



THE ASSOCIATION OF EXPLORATION GEOCHEMISTS

P.O. Box 523, (Metropolitan Toronto), Rexdale, Ontario, M9W 5L4 Canada

NEWSLETTER

NO. 46

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DECEMBER 1983

JOURNAL DISTRIBUTION

The latest issue of the Journal of Geochemical Exploration was distributed during October 1983, this issue Vol.18, No.3 completes the 1982 subscription. Vol.19, No.1-3 a large volume of the Saskatoon Symposium will be distributed late in December 1983 or early January 1984. Vol.19, No.1-3 is the 1983 subscription issue. Members who have only paid 1983 dues will only receive Vol.19.

PERSONAL COLUMN

Information on Association Members is received from around the world. To keep your fellow members informed of your latest moves send a brief summary to the Rexdale office and please indicate that this information is intended for the Newsletter.

Lawrence Baum has accepted a temporary position as visiting Professor in Exploration Geochemistry at the University of Idaho College of Mines and Earth Resources. Dr. Baum will be returning to his consulting practise in Kirkland, Washington afterwards.

With regret we record the death of Mr. Ross Kidd on May 4th, 1983 in Toronto. Mr. Kidd had been a member of the Association since 1970. He will be sincerely missed by his friends and colleagues.

Graham C. Sylvester has accepted the position of the Queensland Manager for Noranda Australia Limited, based in Townsville, Queensland 4810, Australia. This will take effect on January 1, 1984.

A MESSAGE FROM THE PRESIDENT

L. G. Closs

The AEG Council, after considerable deliberation, has voted to retain our relationship with Elsevier for the purpose of publishing the Journal of Geochemical Exploration. The decision was based upon a comprehensive review of the alternatives. I believe that the best decision for the Association and its members was reached. I am extremely grateful to all who contributed to these discussions; particularly: E.M. Cameron (Editor-in-Chief, JGE), J.A. Hansuld (Business Editor, JGE), A.A. Levinson (Member, Publication Committee), and A.W. Rose (Chairman, Publication Committee). Dr. Hansuld is presently consummating this agreement with Elsevier on behalf of the Association.

A list of committee chairman is attached. Your input to the Association's affairs are actively sought and can be directed to these individuals, myself or the membership at large via the Newsletter.

Ballots for the election of Ordinary Councillors for the 1984-1985 term are contained within this mailing. This is your annual opportunity to select your representation on Council. I urge you to avail yourself of this right.

Finally, Chet Nichols and his organizing committee have layed out an excellent program for the Reno Regional Symposium in March 1984. I look forward to meeting with many of you at that time.

Best wishes for a joyous holiday season and a bright and prosperous 1984.

PROCEEDINGS OF THE WORKSHOP ON THE USE OF BULK STANDARDS IN
EXPLORATION GEOCHEMISTRY, 10th IGES, 1983

A pre-symposium workshop on Bulk Standards in Exploration Geochemistry was included in the technical program of the 10th, IGES - 3rd SMGP held at Espoo, Finland, August 29, to September 2, 1983.

Sixteen participants including the chairman, the co-chairman and four panelists attended the workshop and despite the low pre-symposium interest level, the discussions, and enthusiasm, generated an overall sense of exhilaration which spilled over into the symposium on the next day.

The four panelists were all from the U.S. Geological Survey and included Mr. Glenn Allcott and Mr. Paul Theobald, both former chiefs of the Branch of Exploration Geochemistry and Mr. Howard McCarthy, Jr., and Dr. Maurice Chaffee, chemists and geochemists of the same branch.

The chairman opened the workshop with a brief statement on the distinction between reference materials and reference standards calling attention to the fact that although most geologists, chemists, etc. really do know the difference they often ignore that distinction and use the terms interchangeably both in private and in official publications, e.g. N.B.S. Standard Reference Materials and U.S.G.S. Reference Rocks.

Four sub-sessions made up the day-long session and each panelist led off a sub-session with a short prepared presentation which is summarized below along with matters of comment sparked by the presentations.

Mr. Glenn Allcott leaning on his experience acquired during the collection, preparation, analysis, data treatment, and distribution of the GXR samples emphasized the concept of primary and secondary reference materials. By primary, Mr. Allcott meant reference materials such as the GXR samples and other rock materials distributed by the U.S. Geological Survey such as G-1, G-2, W-1, BCR-1 etc., where the chemical composition has been relatively well established and by secondary he meant reference materials collected, prepared, and maintained by or in the individual laboratory or company. To the geochemist both of these terms apply to natural materials as soils, rocks, minerals, vegetation, and water; whereas, to the pure chemist primary reference materials closely resemble standards and include chemicals of sufficient purity to calibrate an instrument or to establish a titer in volumetric analysis. Overlap does occur in the usage of such terms as evidenced by the suggested applications or primary and more often secondary reference materials as method monitors during the chemical analysis of geologic materials and also as guides during the development of new chemical methodology.

Mr. Allcott further noted in his remarks that with the GXR materials the biggest source of differences in the values obtained for a given constituent seemed to be in the dissolution of the sample prior to analysis, and often a single value of a constituent seemed to be dependent on the type of analysis, e.g. spectrophotometric, atomic absorption, inductively-coupled plasma, etc. The connection between this observation and the prior statement is obvious.

For future considerations Mr. Allcott mentioned the desirability of a mineral analysis before pulverizing the collected reference material and also the need for materials with higher concentrations of the several constituents than those found in the GXR materials.

Mr. Howard McCarthy, Jr. lead off another sub-session of the workshop noting the distinction already made between reference materials and standard materials. As an aside he defined a standard material as a reference material now exhausted - of which there is no more. He agreed with a comment made earlier that at such point one had vast amounts of analytical data but no more sample. Mr. McCarthy noted that often the various laboratories report precision differently making interlaboratory comparison difficult if not impossible. On a more optimistic note Mr. McCarthy suggested that the judicious use of reference materials in chemical analysis of reconnaissance samples should eliminate oddities like "borderline faults" which often seem to be indicated by the chemical data.

Obviously reference materials have to be collected and we have repeatedly used the term bulk reference materials. By the term, bulk, we mean quantity and all of the participants agreed that no less than 4 to 5 hundred kilograms should be considered as a reference material especially if widespread distribution is anticipated.

