

THE ASSOCIATION OF EXPLORATION GEOCHEMISTS



President:

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

May 1973.

NEWSLETTER #9

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 third Annual General Meeting of the Association was held in the Hotel Vancouver, Vancouver, on Tuesday April 17th at 2:30 p.m. The main feature of the meeting was Dr. R.L. Erickson's Presidential address. Dr. Erickson, following a review of the Association's activities over the past year, concentrated on the necessity of placing in perspective the role of geochemistry in mineral exploration as a whole. Attention was focussed on the present day mineral exploration challenge to find ore bodies previously uneconomic or which defied detection by presently available exploration methods. In this context emphasis was placed in the need for geochemists to develop methods capable of locating these deposits, rather than being content with the application of standard procedures. The text of Dr. Erickson's address is included with this newsletter and will appear in the third number of the journal for 1973.

Secretary:

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

Four council meetings have been held since the last newsletter, at Toronto, Denver, and two at Vancouver.

Treasurer:

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

The executive and council of the association for the year 1973-4 is as follows:-

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

- President-----Ian Nichol
- Vice President-----E.M. Cameron
- Vice President-----R.W. Boyle
- Secretary-----R.F. Horsnail
- Treasurer-----H. Bloom

Past Presidents (ex-officio members of Council)

- R.L. Erickson
- J.A. Hansuld

An up-to-date membership list has been prepared by Professor Bloom. It is enclosed with this newsletter. I would ask you to check that your name is correct.

Council:

1973-4:

F.C. Canney
W.K. Fletcher
C. Lepeltier
F.N. Ward
H.V. Warren

1973-5:

J.A. Coope
I.L. Elliott
C.F. Gleeson
H.E. Hawkes
M.B. Mehrtens

Regional Councillor:

W.J. Atkinson (Australia)

Applications for Membership

Application from the following persons have been approved by the Admissions Committee and ratified by Council at a meeting on March 13th, at Toronto. Affiliations and addresses are included in the membership list.

Member:

Ahlrichs, J.W.
Albuquerque, G.
Davenport, P.H.
Forman, J.M.A.
Gaitan, R.
Houghton, D.R.
Hurst, H.N.
Judd, A.C.
Lovstrom, K.A.
Mello, J.C.
Painter, J.A.C.
Patrick, D.J.
Pico, W.E.L.
Saum, N.M.
Theobald, P.
Yassin, A.A.
Zuckerman, M.B.
Zweifel, H.

Affiliate:

Binns, M.J.
Felder, F.
Goddard, H.
Gomez-Tagle, A.
Hernandez, M.A.
Kelly, L.W.
Swenson, D.H.
Thomson, I.
Villard, D.J.

Student:

Abu-Abed
Doyle, P.J.
Hoag, R.B.
Hoffman, S.J.
Jackson, R.G.
Lapoint, D.J.
Sven, M.C.

Membership

Over the past year there has been a significant growth in membership, with the total including those in process reaching 512. A feature of this increase in membership has been marked increase in overseas membership. The membership is made up as follows:-

Members - 366
Affiliates - 37
Students - 49

Corporations - 31

Applications in Process - 29

Africa - 17

Australasia - 72

Canada - 176

Central & South America - 24

Europe - 58

United States - 136

An up-to-date membership list has been prepared by Professor Bloom, a copy of which is enclosed with this newsletter. I would ask you to check that your

address is reported correctly and if not advise the Secretary accordingly.

1972 Symposium Proceedings

The papers presented at the Fourth International Geochemical Exploration Symposium held in London in 1972 have now been published in an impressive volume "Geochemical Exploration 1972" by the Institution of Mining and Metallurgy. Copies may be obtained from the Secretary, Institution of Mining and Metallurgy, 44 Portland Place, London W1N 4BR, at a cost of £12 (\$30.00 U.S.).

1974 Symposium

Preparations for the 5th International Geochemical Exploration Symposium at Vancouver, April 1st to 4th, 1974 by the local organizing committee are well in hand under the chairmanship of Dr. I.L. Elliott. Preliminary information was circulated with Newsletter #7 and subsequently the first circular was distributed to the A.E.G. membership and an edited list of 5000 members from the Canadian Institute of Mining and Metallurgy, the Institution of Mining and Metallurgy and the Society of Economic Geologists.

The symposium includes field tours to various areas of interest and a social program for the ladies. In response to the first circular some 450 people from 30 countries have indicated their intention to attend the meeting, 300 to take in the field tours and 150 the ladies program. At this time titles of over eighty papers have been submitted for presentation at the meeting covering a wide range of topics. The local committee has embarked on an ambitious program and the response at this time promises to make the meeting a great success. The second circular for the symposium will be mailed in November 1973. In the meantime anyone wishing further information on the symposium should write to Dr. I.L. Elliott, Chairman, Symposium Committee, 1314 West 71st Avenue, Vancouver 14, B.C., Canada.

1976 Symposium

Having regard to the forward planning necessary for the organization of the biennial symposia we would like to receive proposals for the site of the Sixth International Geochemical Exploration Symposium in 1976 by the end of August 1973. These proposals outlining the site, facilities and support for the symposium should be directed to the secretary, Dr. R.F. Horsnail, American Metal Climax Inc., 4704 Harlan St., Denver, Colorado 80212, U.S.A. At the time of writing expressions of interest in hosting the symposium have been received from Australia, Cyprus, Mexico, South Africa and the U.S.S.R.

Journal of Geochemical Exploration

This past year has seen the birth of the Association's journal, the "Journal of Geochemical Exploration" and by now you should have received the first two numbers. Dr. Eion Cameron and his editorial board have aimed at including papers on a range of topics of international interest and origin.

