursion will be led by staff of the Institute of Geological Sciences to the Dalradian rocks of the Grampian Highlands. Further details will be given in later issues of IMM Bulletin.

Papers will be presented informally at the symposium, and will not be prepublished. The Institution invites intending authors to submit papers for possible publication in the Applied earth science section of the Transactions. A report of discussion will be published.

Abstracts of papers intended for presentation should be submitted by 1 December, 1980, to Dr. M.J. Gallagher, Institute of Geological Sciences, Murchison House, West Mains Road, Edinburgh EH9 3LA (telephone 031-667-1000), to whom enquiries about the symposium should be addressed.

The 1979 Annual Report of the Centre for Precambrian Studies is now available, and may be ordered by returning the attached form with prepayment of \$3.00 Canadian per copy to:

Mr. M.R. Keys
Executive Secretary
Centre for Precambrian Studies
Department of Earth Sciences
University of Manitoba
Winnipeg, Manitoba R3T 2N2

University of Toronto, Department of Geology: SEMINAR PROGRAMME
(all talks are at 4:00 P.M. in Room 202, Mining Building)

Coffee will be served at 3:30 P.M.

Monday, Nov. 10th	Dr. Ian McIlreath Petro-Canada, Calgary Canadian Society of Petroleum Geologists Link Award Speaker "CANADIAN DEEP WATER CARBONATE DEPOSITS: DISTINCTION FROM ANALOGOUS SILICLASTIC DEPOSITS AND THEIR HYDROCARBON POTENTIAL"
Tuesday, Nov. 25th	Dr. V.J. Wall Monash University, Australia "STRUCTURAL METAMORPHIC AND LITHOLOGIC SETTING OF BROKEN HILL MINERALIZATION"

McMaster University Geology Seminar

Tuesday, Nov. 4, 1980 Dr. Dean Jeffries

'EFFECT OF ACID PRECIPITATION ON WEATHERING REACTIONS IN CENTRAL ONTARIO'

Coffee and doughnuts are generally served
at 3:30 p.m. in S.S.C.-123.

All seminars will be presented at 4:00 p.m. in
S.S.C.-102 unless otherwise indicated.

- Nov. 6 Newfoundland Department of Mines and Energy Fourth Annual Open House, Holiday Inn, St. John's, Newfoundland. FOR DETAILS: Norman Mercer, Dept. of Mines and Energy, P.O. Box 4750, St. John's, Newfoundland, A1C 5T7. Phone (709) 737-3159.
- Nov. 6 - 8 Newfoundland Branch, C.I.M.M., Annual Meeting, Holiday Inn, St. John's, Newfoundland. FOR DETAILS: D. Joyce, Canadian Industries Ltd., P.O. Box 13126, St. John's, Newfoundland, A1B 4A4. Phone (709) 726-9051.
- Nov. 17 - 20 Geological Society of America, Annual Meeting, Atlanta, Georgia, U.S.A. FOR DETAILS: G.S.A., 3300 Penrose Place, Boulder, Colorado 80301, U.S.A.
- Dec. 8 - 12 Ore Deposits, (Annual Workshop), Toronto, Canada. Nickel sulfide & platinum. Massive Cu-Zn-Pb sulfides. Lead-zinc in carbonate rocks. Industrial minerals. Uranium. (E.T.C. Spooner, Dept. of Geology, University of Toronto, Toronto, Ontario, Canada, M5S 1A1).
- Dec. 10 - 12 Ontario Geological Survey, Geoscience Research Seminar and Open House, Toronto. FOR DETAILS: Cheryl Collins, O.G.S., Ministry of Natural Resources, 77 Grenville St., Toronto, Ontario, M5S 1B3.
- Feb. 13 - 14 ANNUAL SYMPOSIUM OF CORDILLERAN SECTION
Holiday Inn, Vancouver City Centre,
1133 W. Hastings Street.
Theme: THE LAST 100 M.Y. (MID CRETACEOUS TO HOLOCENE); Geology and Mineral
Deposits of the Canadian Cordillera.
A newsletter concerning the symposium will be circulated before January 1,
1981, to Section members.

Acknowledgement:

The editor of 'The Gangue', on behalf of the MDD executive, would like to express his gratitude to the following organizations who have contributed secretarial help in preparing previous and present issues for publication, and in some cases financial assistance in mailing:

Geological Society of Canada
Cominco Ltd.
Geomex Minerals Ltd.
University of British Columbia, Dept. of Geological Sciences
Canadian Superior Exploration Limited