At a third sub-session of the workshop Mr. Paul Theobald led off by emphasizing the need for geologic input at the beginning especially as regards site of collection, type of material collected and description of the material. He cited an example of what can happen without the geologic input: Collectors of a reference material for internal use in the laboratories (a secondary reference material by definition) selected material to represent the "zone of terminal moraines to the young valley glaciers of the Rocky Mountains" and they described the material as "well bedded glacial flour". Chemical analysis revealed that the material resembled a low grade ore. Geologic input "yielded a different description", "well bedded tailings from a gold mill, largely removed by erosion along the main stream and overlain by recent, coarse gravel on the fan of an over-steepened tributary".

Referring back to previous experience in Saudi Arabia, Mr. Theobald cited another pitfall that geochemist may encounter using reference materials in exploration geochemistry. Reference materials had been used to establish the precision on the 80 to 200 mesh fraction. Analyses of the -200 mesh fraction of 25 separate samples taken at 1 km intervals along a traverse spanning a range of rock types from diorite to alkaline granite revealed a precision less than the precision reported for the constituent using reference materials to establish that value. The bottom line was that the 25 separate samples were from a source material more homogeneous than the reference materials. Moreover, the precision of the analytical procedure was better than the homogeneity of the reference materials used to establish that precision and hence the reported precision was really that of sub-sampling of the reference material.

Leading off the last of the 4 sessions of the workshop Dr. Chaffee told of his own experience - a bit of serendipity - in finding a secondary reference material with a chemical composition and a matrix resembling that of the samples collected in a current research interest of identifying chemical zoning patterns in mineral deposits. In short he suggested that in addition to the needs of the chemist for secondary reference materials to monitor his day-to-day results, each geochemist needs to provide his own secondary reference material - unique to him - to evaluate the laboratory with regard to both precision and accuracy.

Dr. Chaffee also urged users of analytical data to exercise caution in data manipulation - to realize that most single values of a constituent provided by laboratories really represent a range of values and that within limits one can measure that range using bulk reference materials.

In summary the panelists and participants in the workshop considered the important distinction between bulk reference materials and bulk standards and the use of such materials not only as method monitors and aids in developing new chemical methodology, but also as a means of evaluating the reliability of data sets. For such uses all agreed on the need of continuing program of reference material collection,

analysis, and distribution. Moreover all agreed with Dr. Richard Howarth that such programs would be of greater use if the promoters would first agree on a means of expressing precision so as to facilitate interlaboratory comparison.

Finally the workshop participants agreed to make the following recommendations to the Council of the Association of Exploration Geochemists:

- 1) That the Association of Exploration Geochemists initiate and distribute a pamphlet on the preparation of bulk reference materials.
- 2) That the Council of the Association of Exploration Geochemists should define the detection limit of analytical methods in a way similar to the ASTM.
- 3) That the Council of the Association of Exploration Geochemists reactivate the existing committee or name a new committee on standards development and assign that committee the responsibility of developing a dynamic program of reference materials - specifically a new set of GXR materials.

F.N. Ward

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HYDROGEOCHEMISTRY IN MINERAL EXPLORATION

A summary of a workshop held at the 10th IGES-3rd SMGP meeting, Helsinki, Finland, Aug. 29-Sept. 2, 1983.

Chaired by Donald D. Runnells and P. W. Lahermo

Approximately 25 to 30 people participated in the one-day workshop on hydrogeochemical exploration. Eight talks were given, including two overview presentations, three case histories, two discussions of aqueous speciation and transport, and one talk on statistical methods of interpretation.

In general, it appears that hydrogeochemical methods of exploration are being used in a complementary manner to more traditional methods, such as stream sediment and soil sampling. The main reasons for the restricted use of hydrogeochemistry appear to be the difficulty of preserving the samples for analysis and the multitude of factors that must be understood to allow proper interpretation of the data. However, most participants in the workshop appeared to agree that certain aspects of hydrogeochemical exploration offer advantages not available from other methods, such as the potential for disclosure of deeply hidden ore deposits and the identification of the actual ionic and molecular species that may be involved in the transport.

Several times during the workshop the point was made that dissolved halogens, such as I^- , F^- , and Br^- may be useful pathfinder elements for a variety of types of ore mineralization. The potential importance of colloidal transport of certain elements, notably Au, was also discussed.

In the summary discussion that was presented by Dr. D.D. Runnells to the conference as a whole, the following lists of advantages, disadvantages, and research needs were offered for consideration:

Advantages:

1. Waters are often easy to collect.
2. Hydrogeochemical exploration may be especially valuable in covered or deeply weathered terrain.
3. New analytical techniques have moderated some of the analytical problems inherent in waters.
4. Information can be obtained on dissolved anions in the waters of interest.
5. Information on the actual dissolved species may be obtainable in hydrogeochemical programs.
6. Statistical methods are available which may allow the investigator to identify waters from different sources and aquifers.
7. Costs are roughly equivalent to other methods.
8. Computer models are already available for interpreting the chemistry of natural waters.
9. Hydrogeochemistry offers the potential for direct discovery of hidden ore deposits due to contact between the water and the mineralization.
10. Vast quantities of data already exist in data banks generated for other purposes, such as environmental and engineering studies.

Disadvantages:

1. The composition of natural waters varies dramatically as a function of time.
2. The collection of waters may be difficult if methods of preservation and filtration are required.
3. Low concentrations may require special analytical methods.
4. Waters are inherently unstable and cannot be "archived".
5. Proper interpretation of resulting data may require separate studies of the hydrology of the system of concern.
6. The chemistry of the water may also vary as a function of a great many other factors, such as paths of flow, adsorption, residence time, re-equilibration with the minerals of the aquifer, etc.

Topics deserving of further study:

1. As always, in all fields of geochemistry, we need more and better thermodynamic data.
2. More research is need on the form and speciation of elements of interest in natural waters, including colloids.
3. We need more study on the mechanisms of movement, transport, and retardation of dissolved species, including such factors as diffusion, osmosis, ion-exchange, salt creep, and capillary rise.
4. Greater emphasis must be placed on statistical methods of identifying and separating out the effects of anthropogenic factors and of waters from different sources.