For your information the contents of the first three numbers of 1973 will be as follows:

Volume II, No. 1

SECONDARY DISPERSION PATTERNS OF FLUORIDE IN THE OSOR AREA, PROVINCE OF GERONA, SPAIN by M.O. Schwartz and G.H. Friedrich.

COMPARISON OF TOTAL AND PARTIAL EXTRACTIBLE COPPER IN ANOMALOUS AND BACKGROUND PEAT SAMPLES by D.E. Maynard and W.K. Fletcher.

INTERPRETATION OF A DETAILED ROCK GEOCHEMICAL SURVEY AROUND MATHIATI MINE, CYPRUS by Th. M. Pantazis and G.J.S. Govett.

THE COLORIMETRIC DETERMINATION OF MOLYBDENUM IN ORGANIC-RICH SOIL by R.E. Stanton, M. Mockler and S. Newton.

GEOCHEMICAL PROSPECTING FOR PORPHYRY COPPER-TYPE MINERALIZATION by J. Alan Coope.

A RAPID ESTIMATION OF ORGANIC CARBON IN SILTY LAKE SEDIMENTS by J.J. Lynch, R.G. Garrett and I.R. Jonasson.

GEOCHEMICAL PROSPECTING OF OIL AND GAS BY REFERENCE HORIZONS by A.A. Geodekian and V.A. Stroganov.

ANALYSIS OF FLUORIDE IN ROCKS AND AN APPLICATION TO EXPLORATION by S.E. Kesler, J.C. Van Loon and J.H. Bateson.

1972 SUPPLEMENT TO BIBLIOGRAPHY OF EXPLORATION GEOCHEMISTRY.

Volume II, No. 2

ERRORS IN ATOMIC ABSORPTION SPECTROPHOTOMETRIC DETERMINATION OF Pb, Zn, Ni, AND Co IN GEOLOGIC MATERIALS by G.J.S. Govett and R.E. Whitehead.

RAPID COLORIMETRIC DETERMINATION OF PHOSPHORUS IN GEOCHEMICAL SURVEY SAMPLES by D. Peachey, J.L. Roberts and Jane Scot-Baker.

GLACIOLOGY AS A KEY TO GEOCHEMICAL EXPLORATION IN AREAS OF GLACIAL OVERBURDEN by I. Nichol and A. Bjorklund.

DISTRIBUTION OF URANIUM IN THE CRUST OF THE NORTHWESTERN CANADIAN SHIELD AS SHOWN BY LAKE SEDIMENT ANALYSIS by E.M. Cameron and R.J. Allan.

TRANSLATION: SOME ASPECTS OF THE PROBLEM OF THE GEOCHEMICAL METHODS OF PROSPECTING FOR CONCEALED MINERALIATION by F.K. Shipulin, A.D. Genkin, V.V. Distler, P.V. Komarov, E.P. Malinovskii, N.A. Ozerova, A.I. Perel'man, V.I. Rekharskii, Yu. A. Rozanov, L.G. Filimonova, V.F. Chernyshev, and M.M. Elinson.

BOOK REVIEW.

Volume II, No. 3 (incomplete listing)

THE GEOCHEMISTRY OF ARSENIC AS AN INDICATOR ELEMENT IN GEOCHEMICAL PROSPECTING by R.W. Boyle and I.R. Jonasson.

GEOCHEMICAL AND BIOGEOCHEMICAL EXPLORATION RESEARCH NEAR EARLY PRECAMBRIAN PORPHYRY TYPE Mo-Cu MINERALIZATION, NORTHWESTERN ONTARIO, CANADA by W.J. Wolfe.

Papers for the first three numbers for 1973 are already in the hands of the publishers.

Dr. Peter Donovan has agreed to assemble a special Australasian issue of the Journal to appear as the fourth number for 1973. Anyone interested in submitting a paper for inclusion in this number should contact Peter Donovan, McPhar Geophysics Pty. Ltd., 63 Alexander St., P.O. Box 401, Manly, NSW 2095 Australia. Eion Cameron will be pleased to consider at anytime review articles, case histories or papers on new developments in geochemical exploration technology.

We are aware of problems associated with the distribution of the first two numbers of the Journal. Elsevier have assured us that future numbers of the Journal will be sent airmail to North America which should help the situation to a considerable extent. John Hansuld has joined the editorial board of the Journal as Business Editor to handle business matters connected with the Journal. Any problems associated with the distribution of the Journal should in future be referred directly to him (Dr. John A. Hansuld, Amax Exploration Inc., 7 King St. E., Toronto, Ontario, Canada).

Committee Activities

Over the past year seven Association committees have been in operation, reports of the activities of the individual committees being presented at the Annual General Meeting in Vancouver. Several of the committees have been in existence for a number of years and the interim results of their work have been published in the newsletter from time to time. J. Alan Coope has undertaken to edit final reports of different aspects of committee activity prior to publication in the Journal.

The individual A.E.G. committees and their chairmen are as follows:-

Admissions-----	M.B. Mehrtens
Bibliography-----	H.E. Hawkes
Case History-----	P.M.D. Bradshaw
Computer Applications-----	R.G. Garrett
Constitution-----	J.A. Coope
Geochemical Analysis-----	H.W. Lakin
Regional Geochemical Data Compilation-----	W.K. Fletcher
Research and Education-----	R.H. Carpenter.

Bibliography - (H.E. Hawkes)

The bibliography committee compiled a bibliography of literature on geochemical exploration in 1972, which will appear in Vol. 2, No. 1 of the Journal, scheduled for distribution in the immediate future. We are indeed extremely grateful to Herb Hawkes and his committee for this invaluable contribution.

