

THE ASSOCIATION OF EXPLORATION GEOCHEMISTS



January 1974.

President:

I. Nichol
Dept. of Geological Sciences
Queens University
Kingston, Ontario

NEWSLETTER #12

Vice Presidents:

R. W. Boyle
Geological Survey of Canada
601 Booth Street
Ottawa 4, Ontario

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Fifth International Geochemical Symposium

Information on the programme for the meeting, registration and accomodation arrangements are included with this newsletter. This information has already been distributed by the Symposium Committee to respondents to the first circular. From this information I am sure you will agree the meeting together with the field tours promises to be extremely interesting. A limited number of rooms are available to Students at greatly reduced prices at the Hyatt Regency Hotel. Requests for reservations should be made as soon as possible.

Secretary:

R. F. Horsnail
AMAX Exploration Inc.
4704 Harlan Street
Denver, Colorado 80212

Group Travel to Symposium

Treasurer:

H. Bloom
Geology Department
Colorado School of Mines
Golden, Colorado 80401

I have made some preliminary enquiries regarding group travel to the Vancouver symposium. Return fares from Montreal, Ottawa and Toronto to Vancouver are listed below.

Councillors:

F. C. Canney
J. A. Coope
I. L. Elliott
R. L. Erickson (ex-officio)
W. K. Fletcher
C. F. Gleeson
J. A. Hansuld (ex-officio)
H. E. Hawkes
C. J. Lepeltier
M. B. Mehrtens
F. N. Ward
H. V. Warren

	Regular Fare	Group Fare	8-30 day return
Montreal	\$262	\$210	\$183
Ottawa	256	204	179
Toronto	244	196	171

The outward leg of the group fare would be valid for any westbound flight on Sunday 31st March. i.e. the A.E.G. group would not all have to travel on the same flight. The return eastbound leg would be valid any time for up to 1 year. (For persons contemplating being in Vancouver for 8-30 days, the 8-30 day return, available in the normal manner on an individual basis, offers additional advantages notwithstanding certain restrictions on weekend travel.) The main advantage of the group fare lies in it allowing the traveller to return

east at anytime, including weekend travel or at the end of the formal meetings.

Anyone interested in going a group flight should complete the attached form as soon as possible.

Council Ballot

The ballot for the next Council is enclosed to voting members. Instructions for voting are given on the ballot sheet. The adequate representation of all sections of our profession in Association affairs is in large part dependent on Council being composed of members of different backgrounds, experience and geographic location. I would therefore, strongly recommend you consider these features prior to making your selection to ensure next years Council is as widely representative as possible. For your guidance a brief resume is included on Council nominees.

Journal of Geochemical Exploration

Publication of the Australian issue of the Journal is due any day. Elsevier advised us that this slight delay has been caused by the proofs being delayed two weeks at Customs. The first number for 1974, including a bibliography of exploration geochemistry for 1973 will be published in February 1974.

I look forward to meeting as many members as possible in Vancouver.



IAN NICHOL,
President.

IN:s1b

TRENDS IN EXPLORATION GEOCHEMISTRY IN AFRICA

SUMMARY PROGRESS REPORT

by
G.L. Coetzee

This review is concerned essentially with southern Africa as the bulk of the continent's metal production derives from the subcontinent. The francophone African countries and the Arab states have not been included in this review.

There has been a dramatic upsurge in exploration activity in southern Africa as a result of major new discoveries (notably the Prieska massive sulphide deposit), geological re-appraisals which highlight the metal potential of the subcontinent and a decline in exploration in some of the major areas elsewhere in the world.

Exploration geochemistry, per se, is not taught as a distinct subject at any of the Earth Science departments in southern Africa. It should be noted however that there is a long-standing tradition of academic geochemistry of high standing in southern Africa, such as that at the Department of Geochemistry at the University of Cape Town. Exploration geochemistry is included as part of the Exploration Geology or Economic Geology curricula at a couple of universities in southern Africa. A number of universities are however on the point of introducing exploration geochemistry courses, generally at graduate level. All are prepared to accept theses involving exploration geochemistry.

Exploration geochemistry has a broader connotation in southern Africa than in most other major exploration areas. This is because of the contributions made by academic geochemistry towards an understanding of the Witwatersrand gold ores, the Zambian sedimentary copper deposits and the platinoid deposits of the Bushveld. Although geochemistry is widely used as an exploration tool there is a degree of resistance to the employment of exploration geochemists, *sensu stricto*. It is generally felt that a broader exploration background is required. Some mining companies, governmental and international agencies have however appointed exploration geochemists.