ADMISSIONS COMMITTEE REPORT

Names of the following candidates have been recommended to membership by the Admissions Committee and have been approved by Council. According to the Associations by-laws the names of the candidates are to be published for consideration by the membership. If you wish to comment on any candidate, please do so in writing to the secretary within 60 days.

VOTING MEMBERS

DelMundo, A.C.	Laboratory Manager/Chief Chemist, Mcphar Geoservices Philippines, Inc. ADC MIA, Philippines.
Downes, P.M.	Contract Mineral Exploration Geologist, Como, W.A., Australia.
Romanini, S.J. (transfer)	Geologist/geochemist with CPRM, at Porto Velho, Brazil.
Wallner, P.H.	Chief geologist, Little River Goldfields, N.L. Grafton, N.S.W., Australia.

AFFILIATE MEMBERS

Agupitan, H.P.	Exploration geologist, Lepanto Cons., Mining Co., Manila, Philippines.
Catts, J.G.	Geochemist, Ertec Western Inc., Long Beach, California, USA.
Dousset, P-E.	Geologist Expert Associate (United Nations) presently in Malaysia.
Gripp, A.H.	Teacher at the Universidade Federal de Minas Gerais, Belo Horizonte, Brazil.

- Naftz, D.L. Geochemist/soil scientist, Dept. of Environmental Quality Division, Cheyenne, Wyoming, USA.
- Passos, V.T. (transfer) Assistant Professor at Federal University of Ceara, Fortaleza, Brazil.
- Renken, P.B. Geologist, PRC Inc., Sparks, Nevada, USA.

STUDENT MEMBERS

- Angeles, C. Post-graduate student at the University of New South Wales, Kensington, NSW, Australia.
- Apostol, A. Post-graduate student at the University of New South Wales, Kensington, NSW, Australia.
- Bianchi, G. Post-graduate student at the Penn State University, State College, Pa., USA.
- Fukuda, M. Post-graduate student at the Colorado School of Mines, Golden, Colorado, USA.
- Hall, D.J. Reserach student at the University of New South Wales, Kensington, NSW, Australia.
- Rollan, L.A. Post-graduate student at the University of New South Wales, Kensington, NSW, Australia.
- Tembo, F. Post-graduate student Unza School of Mines, University of Zambia, Lusaka, Zambia

FUTURE MEETINGS

THE ASSOCIATION OF EXPLORATION GEOCHEMISTS REGIONAL SYMPOSIUM "EXPLORATION FOR ORE DEPOSITS OF THE NORTH AMERICAN CORDILLERA" Reno, Nevada
March 25-28th, 1983 THIRD and FINAL NOTICE

Through the energetic work of the symposium organizing committee, this meeting has received considerable and widespread publicity. Consequently, the committee reports an increasing number of registrations particularly for the field trips which are proving to be very popular.

Further details are included with this Newsletter.

11th INTERNATIONAL GEOCHEMICAL EXPLORATION SYMPOSIUM - Toronto, CanadaApril 28, - May 1st, 1985UPDATE

Plans for this Symposium are well advanced and the organizing committee will be distributing a second circular early in the New Year.

CORDILLERAN GEOLOGY AND EXPLORATION ROUND-UPJanuary 25-27, 1984, Holiday Inn, Harbourside, Vancouver, B.C. Canada

A joint venture of the British Columbia Ministry of Energy, Mines and Petroleum Resources: Geological Survey of Canada: Indian and Northern Affairs Canada (Yukon) and British Columbia and Yukon Chamber of Mines. The Round-Up will also include "The Core Shack" containing rock specimens and/or diamond drill core and maps of some significant Cordilleran prospects.

For further information contact:

British Columbia and Yukon Chamber of Mines
840 West Hastings Street
Vancouver, B.C. Canada, V6C 1C8
Telephone (604) 681-5328

86th CANADIAN INSTITUTE OF MINING AND METALLURGY ANNUAL GENERAL MEETINGOttawa, April 15-19th, 1984

Canada's largest minerals industry convention, the 86th Annual General Meeting of CIM, will place in Ottawa, the nation's capital. All CIM Divisions/Societies/Committees will sponsor technical sessions on the theme 'Technology for Survival: the Next 20 Years'. Activities will be centered at the Capital Congress Centre and the Westin Hotel.

For the first time, a Trade Show will be held in conjunction with CIM's Annual General Meeting in the Congress Hall of the Capital Congress Centre, and will feature 100 booths displaying products and services for Canada's minerals industry.

For further details contact:

CIM,
400-1130 Sherbrooke Street, W.,
Montreal, Quebec, Canada H3A 2M8

CALENDAR OF COMING EVENTS

To assist Members in completing their plans for attending various future exploration symposium and meetings a calendar of coming events will appear as a regular feature in the Newsletter.

1984

January 10-11, 1984

COMPUTER APPLICATIONS IN MINERAL EXPLORATION, Toronto, Canada, sponsored by TGDG, GAC, CIMM, KEGS, and AEG (see Newsletter for further details).

January 17-19, 1984

The 16th Annual Meeting of the Canadian Mineral Processors Division of CIM is scheduled for Ottawa. The meeting is limited to invited operators from CMP's nine regions.

February 22-23, 1984

APPLIED MINERALOGY IN THE MINERALS INDUSTRY (2nd International Congress), Los Angeles, California, U.S.A. (The Organizing Committee Chairman, ICAM 84, P.O.Box 310, Danbury, CT, 06810, U.S.A.)

March 4-7, 1984

PROSPECTORS AND DEVELOPERS ASSOCIATION 52nd ANNUAL CONVENTION, Toronto, Canada.

March 25-28, 1984

ASSOCIATION OF EXPLORATION GEOCHEMISTS REGIONAL SYMPOSIUM, Reno, Nevada, (see Newsletter for further details).

March 26-30, 1984

COMPUTER APPLICATIONS IN THE MINERAL INDUSTRIES (18th International Symposium, London, U.K. Organized by the Institution of Mining and Metallurgy. (The Conference Office, Institution of Mining and Metallurgy, 44 Portland Place, London, W1N 4BR, U.K.)