The earlier bibliography covering the period 1965-1971 is now sold out, over 300 being distributed in the last year. Arrangements are being made for a

reprinting in view of the continuing interest in the publication.

Case History - (P.M.D. Bradshaw)

Peter Bradshaw has undertaken to chair a case history committee. In addition to soliciting case histories for publication in the Journal the committee plans to assemble a series of papers dealing with geochemical exploration in different regions. The objective of these papers is to define geochemical techniques appropriate to the search for various types of deposits in different surface environments. At this time plans are in hand for papers dealing with geochemical exploration in the North American Cordillera, the Canadian Shield, and the Maritimes, the southeast and the southwestern United States.

Computer Application - (R.G. Garrett)

A final report presenting an analysis of replies to a questionnaire soliciting information on the usage of computer based systems in the handling and interpretation of exploration oriented geochemical data is currently in the course of preparation.

Constitution - (J.A. Coope)

The Constitution committee over the past year recommended amendments to the Constitution affecting the number of supporters necessary for Applications for membership in the Association as follows:-

Member-----three supporters
 Affiliate-----two supporters
 Student-----Professor or two supporters.

In addition a change in the fees to \$27 was recommended to accommodate the cost of the Journal in the annual dues. The recommendations were approved by the membership in a ballot counted at the Annual General Meeting. Having regard to other changes in the Constitution since the inception of the Association, a new Constitution is scheduled for printing in the near future.

Geochemical Analysis - (H.W. Lakin)

The geochemical analysis committee have made a summary of the sample material used in geochemical analysis, the analytical procedures employed, the geographical distribution of geochemical exploration activity; based on replies to their questionnaire distributed to A.E.G. members (Tables 1-4). Persons desiring a full report are referred to the Branch of Exploration Research, U.S. Geological Survey, Federal Center, Denver, Colorado 80225, U.S.A.

In addition a set of six standard samples were distributed to some 150 laboratories and at this time analytical reports have been received from over 50% of these laboratories (Table 5). Descriptions of the six samples were given in newsletter #6. The results are currently in the course of being coded for statistical analysis by computer.

Table 2.--Samples taken by country
for the year ending June 30, 1971

<u>Country</u>	<u>Total samples</u>
Australia-----	1,516,415.
Canada-----	879,660.
New Zealand-----	10,500.
Turkey-----	30,000.
England-----	165,000.
Ireland-----	112,900.
Netherlands-----	3,000.
West Germany-----	4,500.
Sweden-----	71,366.
Norway-----	28,000.
Finland-----	29,000.
Denmark-----	300.
Mexico-----	8,500.
Ecuador-----	17,000.
Guyana-----	10,600.
Colombia-----	15,600.
Panama-----	20,000.
Argentina-----	63,000.
Venezuela-----	1,700.
Brazil-----	21,000.
Singapore-----	5,000.
West Malaysia-----	11,956.
United States-----	621,384.
Japan-----	62,290.
Spain-----	30,000.
South Africa-----	277,000.
All countries-----	4,015,671.

	<u>Company type</u>	<u>Soils</u>	<u>Rocks</u>	<u>Stream sed.</u>	<u>Vegetation</u>	<u>Water</u>
Mining or oil company-----	44.2	33.3	18.0	0.40	2.0	
Expl. sub. of mining or oil co.-----	53.2	24.8	16.4	0.32	1.3	
Government-----	34.2	19.1	32.1	1.30	5.7	
Univ. or Tech. Institute-----	33.3	35.5	19.5	3.43	4.8	
Custom Laboratory-----	43.5	24.6	21.1	1.0	3.5	
Consultants-----	42.1	20.4	34.3	0.80	1.4	

Table 1.--Frequency distribution of class of samples by company type

Table 3.--Frequency distribution of methods of analysis by laboratories
(In percent)

Method	Frequency
Atomic absorption	91.2
Emission spectrography	36.1
Colorimetry	74.1
Cold extraction colorimetry	36.7
X-ray fluorescence spectrography	28.6
Paper chromatography	17.7
Selective ion electrode	33.3
Other	53.7

Table 4.--Frequency distribution of methods of analysis for selected elements
(in percent)

Method	Ag	As	Au	Co	Cu	F	Hg	Mo	Pb	Sb	Sn	U	W	Zn
Atomic absorption	72.1	17.7	54.4	72.8	87.8	0.7	50.3	46.3	83.0	28.6	19.7	2.0	13.6	84.4
Emission spectrography	27.2	12.9	15.0	26.5	25.9	0.0	6.8	27.9	26.5	17.7	28.6	3.4	18.4	24.5
Colorimetry	6.8	43.5	4.8	13.6	25.2	10.2	9.5	55.8	15.6	27.2	23.8	12.2	37.4	19.7
Cold extraction colorimetry	3.4	2.0	0.7	4.8	27.9	0.0	2.0	6.1	7.5	0.0	1.4	1.4	2.0	17.7
X-ray fluorescence spectrography	7.5	13.6	2.0	10.9	15.0	1.4	2.7	13.6	12.2	6.8	12.9	14.3	10.9	15.0
Paper chromatography	0.7	2.7	0.7	0.0	2.0	0.0	0.0	0.7	0.0	0.0	0.0	9.5	0.0	0.0
Selective ion electrode	2.0	0.0	0.0	0.0	2.0	31.3	0.0	0.0	0.0	0.0	0.7	0.0	0.0	0.0
Other	6.8	4.8	13.6	0.7	8.8	5.4	8.8	2.0	5.4	3.4	4.1	25.2	0.7	4.8