Exploration geochemistry, in terms of quantity and expenditure, has largely been the preserve of the major mining companies. There is much less exchange of information between these companies than there is between their counterparts in northern America, for example, and this factor creates a problem in attempting to prepare an objective and meaningful review. Little fundamental research, apart from that done in the rather specialised context of the major gold, platinum, copper and diamond deposits, is done. A considerable amount of orientation work, preceding more extensive geochemical surveys, is however conducted by private companies. University and geological survey research has generally been at a much lower expenditure level and directed towards a broader goal. In this context the current work of the Botswana Geological Survey in compiling a geochemical atlas and research in mercury halos and that of the Geological Survey of the Republic of South Africa in arid-region geochemistry and hydro-geochemistry deserve mention.

Significant discoveries, which may be attributed to geochemistry are:

1. Kalengwa, Zambia. The discovery of a small, high grade copper deposit, starting from a crude, albeit effective, form of geochemical observation (natural plant poisoning) to an imaginative follow-up and discovery has been adequately described by Ellis & McGregor (1967) (600.000 tons containing 16% Cu).
2. It is generally believed that the major Pikwe-Selebi nickel-copper deposits in Botswana were initially selected as anomalies on the basis of a broadly spaced geochemical reconnaissance. Investigation of these anomalies required a protracted programme of geochemistry, pitting and drilling. (Published ore reserves are 22.1 million tonnes containing 1,45% Ni and 1,14% Cu proven at Pikwe and 10 million tonnes containing 0,70% Ni and 1,56% Cu proven at Selebi.)

The volume of samples being analysed annually is estimated at some 3 to 5 million probably representing some 12 - 15 million analyses. The number of laboratories which handle this work is estimated at about 25 to 30 of which about one third are custom analytical houses, exploration consultants and governmental agencies whereas the remaining two thirds would be operated by mining-exploration companies. Atomic absorption spectrometry is the most widely used analytical technique with X-ray fluorescence, optical spectrometry and colorimetry accounting for the remainder.

Systematic grid soil-sampling accounts for the greater part of the sample volume generated. Stream sediment sampling also contributes a significant number of samples. Hard rock or outcrop sampling is widely used but does not account for a large volume of analyses done. Biogeochemical and hydrological surveys do not give rise to a significant number of analyses.

There has been a significant change during the past decade in the following respects:

1. Whereas stream sediment sampling programmes contributed the bulk of sample volume 10 years ago, notably in the large programmes conducted in Zambia, samples generated by grid soil-sampling now provide the largest volume.
2. Virtually all analyses at present are done in well equipped laboratories in major centres compared to the practice of a decade ago of establishing field laboratories in the exploration area. This is probably largely a result of the change from the simple colorimetric techniques used to the more sophisticated atomic absorption method.

The greatest challenges facing exploration geochemistry in southern Africa are in the arid or desert regions and in the extensive areas covered by the Kalahari Formation in south-central Africa.

Geochemistry has been shown to be effective in the deserts of south-western Africa, an area of considerable exploration activity. The major difficulties encountered are:

1. Narrow, low amplitude anomalies over mineralised bodies.

2. Spurious anomalies produced by lithological differences.
3. Problems in selecting the optimum size fraction for analysis. In some desert areas or environments the best results are obtained using the finest fraction of the soil, say -200 mesh, whereas in other environments a coarse fraction say -10 mesh and +30 mesh, is most effective.

The vast Kalahari basin of south-central Africa is underlain by up to 300 m of sands, silts, marls, gravels, silcrete and calcrete. This continental assemblage of Cretaceous to Recent age obscures the bedrock geology over vast areas especially in Botswana, Zambia and Angola. Geochemistry has however been successfully used in areas with up to 30 m cover of Kalahari Formation. Biogeochemistry and analysis of the heavy and of the ultrafine fractions of the soils have thus far proven the most promising techniques. Mercury vapour measurement appears to be a technique which holds promise and is being used in Botswana.

In conclusion it may be said that geochemistry is an integral and completely established component of mineral exploration in southern Africa. The use of geochemistry in exploration is certain to increase but there is need for:

- a) Innovation and improvement in analytical technique so that a larger number of elements may be determined inexpensively and reliably at low concentration levels.
- b) Greater refinement and sophistication in interpretation of geochemical data.

References:

Ellis, M.W. & McGregor, J.A.
1967: 'The Kalengwa Copper Deposit, Northwestern Zambia', Econ. Geol. Vol. 62, pp. 781-797.

THE ASSOCIATION OF EXPLORATION GEOCHEMISTS



President:

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Dept. of Geological Sciences
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ELECTION OF COUNCILLORS 1974

Vice Presidents:

R. W. Boyle
Geological Survey of Canada
601 Booth Street
Ottawa 4, Ontario

E. M. Cameron
Geological Survey of Canada
601 Booth St.
Ottawa 4, Ontario

The following persons have been nominated to stand for election as Ordinary Councillors for a 2-year term (1974-1975). You are asked to vote for up to 8 by striking out the names of persons for whom you do not wish to vote. The 5 nominees receiving the highest number of votes will serve a 2-year term. The 3 nominees receiving the next highest number of votes will serve for 1 year to complete the unexpired 2-year term of I.L. Elliott, C.F. Gleeson, and M.B. Mehrtens, President, Vice-President and Treasurer Elect, respectively, of A.E.G. for 1973. As Past Presidents, R.L. Erickson and I. Nichol will be ex-officio members of Council.