March 26-30, 1984

RECENT ADVANCES IN MINERAL SCIENCE AND TECHNOLOGY (International Conference), Johannesburg, South Africa, Sponsored by the South African Council for Mineral Technology, (The Conference Secretary (C.25), Mintek, Private Bag X3015, Randburg, 2125 South Africa).

April 9-13, 1984

GEOLOGY, MINERAL AND ENERGY RESOURCES OF SOUTHEAST ASIA (GEOSEA V), Kuala Lumpur, Malaysia, Sponsored by Geological Society of Malaysia, AGID, (T.T. Khoo, Dept. of Geology, University of Malaysia, Kuala Lumpur 22-11, Malaysia).

April 15-19, 1984

CANADIAN INSTITUTION OF MINING AND METALLURGY, 86th Annual Meeting, Ottawa, Canada (Ste. 400 - 1130 Sherbrooke St., W., Montreal, Quebec, Canada M3A 2M8).

May 14-16, 1984

GEOLOGICAL ASSOCIATION OF CANADA, MINERALOGICAL ASSOCIATION OF CANADA (Joint Annual Meeting), London, Ontario, Canada. (N.D. MacRae, Department of Geology, University of Western Ontario, London, Ontario, Canada N6A 5B7).

May 17-18, 1984

PROSPECTING IN AREAS OF GLACIATED TERRAIN, Strathclyde University, Scotland. (see enclosed circular)

June 23-26, 1984

PRACTICAL APPLICATIONS OF GROUNDWATER GEOCHEMISTRY (Workshop), Banff, Alberta, Canada. (Dr. E.I. Wallick, Alberta Research Council, 5th Floor Terrace Plaza, 4445 Calgary Trail South, Edmonton, Alberta, Canada T6H 5R7).

August 4-14, 1984

27th INTERNATIONAL GEOLOGICAL CONGRESS, Moscow, U.S.S.R. (N.A. Bogdanov, General Secretary, Organizing Committee of the 27th IGC Staromonetny per, 22, Moscow 109180, U.S.S.R.)

August 27-31, 1984

WATER MOVEMENT IN HEAVY CLAY SOILS (Meeting), Wageningen, Netherlands. (Dr. W.G. Sombroek, 1555, International Soil Museum, 9 Duivendaal, POB 353, 6700 A.J. Wageningen, The Netherlands)

September 10-14, 1984

TITANIUM (5th International Conference), Munich, F.R.G. (Deutsche Gesellschaft fur Metallkunde E.V., Adenaureallee 21, D-6370 Oberursel 1, F.R.G.)

September 10-14, 1984

HYDROCHEMICAL BALANCES OF FRESH WATER SYSTEMS (International Symposium), Stockholm/Uppsala, Sweden. Sponsored by Swedish Natural Science Research Council, Unesco, and IAHS, (International Symposium on Hydrochemical Balances of Fresh Water Systems, c/o Stockholm Convention Bureau, Joakobs Torg 3, 5-111 52 Stockholm, Sweden)

October 1-5, 1984

REMOTE SENSING OF ENVIRONMENT (18th International Symposium), Paris, France. (Environmental Research Institute of Michigan, P.O.Box 8618, Ann Arbor, MI 48107, U.S.A.)

November 5-8, 1984

GEOLOGICAL SOCIETY OF AMERICA (Annual Meeting), Reno, Nevada, U.S.A. (S.S. Beggs, Geological Society of America, P.O.Box 9140, 3300 Penrose Place, Boulder, CO 80301, U.S.A.)

November 19-23, 1984

12th WORLD MINING CONGRESS, New Delhi, India (Organizing Committee Institute of Engineers, 8 Gokhale Road, Calcutta 700 020, India.)

December 2-6, 1984

SOCIETY OF EXPLORATION GEOPHYSICISTS (54th Annual Meeting, Atlanta, Georgia, U.S.A. (3 Hyden, SEG, Box 3098, Tulsa, OK 74101, U.S.A.)

1985

April 1985

PROSPECTING IN AREAS OF DESERT TERRAIN (Conference), Rabat, Morocco. (Conference Office, IMM, 44 Portland Place, London W1N 4BR, U.K.)

April 21-25, 1985

CANADIAN INSTITUTION OF MINING AND METALLURGY, 87th Annual Meeting, Vancouver, Canada.

April 28 - May 1, 1985

11th INTERNATIONAL GEOCHEMICAL EXPLORATION SYMPOSIUM, Toronto, Canada.

July 28 - August 2, 1985

8th INTERNATIONAL CLAY CONFERENCE, Denver, Colorado. Sponsored by AIPEA, (Dr. A.J. Herbillon, Groupe de Physico-Chimie Minerale et de Catalyse, Univ. Catholique de Louvain, Place Croix du Sud 1, B-1348 Louvain-la-Neuve, Belgium)

September 8-13, 1985

HYDROGEOLOGY IN THE SERVICE OF MAN

September 15-21, 1985

FIRST INTERNATIONAL CONFERENCE ON GEOMORPHOLOGY; Geomorphology, Resources, Environment and the Developing World (British Geomorphology and Research Group, University of Manchester, Manchester, England, M13 9PL, U.K.)

ELECTION OF ORDINARY COUNCILLORS

Twelve nominations for Council have been made to fill 5 vacancies which will arise at the next Annual General Meeting in March, 1984. Ballots have been prepared and distributed to the Voting Membership. It is important that Voting Members cast their ballots as soon as received. The Ballots must be returned to the Association permanent office in Rexdale (Toronto) by March 4th, 1984, from there the ballots will be transferred, by the Secretary to the Auditor of the Association for counting. Results of the vote will be announced at the AGM after which the New Councillors will be announced.

REGIONAL COUNCILLORS

Regional Councillors, like Ordinary Councillors, hold office for two year periods.

Richard Mazzuchelli, Australian Regional Councillor, Louis Coetzee, Southern Africa Regional Councillor and B. Bolviken, European Regional Councillor and Richard Lewis, Brazilian Regional Councillor will continue to serve the Association through the 1984-85 term.

NEW EXECUTIVE FOR THE ASSOCIATION

At a Council Meeting held on December 1st, 1983, members of the new executive were elected for the year 1984-85.