Status of reference samples as of April 4, 1973

Country	Number of laboratories that received reference samples	Number of laboratories that have reported results
Africa-----	6	3
Australia and New Zealand-----	23	14
Canada-----	38	21
Europe-----	14	7
Fennoscandia-----	9	4
Japan-----	5	2
Mexico and South America-----	17	6
Russia-----	2	--
Southeast Asia-----	7	6
United States-----	36	17
Total-----	157	80
Total number of laboratories sent questionnaire-----		176
Percent of laboratories contacted that are cooperating on reference samples-----		89.8%
Percent of cooperating laboratories that have reported results-----		51%

Regional Geochemical Data Compilation - (W.K. Fletcher)

The objectives of this committee are (a) to provide a census of the regional geochemical data arising from the activities of exploration companies, government agencies and universities, (b) to ascertain what sampling analytical and interpretative techniques are in common usage from regional geochemical surveys, and (c) to solicit opinion on the future role of government agencies and universities in regional geochemical surveys and related research. To meet these objectives a questionnaire has been drawn up which will be distributed to A.E.G. members in the near future.

Research and Education - (R.H. Carpenter)

The research and education committee has initiated the following studies-

- (a) Survey of government agencies on the role of exploration geochemistry.
- (b) Survey of educational institutions on the role of exploration geochemistry.
- (c) Evaluation of recent literature for trends in exploration geochemistry.
- (d) Trends in exploration geochemistry in South America.

Additional projects will be initiated in Africa and Europe.

Employment Service

As a service to our membership the Secretary will maintain a roster of persons available for employment in the exploration industry. Anyone wishing employment should advise the Secretary of their qualifications, background experience and nature of the position sought. Interested employers should contact the Secretary for information on available personnel.

Before ending I should like to express my gratitude to the many persons throughout the world that are assisting in many ways with A.E.G. affairs. I would welcome hearing ideas from members at anytime on ways in which the Association may better serve the needs of the exploration geochemical profession.

IAN NICHOL.

Presidential Address given at Annual General Meeting in Vancouver April 13, 1973

by

R.L. Erickson

One year ago today we gathered together at the Waldorf Hotel in London for our Second Annual General Meeting of The Association of Exploration Geochemists. The occasion was the Fourth International Geochemical Exploration Symposium. Almost one year from today, we will meet again in this city for our Fourth Annual General Meeting and the occasion will be the Fifth International Geochemical Exploration Symposium. On this only our Third Anniversary, I think it is fair to state that our Association is on firm ground as a recognized and respected international organization. Our membership is now over 500 scientists from 43 different countries. This past year we established the class of Corporate Membership and we now have 33 companies on our rolls.

At our previous two annual meetings, our Presidents, Alan Coope and John Hansuld have reviewed the accomplishments of our Association. I feel compelled to do the same, not because great things have been done during my year as your President, but because I am genuinely proud of the Association, confident of its future, and both pleased and humbled to have been your president this past year.

In the three short years of our steady growth, we can point with pride to several signal accomplishments. None of these were easily won; they each represent hard, dedicated work by many people. The Institution of the Biennial symposia, first at Ottawa in 1966, Golden 1968, Toronto 1970, and London 1972, spawned our Association. Now the Association has assumed complete responsibility for sponsorship of these highly successful international meetings. The Fifth Symposium next year here in Vancouver will be entirely organized, managed and staged by A.E.G. I am sure I speak for the entire membership in expressing our appreciation of the hard work done by the local organizing committee for the symposium under the Chairmanship of Ivor Elliott.

Another major accomplishment has been the publication by the Association of a much needed bibliography of geochemical exploration literature, which was distributed free to the membership. As you know Dr. H.E. Hawkes provided the leadership in this effort. Dr. Hawkes and his committee have also prepared a supplement to the bibliography for the year 1970-71. The supplement will be included in the first number of the journal for 1973.

A third signal accomplishment has been the preparation under the direction of H.W. Lakin of the United States Geological Survey of six bulk standards for geochemical analysis. These standards are surficial materials of the type that we most often sample in geochemical exploration programs. Thus

they are much more meaningful than the traditional fresh granite G-1 or diabase W-1. 157 laboratories around the world are participating in this study and 80 laboratories have reported results. The collection, preparation distribution and computer analyses of results of these standards has been an officially funded project of the United States Geological Survey. A current status report of the Geochemical Analysis Committee, dated April 10th, has been received by Council and will be made available to the membership either through the newsletter or the Journal. Analyses of variance have been completed to establish the homogeneity of the standards and Au, Ag, As, Ba and Bi analyses have been coded for entry into a computer. Coding is time consuming and the committee requests the patience of the many people who have so generously supplied them with data.

The fourth and most recent accomplishment has been the launching of our new Journal of Geochemical Exploration, the first specialized periodical in the branch of our science. The two issues for 1972 have been distributed. I am most pleased with the format and quality of the journal and I am sure that I speak for the entire membership in congratulating Dr. Eion Cameron, and his staff for an outstanding effort. A report summarizing progress with the Journal has been submitted by Dr. Eion Cameron, Editor in Chief, which will be published in the newsletter or the Journal. Please remember that the continued success of our journal depends upon the interest and support of the membership, particularly in providing a smooth flow of good papers for publication. In a very direct way, to insure the success and excellence of our journal is to insure the success and acceptance of exploration geochemistry.

There is another rather intangible benefit that the Association has provided, is providing, and will continue to provide. That is the opportunity for the international community of exploration geochemists to meet each other, to know each other, to learn what is going on currently in our profession, and to support our profession through a single, organized, international group. This certainly is something we have never had before.