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AMAX Exploration Inc.
4704 Harlan Street
Denver, Colorado 80212

Treasurer:

H. Bloom
Geology Department
Colorado School of Mines
Golden, Colorado 80401

H. Bloom
P.M.D. Bradshaw
M.J. Bright, Jr.
A.A. Burgoyne
E.M. Cameron
R.H. Carpenter
W.K. Fletcher
G.J.S. Govett

J.A. Hansuld
L.D. James
S.E. Kesler
A.A. Levinson
E.V. Post
P.K. Theobald
P.B. Trost
H.V. Warren

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H. E. Hawkes
C. J. Lepeltier
M. B. Mehrtens
F. N. Ward
H. V. Warren

Your ballots should be returned to me in an envelope marked A.E.G. Election by March 22nd, 1974. Counting will take place at the A.E.G. Annual Meeting to be held on Monday, April 1st, 1974 at the Fifth International Geochemical Exploration Symposium in Vancouver.

R.F. HORSNAIL,
Secretary.

RFH:slb

R.F. Horsnail,
Amax Exploration Inc.,
4704 Harlan St.,
Denver, Colorado 80212,
U.S.A.

BRIEF RESUME OF NOMINEES FOR ORDINARY COUNCILLOR

<u>NAME</u>	<u>BORN</u>	<u>EDUCATION</u>	<u>EMPLOYMENT</u>	<u>PRESENT POSITION</u>	<u>A.E.G. OFFICES HELD</u>
BLOOM, H.	New York 1913	C.S.M. M.Sc. 1961	Chemist U.S.G.S. Instructor in Expl. Geology Geoch. C.S.M.	Assoc. Prof. C.S.M.	Secy, 1972/3 Treas. 1973/4
BRADSHAW, P.M.D.	Ontario 1938	U. of Durham Ph.D. 1965	Univ. Research (Imp. Coll) & Industry	Chief Geochemist Barringer Res.	Councillor 1971/2 Chairman 'Case History Committee'.
BRIGHT, M.J.	N. Carolina 1932	U. of N.C. M.Sc. 1956	Industrial Research	Mgr. Geologic Res. Climax Molybdenum	None
BURGOYNE, A.A.	Manitoba 1940	U. of N.M. M.Sc. 1967	Industrial Geoch. & Mgmt.	Regional Expl. Mgr. W. Canada Union Miniere	None
CAMERON, E.M.	Scotland 1933	U. of Manchester Ph.D. 1957	Govt. Res. & mgmt.	Head Geochem Section G.S.C.	Vice-Pres., Councillor J.G.E. Editor
CARPENTER, R.H.	Tennessee 1937	U. of Wisc. Ph.D. 1965	Industry Univ. Res. & teaching	Prof. Univ. of Georgia	Chairman Research & Education Committee
FLETCHER, W.K.	England 1943	U. of London Ph.D. 1968	Univ. Res. & teaching	Assist. Prof. U.B.C.	Councillor
GOVETT, G.J.S.	Wales 1932	U. of London Ph.D. 1958	Teaching & Res. Univ. & Govt.	Prof. U. of New Brunswick	None
HANSULD, J.A.	Ontario 1931	McGill U. Ph.D. 1961	Industrial geoch. & mgmt.	Mgr. Canadian Expl. AMAX	Pres. 1971/2 Councillor
JAMES, L.D.	England 1932	U. of London Ph.D. 1965	Industrial Geoch.	Chief Geochemist ASARCO	Member Admissions Committee
KESLER, S.E.	Wash. D.C. 1940	Stanford Ph.D. 1966	Univ. Res. & teaching	Assoc. Prof. U. of Toronto	None
LEVINSON, A.A.	New York 1927	U. of Mich Ph.D. 1952	Industry & Univ. Res. & teaching	Prof. U. of Alberta	None
POST, E.V.	Illinois 1928	Wash. St. Coll. M.Sc. 1953	U.S.G.S. Geol.	Pres. Skyline Labs, Denver	None
THEOBALD, P.K.	California 1928	Stanford B.Sc. 1950	Govt. Res.	Mgr. Expl. Res. U.S.G.S.	None
TROST, P.B.	Illinois 1942	C.S.M. Ph.D. 1970	Industry	Geochemist- private Company	None
WARREN, H.V.	Washington 1904	D. Phil Oxford 1929	Univ. Res. & Teaching	Prof. Univ. B.C. Consultant	Councillor