Bob Garrett of the Geological Survey of Canada, Ottawa, has been elected to the position of President of the Association.

Ian Thomson of Placer Development Limited, Vancouver has been elected to the post of First Vice President.

Glen Allcott of the United States Geological Survey, Reston, Virginia, has been elected to the post of the Second Vice President.

Ray Lett of Barringer Magenta, Toronto has been re-elected to the post of Secretary.

R.G. Jackson of Sulpetro Minerals, Toronto, has been re-elected to the post of Treasurer.

Note L.G. Closs will continue to serve Council during the 1984-86 term as Past President Councillor

AEG COMMITTEE CHAIRMEN, 1983-84

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Student Prize Committee,
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Ann Arbor, Mich., USA. 48109
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Dr. N.G. Lavery, Chm.,
Membership Renewal Committee, and Distinguished Lecturer Committee,
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ANNUAL GENERAL MEETING 1984

The next Annual General Meeting of the Association will be held during the Association of Exploration Geochemists Regional Meeting, in Reno, Nevada. The meeting will be held at 4 p.m. on Tuesday, March 27th, 1984.

The Agenda for AGM is as follows,

1. Minutes of the 1982 Annual General Meeting.
2. Matters Arising.
3. President's Report.
4. Secretary's Report.
5. Treasurer's Report.
6. Admission's Committee Report.
7. Introduction of the 1983-84 Executive.
8. Announcement of the Ordinary Councillors Elections.
9. Any other business.
10. Adjournment.

The President, L.G. Closs will deliver his address immediately following the adjournment of the meeting.

FROM THE SECRETARY'S OFFICE - Ray Lett

As the New Year approaches an increasing number of 1984 dues are arriving at the Toronto office. We certainly appreciate those of you who have promptly responded to the call for dues notices and I would urge members who still have not mailed their dues to do so as soon as possible.

During 1984 the Association will be involved in a number of important projects including the Computer Applications to Mineral Exploration Workshop in Toronto in January and the Regional Geochemical Exploration Symposium in Reno, Nevada. The Reno Symposium is doubly important not only for the range of stimulating topic which will be covered, but also because it is the venue of the Association's Annual General Meeting when the Executive and Council for the 1984-85 term will be introduced. You will see that a list of nominee's for Council and a ballot form is included with the Newsletter. This year, under the revised By-Law, counting of the ballots will be done before the Annual Meeting and the result will be announced during the Meeting. Please complete your ballot as soon as possible and return it to the office.

In an effort to encourage new membership we are presently modifying the current application, principally to streamline the process whereby Affiliate and Student Members join the Association. Examples of the New Application Form should be available early in the New Year.

A number of members have written in supporting the idea of a regular feature on microcomputer applications. I hope to introduce this feature in the March 1984 Newsletter and I would encourage you to send in any contributions on this topic.

Finally from Ines Filicetti and myself, a successful and peaceful New Year.

REVIEWERS FILE

Response to our request for volunteers to review AEG symposium papers has been good, particularly from geochemists in Australia. It is hoped that eventually 100 to 125 volunteers will constitute this file to alleviate too great a workload on a small number of individuals (the present file contains about 40 reviewers). If you would like to participate in this program, I would encourage you to complete the reviewers file form mailed in Newsletter No. 45. or write to me directly. Your assistance would be greatly appreciated and will be needed for the Reno 1984 symposium volume.

Stan Hoffman
Chairman, Symposium Committee

GEOCHEMICAL REPORTS

The Association of Exploration Geochemists is currently considering the question "How to Write a Geochemical Report" of high technical merit, with specific reference to glaciated terrains. The objective is to produce guidelines on what should and perhaps should not be included in a geochemical report. Special emphasis is being placed on the format and composition of the geochemical map so that it can be interpreted in a stand-alone fashion. Contents of appendices are also being considered for their ability to archive data and procedures.

The "Geochemical Report" guidelines are being established in "cook-book" format to provide the non-geochemist and geochemist alike means to upgrade the quality of their technical writing. The final document is to represent a consensus of geochemists in industry and government. Questions regarding the applicability of geochemical reports for government "assessment" reports and the need for confidentiality of data or methods will be considered subsequently. Report guidelines will be published in the Newsletter for comments by the general membership. Any interested party wishing to contribute his/her thoughts on what the contents of a geochemical report should be, please contact:

Dr. Stan J. Hoffman
c/o BP Minerals Ltd.,
Ste. 700 - 890 W. Pender Street
Vancouver, B.C. Canada V6C 1K5

COURSESGEOCHEMICAL EXPLORATION FOR PRECIOUS AND BASE METALS, May 7-11, 1984

This short course is being given by H. Bloom, L.G. Closs and I. Nichol at Metals Hall, Green Center, Colorado School of Mines, Golden, Colorado, USA.

The program, now in its 24th year, is an introductory course on the fundamentals of modern geochemical exploration techniques, ideally suited for geologists, chemists, and others interested in trace element geochemistry, as related to mineral exploration. For information concerning the program, contact,

L.G. Closs
Geology Department
Colorado School of Mines
Golden, Colorado 80401
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or or

Telephone 303-273-3856

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THE AEG AND AID PROGRAMMES

As a follow-up to the discussion on "Involvement of Geochemistry in Aid Programmes" held during the IGES-SMGP meeting in Helsinki, a group of interested AEG members gathered to consider what steps the AEG might take:

- to increase the use of exploration geochemistry in developing countries;
- to assist exploration geochemists in developing countries to enhance their training and access to information on new geochemical exploration methods;
- to increase the representation of developing country geochemists in the activities of the AEG, and;
- to encourage AEG members to share their resources and expertise with counterparts in the developing countries.