Reports of some of our working committees are being collated by Alan Coope and will appear in the journal. The work of the Bibliography Committee, chaired by Dr. H.W. Hawkes, and the Geochemical Analyses Committee chaired by Dr. H.W. Lakin has been previously noted.

The Research and Education Committee has been reorganized under the chairmanship of Robert H. Carpenter of the University of Georgia. Dr. Carpenter has recruited committee members from various parts of the world and each has been given a specific assignment:

1. Survey of governmental agencies on the role of exploration geochemistry (Otis Clarke, Alabama Geological Survey).
2. Survey of educational institutions on the role of exploration geochemistry (R.H. Carpenter, University of Georgia).

3. Evaluation of recent literature for trends in exploration geochemistry (P.L. Siems, University of Idaho).
4. Trends in exploration geochemistry in South America (R.W. Lewis, Geoquimica Ltd., Brazil).

Additional projects will be initiated in Africa and Europe.

A new committee was organized this year; the Regional Geochemical Data Compilation Committee. Dr. W.K. Fletcher of the University of British Columbia agreed to act as chairman and Ray Band of Falconbridge Nickel Mines Ltd. and Peter Bradshaw of Barringer Research Ltd. are working with him. The objective of this committee is to provide a census of the Regional Geochemical Data arising from the activities of exploration companies, government agencies, and universities. To ascertain what sampling, analytical and interpretative techniques are in common usage for regional geochemical surveys, and to solicit opinion on the future role of government agencies and universities in regional geochemical surveys and related research. A questionnaire has been prepared for circulation to A.E.G. members in the near future. Hopefully, the end product will be a meaningful compilation of the available regional geochemical data.

But enough talk of past accomplishments. The time has come to not only broaden representation in Council but to consider organization of local groups as sections or chapters of A.E.G., perhaps patterned after something like the local sections of the Geological Society of America. These groups could conceivably have their own executive to deal with local problems unique to their area. Examples would include wrestling with local professionalism or licensing problems, contributions to local environmental or pollution problems, local symposia. The work of local groups could contribute significantly to the international stature of our entire Association.

On the other hand, we do not want to dilute the strength of our growing organization by premature fragmenting into satellite groups without common future of our Association. What do we want it to do for us? What contributions can the Association make not only to mineral exploration but the world community of peoples? How can we best accomplish our goals? Our new Journal of Geochemical Exploration should provide one medium for expression of views of the membership through letters to the Editor.

I would like to take advantage of this opportunity to discuss with you some of my own philosophy about exploration geochemistry. Some of these thoughts I have held for a long time whilst others are more recent and born of meetings attended. Two meetings in particular have much input into what I want to talk about. About a year ago, a mineral resource appraisal program was undertaken in the United States Geological Survey. The problem was and still is that we have practically no information on the mineral resource potential of the United States in order to develop a meaningful National Minerals Policy. True, we do have the traditional type of information

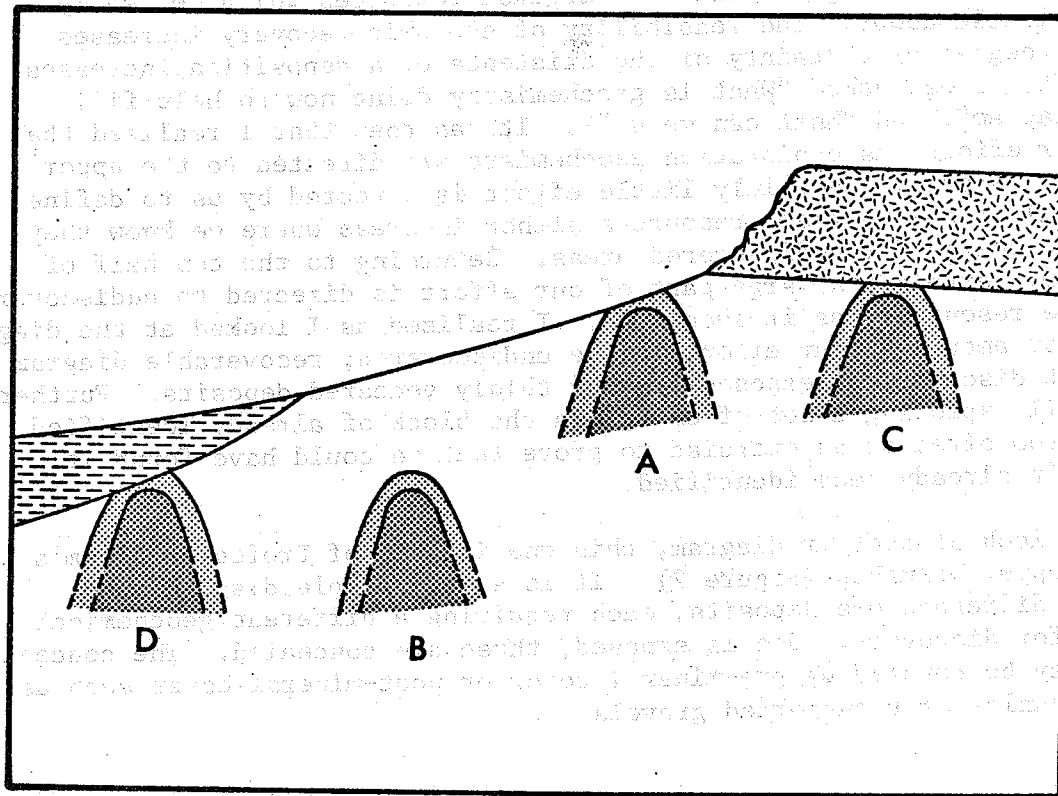
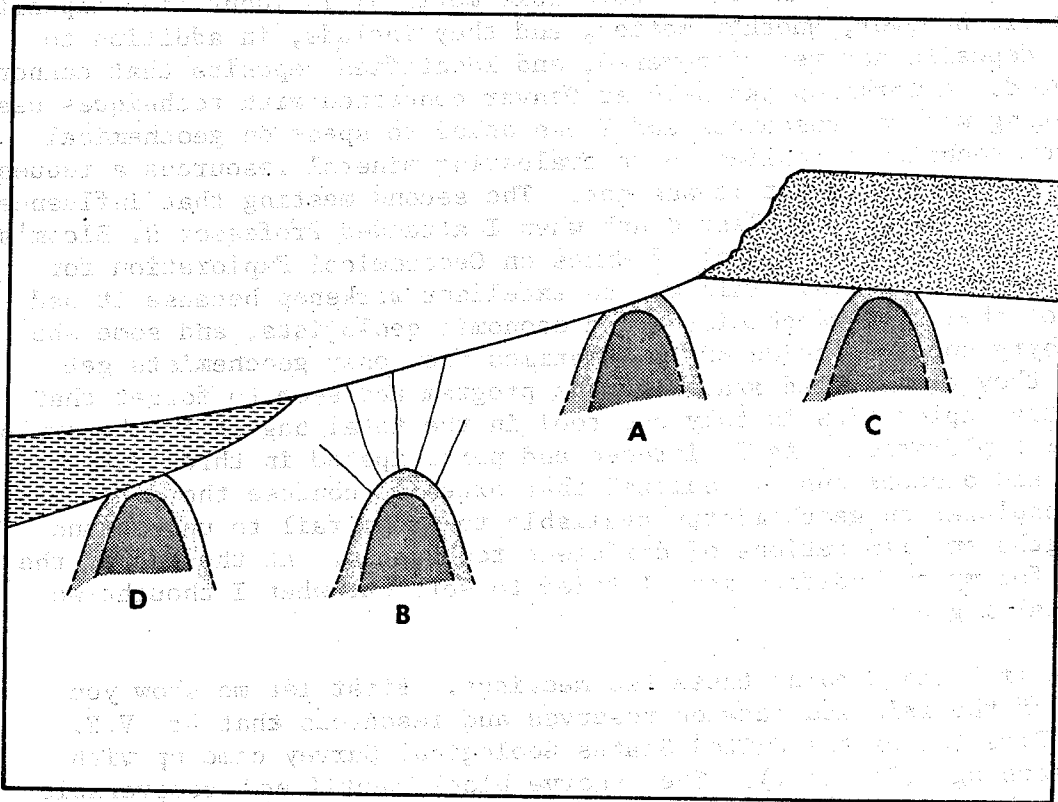
SUBMARGINAL PARAMARGINAL RECOVERABLE

DEGREE OF CERTAINTY

<p>RESOURCES</p>	<p>RESERVES</p>	<p>PROBABLE</p>	<p>PROVED</p>
<p>RESOURCES</p>	<p>RESERVES</p>	<p>PROBABLE</p>	<p>PROVED</p>
<p>RESOURCES</p>	<p>RESERVES</p>	<p>POSSIBLE</p>	<p>IDENTIFIED</p>
<p>RESOURCES</p>	<p>RESERVES</p>	<p>POSSIBLE</p>	<p>UNDISCOVERED</p>

FEASIBILITY OF ECONOMIC RECOVERY

National Minerals Policy Act of 1950



on ore reserves or economically recoverable material in identified deposits. Resources are however, another matter, and they include, in addition to reserves, deposits not yet discovered, and identified deposits that cannot now be recovered. A workshop was held at Denver concerned with techniques used in evaluating mineral resources and I was asked to speak on geochemical exploration techniques applicable to evaluating mineral resources a request that might sound simple but it was not. The second meeting that influence my remarks here occurred just last month when I attended Professor H. Bloom's workshop at the Colorado School of Mines on Geochemical Exploration for Porphyry Copper Deposits. This was an excellent workshop because it had good mix of chemists, geochemists, and economic geologists, and some who knew porphyry coppers inside out. Sometimes when only geochemists get together, they are carried away with the program and seem to forget that geochemistry exploration is only one tool in the total bag of tricks employed in mineral exploration. As I listened and participated in three days of papers and discussions, I realized that often we confuse the different types of exploration geochemistry available to us or fail to understand the strengths and limitations of different techniques. At the end of the workshop, for my own edification, I tried to sort out what I thought we had been talking about.

Now let me if I can combine these two meetings. First let me show you a diagram of the relation between reserves and resources that Dr. V.E. McKelvey, Director of the United States Geological Survey came up with several years ago (Figure 1). The reserve block identifies recoverable deposits. The remainder of the diagram can be called resources comprising undiscovered recoverable, paramarginal, and sub-marginal resources and we have identified paramarginal and sub-marginal resources which we really know very little about. The feasibility of economic recovery increases upward and degree of certainty of the existence of a deposition increases to the left. I was asked "What is geochemistry doing now to help fill in this diagram"? and "What can we do"? It was then that I realized that most of our efforts as exploration geochemists are directed to the upper half of the diagram. Certainly little effort is directed by us to define paramarginal or sub-marginal resources either in areas where we know they exist or to search for undiscovered areas. Returning to the top half of the diagram, certainly a large part of our effort is directed to undiscovered, recoverable resources, as it should be. I realized as I looked at the diagram, that a great amount of our effort in the undiscovered, recoverable diagram is aimed at discovery of exposed or only thinly veneered deposits. Further, we are still expending a lot of energy in the block of already identified reserves, too often as an exercise to prove that we could have found it if it hadn't already been identified.