Our discussion gave rise to a number of suggestions as to how these questions could best be approached. These included:

1. Establishment of a Committee to advise the Council and membership of the A.E.G. on activities the Association might undertake, and to coordinate activities in this field.
2. Establish a mechanism to supply free, or at reduced cost, AEG symposium proceedings and the Association Journal to developing country institutions concerned with mineral exploration, and currently unable to afford these publications.
3. Establish a mechanism where members from the developed countries would undertake to subsidise, wholly or in part, the Association membership fees of qualified developing country candidates unable at present to join the Association through lack of funds or lack of foreign currency.
4. Establishment of a voluntary fund to support the attendance of one or more developing country geochemists at AEG symposia.
5. Establish contact with AGID (Association of Geoscientists for International Development), UNESCO and other organizations active in international development to make known to them the interest of AEG in aiding and promoting the effective use of exploration geochemistry in developing countries, and to enlist their help in such activities as the AEG may decide upon.
6. Stimulate and promote communication between exploration geochemists in developing countries and encourage the holding of regional meetings where information and experience on the use of geochemical methods in the region may be exchanged.

Before going further, the group considered it necessary to put these suggestions to other interested members who may not have been at Helsinki. This is best done through the medium of the Newsletter. The group would welcome ideas, suggestions, comments or opinions from any and all interested members. These will be gathered, summarized and presented to the Council for any action they feel appropriate. Art Smith (IAEA-Vienna) has volunteered to act as a clearing house for any responses, and will forward these to the Council.

Letters should be addressed to:

ARTHUR Y. SMITH
INTERNATIONAL ATOMIC ENERGY AGENCY
WAGRAMESTRASSE 5, P.O. Box 200
A-1400 VIENNA, AUSTRIA

We hope you will give these questions serious thought and let us have your views.

Signed:

ASHLYN ARMOUR-BROWN
JEFFREY AUCOTT
R.W. BOYLE
EION CAMERON
ROBERT GARRETT
G.J.S. GOVETT
MALCOLM MC CALLUM
A.Y. SMITH
HENRIK STENDAL
MOHAMAD TAUCHID
JOHN TOOMS

PUBLICATIONS

10 IGES PROCEEDINGS - UPDATE - A. Bjorklund

To December 20th, 51 manuscripts have been received of which 12 have been rejected; 18 submitted to Elsevier; 7 are in final editorial; 11 are with the authors for revision and 3 are with referees. Elsevier expect publications of the proceedings in May-June 1984.

PUBLICATIONS OF GENERAL INTEREST

From time to time copies of miscellaneous publications and journals are received at the Association Office. Where possible the abstract of those publications will be published in the Newsletter.

Association of Geoscience for International Development

AEG members may be interested in two recent publications by AGID, the Association of Geoscientist for International Development.

"Geochemistry in Zambia" is the 94 page report of a workshop held in Lusaka in 1977. It contains case histories and reviews of the Chipirinyuma, Inyati and Kalengwa sulphide deposits, nickel prospecting in Zambia and geochemical exploration over kimberlite pipes in Zaire. The report is available for \$6 US (\$3 to AGID members in developing countries:

\$4.75 in industrialized countries) from AGID, Asian Institute of Technology, G.P.O.Box 2754, Bangkok 10501, Thailand. Airmail postage is included. A limited number of copies are also available from EPISODES, 601 Booth Street, Ottawa, Canada K1A 0E8.

Of more general interest is "Hidden Wealth: Mineral Exploration Techniques in Tropical Forest Areas", edited by D.J. Laming and A.K. Gibbs (221 pages). This is a collection of papers presented at an international symposium in Caracas in 1977 and dealing with geological, geochemical, geophysical and remote sensing techniques as well as with mineral exploration strategies and environmental aspects. One of the rare volumes to focus on rain forests, it includes case histories from Brazil, Sri Lanka, Guyana, Venezuela, Nigeria, Zaire and several other regions. Geochemical reviews were contributed by P.M.D. Bradshaw and I. Thompson, J. Pasquail, C.J. Lopez, R.E. Learned, E.H. Dahlberg, and G. Matheis among others. Available at \$30.50 US from A.K. Gibbs, Department of Geological Sciences, Cornell University, Ithaca, N.Y., 14853 USA. with special prices including airmail postage to other regions and to AGID members (details from A.K. Gibbs).

GEOLOGICAL SURVEY OF FINLAND - Publication.

Peuraniemi, V. 1982. Geochemistry of till and mode of occurrence of metals in some moraine types in Finland. Geological Survey of Finland, Bulletin 322. 75 pages, 71 figures and 11 tables.

The areas covered by this survey represent four types of morainic landform: cover moraine, ground moraine, drumlins and Rogen moraine. All these moraines consist mainly of basal till facies. The <0.06 mm fraction was analyzed from a total of 4441 geochemical till samples taken by percussion drilling and pneumatic drilling. The metal contents were determined by AAS after total dissolution of the samples. The mode of occurrence of the metals was studied by chemical cold-extractability studies and mineralogical investigations. The use of a scanning electron microscope equipped with an energy-dispersive X-ray spectrometer was important in identifying the ore minerals and their alteration products.

The anomalies in the till proved to be predominantly clastic and glaciogenic in all four moraine types. Sulphide minerals had been preserved unweathered in the till which had been saturated with groundwater, whereas above the groundwater level they had been weathered to variable extents, entailing alteration, most commonly to goethite. A small proportion of the sulphide grains had been preserved in the fresh state even in the superficial parts of the till deposits.

The geochemical anomalies, which can be traced up to 400-600 m from the mineralization in the direction of ice movement, are more local in the cover moraine area than in the other moraine types. Till geochemistry is highly applicable to all four moraine types when searching for indications of mineralizations and locating these.

The mode of occurrence of metals requires to be investigated in every survey of till geochemistry, and mineralogical studies are

particularly important in areas where there is a thick preglacial weathering crust.

This publications can be ordered from,

Government Bookshop
Akateeminen Kirjakauppa
Keskuskatu I. SF-00100
Helsinki 10, FINLAND

RUSSIAN TRANSLATIONS

The Russian translations, the title of which were previously published in the newsletter have been edited and are now ready for distribution. As you recall these papers were directed towards recent geochemical techniques applied by Russian geologists and geochemists in the search for precious metal deposits. Papers range in topics from geochemical halos; use of mercury differential thermal analysis to predict blind ore bodies; effect of permafrost on hydrogeochemistry and distribution of gold; use of Au¹⁹⁵ isotope to determine gold distribution to the formation of exhalative gold. Prices have been set at Can \$3.75 per original Russian page and this amounts to a cost of anywhere between Can\$11.25 to Can\$45.00 for various papers. Total price for 12 papers available for Can\$200.00 plus postage and handling. If you are interested please contact,

Geo Russian Translation Services
Suite 1417 - 5000 Jane Street
Downsview, Ontario Canada M3N 2W5

11th IGES ABSTRACTS

Early in the New Year roughly 100 copies of the 1983 11th IGES Abstracts will be available through the Rexdale office at a cost of US\$10.00.