Now let us look at another diagram, this one is born of Professor Bloom's Porphyry Copper Workshop (Figure 2). It is a very simple diagram, and shows four different ore deposits, each requiring a different geochemical technique for discovery. One is exposed, three are concealed. The concealed deposits may be covered by pre-mineral cover or post-mineral cover such as recent volcanics or transported gravels.

At the workshop different people talked about different types of geochemistry and when this material is sorted out and regrouped, it would seem to fit into 3 categories. The first is reconnaissance geochemistry usually in large virgin areas such as Central America or The Pacific Islands. The common technique is collection and analysis of stream sediments for one or two elements (usually Cu and Mo). The method is rapid, cheap, and reliable, some would say fast and dirty. The chances are excellent that if a significant ore deposit is exposed at the surface and it is cut by a drainage, we will discover its existence. I often think of Herb Hawkes' stories of motoring leisurely around the perimeter of some Pacific Isle with his wife, collecting stream sediments wherever the road crosses a drainage and the analyses for cold extractable copper leading to a discovery. Obviously this is a powerful tool in certain circumstances, but we must keep in mind that, by definition, our target must be exposed or only thinly veneered, must contribute mineralized material to the drainage, and must contain significant amounts of the one or two metals that we are analyzing for. This is deposit A on (Figure 2) and it also fits in the block of undiscovered, recoverable resource. I think most of us would agree that most geochemical exploration is directed toward discovery or rediscovery of deposit A. Now let's look at deposit B, concealed by pre-mineral cover or barren bedrock. Geochemists have directed a fair amount of effort to discovery of this type of deposit. The concepts of leakage halos are very important here. Similarly important are concepts of zoning unique to different types of deposits so that we might recognize segments of zones that could be projected into areas of post-mineral cover. In stream sediment work, the analysis of stained pebble or crude pan concentrates is useful. Deposits C and D are concealed by post-mineral cover. I think that in these cases we must admit that geochemical exploration techniques, as now practiced, offer little promise of discovery. In the case of deposit D there has been some encouraging work with phreatophytes, ground waters, and basal caliche layers, and some very preliminary work with volatiles such as Hg being exhaled from the deposit through the overlying cover. Volatile exhalation has also been attempted with Deposit C.

Both diagrams indicate that I have talked in very general terms but I think it is important to attempt periodically to put the present state of the art of geochemical exploration in some perspective in relation to what progress we are making in identifying the mineral resources of the world, and in relation to the spatial distribution of ore deposits in the earth's crust. Obviously the potential resources existing in concealed deposits (B,C,D) must be much greater than what we now know about exposed deposits (A). And of course even the exposed deposits are not as well known as we would like to think. Witness the Carlin type gold deposits, PreCambrian Belt copper beryllium in volcanic ash deposits completely overlooked because of our prejudices as to how ore deposits should occur, what they should look like, and how to find them. What I am trying to say is that in this day of expanding populations, emergent nations, the raw materials crunch, and the energy crisis, that we, as individuals, and as an

association, should be in the forefront of awareness, understanding, and expertise in identifying and describing the mineral resource potential of the world. We have an important role to play if we wish to maintain the respect and recognition for our profession that we have only so recently won. We must demonstrate that we can find the concealed deposit and have significant input into the discovery. Let us not continue to prove year after year that analysis of stream sediments down drainage from an exposed ore deposit will yield a geochemical anomaly. Let us not devote too much time to the development of new and more sophisticated ways of presenting or manipulating the same old geochemical data. Rather, I think we should direct a larger portion of our total effort to learning more about the distribution and abundance of elements in the various naturally occurring media in the earth's crust and the laws that govern that distribution and abundance. Hopefully then we can do a better job of predicting and identifying resource concentrations of minerals.

In closing, I would like to record my thanks for the support and assistance of my fellow officers, councillors, and committee member this past year. We held six council meetings during the year and I wish to thank our Vice-Presidents Drs. Cameron and Hawkes for chairing meetings that I was unable to attend. One certainly cannot say that the A.E.G. has "Do Nothing" Vice Presidents. Vice President Cameron is editor in chief of our journal, a really tough assignment; Vice President Hawkes has worked long and hard and at personal expense to provide us with the bibliography. Fortunately, secretary Dr. Bloom and more recently treasurer Dr. Horsnail both live in the Denver area, and I have benefited greatly by their help and counsel. Running the affairs of a growing association with its attendant growing pains calls for much dedicated effort on the parts of our secretary and treasurer.

And now I would like to introduce the next executive for next year. Your new president is Ian Nichol, Professor of Geochemistry at Queen's University. Ian served as our secretary for the first two years of our existence. We've given him one year off and now called him back to duty. Dr. R.W. Boyle of the Geological Survey of Canada is the new vice president for a two year term. Dr. Eion Cameron will be continuing as vice president to complete the second year of his term. Dick Horsnail of Amax is our new secretary, and Prof. H. Bloom will move into the treasurer's office. I wish you all well. The contact that I have had with Ian Nichol since he became president elect attests to dynamic new leadership this coming A.E.G. year.

And one final word to the membership. The continued growth and success of our Association depends upon the interest and active support of the membership, only your willingness to work on committees, your support of the journal through manuscripts, your active participation in the Biennial Symposia, and your enthusiasm to spread the gospel of A.E.G. will insure success, not only for A.E.G. but for our own individual professional accomplishment and satisfaction.