BIBLIOGRAPHYRECENT PAPERS ON EXPLORATION GEOCHEMISTRY

This list comprises titles that have appeared in major publications since the compilation presented in Newsletter 45. Journals routinely covered and abbreviations used are Journal of Geochemical Exploration (JGE), Economic Geology (EG), Geochimica et Cosmochimica Acta (GCA), the USGS Professional Papers (USGS PROF P), Circular (USGS Cir), and USGS Open File Report (USGS OFR), Bulletin of the Canadian Institute of Mining and Metallurgy (CIM Bull), Transactions of Institution of Mining and Metallurgy, Section B: Applied Earth Science (TRANS IMM). Publications less frequently cited are identified in full. Compiled by Donald D. Runnells and Sandra L. Jones, Department of Geological Sciences, University of Colorado, Boulder.

Alekseyev, V.A., Klassova, N.S., Prisyagina, N.I., Volodina, Y.A., and Rafal'skiy, R.P., 1982. Interaction of sulfur acid solution with carbonates and feldspar in the underground leaching of uranium. *Geochem. Int.* 19(2):177-185.

Arutyunyan, L.A., Petrenko, G.V., and Balabonin, N.L., 1982. The behavior of selenium and tellurium during the hydrothermal redeposition of Cu-Ni-sulfide ore. *Geochem. Int.* 19(3):60-65.

Baogui, Z., et al., 1982. Geology and geochemistry of a stratbound manganese deposit in the Tangganshan region of South China. *Geochimica* 4:402ff.

Basu, P.K., 1981. Electron probe micro-analysis of goethite in East Coast bauxite ore. *Indian Minerals* 35(4):34-35.

Beyth, M., and McInteer, C., 1981. Evaluation of stream sediment data for favourability of uranium mineralization in Tertiary granitic plutons of the Alaska Range. *Mineralogical Mag.* 341(1):475-484.

Cantle, J.E.(Ed.), 1982. Atomic Absorption Spectrometry, Vol. 5: Techniques and Instrumentation in Analytical Chemistry. Elsevier, New York, 448 p.

Chatterjee, A.K., Strong, D.F. and Muecke, C.K., 1983. A multivariate approach to geochemical distinction between tin-specialized and uranium-specialized granites of southern Nova Scotia. *Can. J. Earth Sci.* 20(3):420-430.

Chatzidimitriadis, G.E., and Kelepertsis, A., 1983. A geological-geochemical study of magnesites from northern Greece (Chalkidiki peninsula). *Mineral Wealth* 22:29ff.

Dunlop, A.C., Atherden, P.R., and Govett, G.J.S., 1983. Lead distribution in drainage channels above the Elura zinc-lead-silver deposit, Cobar, New South Wales, Australia. *JGE* 18(3):195-204.

Fedikow, M.A.F., and Turek, A., 1983. The application of stepwise discriminant analysis to geochemical data from the host rocks of the Sullivan Pb-Zn-Ag deposit, Kimberly, B.C., Canada. *JGE* 18(3):231-244.

Fyon, J.A., Crockett, J.H., and Schwarcz, H.P., 1983. Magnesite abundance as a guide to gold mineralization associated with ultramafic flows, Timmins area. *JGE* 18(3):245-266.

Granier, C., Monteil, G., Trickett, T., and Wilson, S., 1982. Geochemical explorations for uranium in the Cluff Lake, Carswell dome (Canada) glaciated area. *Chron. Rec. Min.* 50(469):5-24.

Heaton, T.H.E., 1981. Dissolved gases: some applications to groundwater research. *Trans. R. Geol. Soc. S. Africa* 84(2) Special Issue:91-98.

Hodder, R.W., and Petruk, W., (Eds.), 1982. *Geology of Canadian Gold Deposits. Proceedings of the CIM Gold Symposium, Val-d'Or, Quebec, September 1980.* CIM Spec. V. 24, 285 pp. (CIM, Suite 1400, 1130 Sherbrooke St. West, Montreal, Quebec, Canada H3A 2M8).

Jonasson, I.R., Jackson, L.E., and Sangster, D.F., 1983. A Holocene zinc orebody formed by supergene replacement of mosses. *JGE* 18(3):189-194.

Kapustin, Y.L., 1982. Geochemistry of strontium and barium in carbonatites. *Geochem. Int.* 19(2):38-48.

Kelepertsis, A.E., and Andrulakis, I., 1983. Geobotany-biogeochemistry for mineral exploration of sulphide deposits in northern Greece--heavy metal accumulation by *Rumex acetosella* L. and *Minuartia verna* (L.) Hiern. *JGE* 18(3):267-274.

Kodama, T., and Date, J., 1982. On chemical characteristics of ferruginous chert in the Kuroko field, Northern Akitu prefecture. *Min. Geol.* 32(6):475-478.

Lovering, T.G., and Hedley, J.A., 1983. The use of sagebrush (*Artemisia*) as a biogeochemical indicator of base-metal deposits in Precambrian rocks of west-central Colorado. *JGE* 18(3):205-230.

Malahoff, A., Embley, R.W., Cronan, D.S., and Skirrow, D., 1982. The geological setting and chemistry of hydrothermal sulfides and associated deposits from the Galapagos Rift at 86 W. *Marine Min.* 4(1):123ff.

McMurtry, G.M., Wang, C.-H., and Yeh, H.-W., 1983. Chemical and isotopic investigations into the origin of clay minerals from the Galapagos hydrothermal mounds field. *GCA* **47**(3):475-490.

Meyer, R., and DeBeer, J.H., 1981. A geophysical study of the Cape Flats aquifer. *Trans. Geol. Soc. S. Africa* **84**(2) Special Issue:107-114.