Thank you.

Dear Sir:

The Association of Exploration Geochemists has appointed a Regional Geochemical Data Compilation Committee. Its objectives are: to provide a census of the regional geochemical data arising from the activities of exploration companies, government agencies, and universities; to ascertain what sampling, analytical and interpretative techniques are in common usage for regional geochemical surveys; and to solicit opinion on the future role of government agencies and universities in regional geochemical surveys and related research. To these ends the enclosed questionnaire has been prepared.

The questionnaire, which is only concerned with regional-reconnaissance geochemical surveys (i.e., reconnaissance surveys of areas greater than 250 km² (100 miles²)), is divided into three sections:

PART A: GENERAL INFORMATION on the regional geochemical work undertaken by your organization.

PART B: DETAILED INFORMATION on sampling and analytical techniques used in regional geochemical surveys.

PART C: FUTURE TRENDS in regional geochemistry and related research.

It is realized that completion of the questionnaire, particularly PART B, will be demanding. Nevertheless, respondents are urged to answer as many of the questions as possible. In meeting the objectives outlined above, all information will be generalized and at no time will individuals or organizations be identified. If desired your name and that of your organization may be withheld, but will in any case only be known to the Chairman.

The committee thanks you for your co-operation in this task. Please return the questionnaire to:

K. Fletcher,
Geological Sciences Centre,
University of British Columbia,
Vancouver 8, B.C.
CANADA

K. Fletcher (chairman)

NAME AND ADDRESS OF RESPONDENT

Throughout this questionnaire please use a cross in the appropriate box to indicate an affirmative.

Part A: General Information

(1) Description of your organisation:

- a. () Mining or Petroleum Company
- b. () Exploration Subsidiary of Mining or Petroleum Company
- c. () Exploration and/or Development Company
- d. () Research and Development Company
- e. () Consultant
- f. () Individual Prospector
- g. () University, College or School of Mining
- h. () Government Department or Survey
- i. () Other, please specify

- | | | <u>Yes</u> | <u>No</u> |
|-----|--|------------|-----------|
| (2) | a. Does your organisation use regional geo-chemical data? | () | () |
| | b. Does your organisation carry-out regional geo-chemical surveys? | () | () |

If yes, are the surveys undertaken primarily for

- () mineral exploration
- () research related to mineral exploration
- () other: please specify

- (3) a. Please complete the table on the following page to provide a general description of your regional geochemical data for the last 10 years.

b. Total number of regional geochemical samples collected
by your organisation in the last decade _____

c. Total number of regional geochemical samples collected
by your organisation in 1972 _____

(4) a. Are the results of any of your regional geochemical
surveys published? Yes No
() ()

b. If yes, please give bibliography or details separately.

Part B: Detailed Information

(1) Sample collection: a breakdown of your organisation's regional geochemical
samples reported in question 3(a) is:

a.	%	Stream Sediments	Soils	Bedrock	Others (specify)
	0-10	()	()	()	() () ()
	11-20	()	()	()	() () ()
	21-30	()	()	()	() () ()
	31-40	()	()	()	() () ()
	41-50	()	()	()	() () ()
	51-60	()	()	()	() () ()
	61-70	()	()	()	() () ()
	71-80	()	()	()	() () ()
	81-90	()	()	()	() () ()
	91-100	()	()	()	() () ()

- e. Approximately what percentage of your regional geochemical samples are analyzed for

	%
organic matter content	_____
Fe and Mn	_____
% sand, silt or clay	_____
pH	_____
Other--specify _____	_____

- f. Do you routinely analyze for

() less than 5 elements?
 () 5-9 elements?
 () 10-20 elements?
 () more than 20 elements?

- g. Does your company have its own geochemical laboratory?

Yes () No ()

- h. If so, please specify which analytical techniques are used on regional geochemical samples.

() atomic absorption
 () emission spectroscopy
 () colorimetry
 () x-ray fluorescence
 () other specify _____

(3) Data storage, presentation and interpretation

- a. Has your organisation used computer processing as an aid to interpreting regional geochemical data? Yes No
() ()
- b. If yes, do you regard the results as worthwhile? () ()
- c. If yes, which of the following do you record on computer processible forms?
- () Field information
- () Analytical data
- () Co-ordinates for sample locations
- d. If sample co-ordinates are given which system is used?
- () Latitude and longitude
- () Universal Transverse Mercator
- () Other--specify _____
- e. Approximately what percentage of your regional geochemical data is stored in a computer processible form?

Part C: Future trends in regional geochemistry

- (1) a. Do you feel that a useful contribution could be made to the mining industry by government agencies (e.g., the Geological Survey of Canada, U.S.G.S., etc.) collecting and releasing regional geochemical data in much the same way as aeromagnetics have been made available? Yes No
() ()
- b. If so do you have any preferences as to
Sampling density? _____

Elements determined other than ore-forming metals? _____

Material collected? _____

Presentation of data? _____

Any special comments? _____

(2) a. Do you think it would be useful and acceptable to the mining industry if splits of reconnaissance samples collected by companies were submitted to government agencies, re-analysed and the results made public after a specified interval of time? Yes No
() ()

b. If so what restrictions do you think should be placed on release of the data?

(3) Would it be useful if the Association of Exploration Geochemists acted as a clearing house for regional geochemical data? () ()

(4) Are there any particular problems in regional geochemistry on which you would like to see more fundamental research carried out by universities or government agencies? Please specify. () ()

(5) Any other comments on this questionnaire or regional geochemistry?

R. Band
 P.M.D. Bradshaw
 K. Fletcher (Chairman)