Moller, P., Dieterle, M.A., Dulski, P., Germann, K., Schneider, H.-J., and Schutz, W., 1983. Geochemical proximity indicators of massive sulfide mineralization in the Iberian pyrite belt and the East Pontic Metalotect. *Mineralium Depos.* **18**(2B):387-398.

Moorby, S.A., 1983. The geochemistry of transitional sediments recovered from the Galapagos hydrothermal mounds field during DSDP Leg 70--implications for mounds formation. *Earth Planet. Sci. Let.* **62**(3):367ff.

O'Brien, T.J., and Williams, P., A., 1983. The aqueous chemistry of uranium minerals. 4. Schrockingerite, grimselite and related alkali uranyl carbonates. *Mineralogical Mag.* **342**:69-74.

Pirkle, F.L., Bement, T.R., Howell, J.A., Koch, C.D., Stablein, N.K., Beckman, R.J., and Tietjen, C.L., 1983. Identification of regions enriched or depleted in radioelements through nondistributional analysis of aerial radiometric data. *JGE* **18**(3):175-188.

Polikarpochkin, V.V., Lomonosov, I.S., Kitaev, N.A., Filippova, L.A., Gapon, A.E., Konstantinova, I.M., Sarapulova, V.N., and Belogolova, G.A., 1983. Theory and practice of geochemical prospecting methods on secondary halos and dispersion flows. *Geol. Geophys.* **1**(277):42-52.

Quinif, Y., Charlet, J.M., and Dupuis, Ch., 1982. Geochimie des radioelements: U-Th-K²⁰ dans les roches detritiques: une nouvelle methode d'interpretation. *Ann. Soc. Geolog. Belgique* **105**(2):223ff.

Ramanamurthy, M.V., 1983. Efficacy of some chemical extractions in the recognition of true and false anomalies in geochemical exploration. *J. Geol. Soc. India* **24**(1):43-53.

Reeves, R.D., and Brooks, R.R., 1983. European species of *Thlaspi* L. (Cruciferae) as indicators of nickel and zinc. *JGE* **18**(3):275-284.

Rickard, D.T., and Wickman, F.E. (Eds.), 1981. Chemistry and Geochemistry of Solutions at High Temperatures and Pressures. (V. 13 and 14, Physics and Chemistry of the Earth), Pergamon Press, 564 p.

Simpson, P.R., Plant, J.A., and Brown, G.C. (Eds.), 1982. Uranium '81. The Mineralogical Society, London, 216 p.

Smith, W.R., and Missen, R.W., 1982. Chemical Reaction Equilibrium Analysis: Theory and Algorithms. Wiley-Interscience, 364 p.

Struhsacker, E.M., Smith, C., and Capuano, R.M., 1983. An evaluation of exploration methods for low-temperature geothermal systems in the Artesian City area, Idaho. Geol. Soc. Am. Bull. 94(1):58-79.

Talapatra, A.K., Bose, S.S., and Venkaji, K., 1981. Sulfur-dioxide soil-gas sampling for exploration of concealed sulphide mineralization under sandy overburden. Indian Minerals 35(4):30-33.

Talma, A.S., 1981. Chemical changes in groundwater and their reaction rates. Trans. Geol. Soc. S. Africa 84(2)Special Issue:99-108.

Tauson, L.V., Zakharov, M.N., Kovalenko, V.I., Kozlov, V.D., Kuzmin, M.I., Popolitov, E.I., and Froshin, Y.P., 1983. Geochemical typification of the ore-bearing granitoids. Geol. Geophys. 1(277):31-41.

Thomann, W.F., Pyron, A.J., and Ray, D.R., 1983. Distribution of uranium, thorium and potassium in Proterozoic igneous rocks, Franklin Mountains, West Texas (a synopsis). CIM Bull 76(850):91-95.

Warren, H.V., Horsky, S.J., Kruckeberg, A., Towers, G.H.N., 1983. Biogeochemistry, a prospecting tool in the search for mercury mineralization. JGE 18(3):169-174.

Weare, J.H., Harvie, C.E., and Moller-Weare, N., 1982. Toward an accurate and efficient chemical model for hydrothermal brines. AIIME J. 22(5):699-708.

Zielinski, R.A., 1983. Tuffaceous sediments as source rocks for uranium: a case study of the White River formation, Wyoming. JGE 18(3):285-308.



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PHYSICS 435

LECTURE 10

STATISTICAL MECHANICS

ENTROPY

ENTROPY AND PROBABILITY

ENTROPY AND INFORMATION

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ANNUAL GENERAL MEETING

The Association of Exploration Geochemists
will hold their
Annual General Meeting
at 4pm
on
Tuesday, March 27, 1984
in the
Fronton Conference Center
of the
MGM Grand Hotel
in
Reno, Nevada

I.L. Elliott. Chief Geochemist, Cominco Ltd., Vancouver, Ph.D. Royal School of Mines, London, Ordinary Councillor 1972-73: AEG President for 1974-75. Co-Chairman 5th IGES. Twenty-five years industrial experience. Member since 1970.

M. Mason. Supervisor Geochemical Services. American Copper and Nickel Co. Inc., Wheatridge, Colorado. Ph.D. Imperial College, London. Twelve years experience with Inco. Member since 1975.

D.G. Brookins. Professor, University of New Mexico, Albuquerque. Ph.D. Mass. Inst. Technology, 1963. Twenty years industrial, government and university experience. Co-editor of "Uranium". Member since 1980.

R.K. Glanzman. Geochemist, Chevron Minerals, Denver Co.. M.Sc. Colorado School of Mines. Four years experience with U.S. Bureau of Mines. Twenty years with U.S.G.S. Member since 1979.

C.E. Nichols. Consultant. Ph.D. University of Missouri-Rolla. Fifteen years experience with Union Carbide. Current General Chairman of the Reno Symposium Committee. Member of AEG publications Committee. Member since 1979.

S.L. Bolivar. Staff Geochemist, Los Alamos Scientific Laboratory, Los Alamos, New Mexico. Ph.D. University of New Mexico, 1977. Member since 1977.

N.G. Lavery. Exploration Geologist. Exxon Minerals Co., Missoula, Montana. Ph.D. Penn State University. Sixteen years experience specializing in mineral exploration. Ordinary Councillor 1982-83. Chairman Distinguished Lecturer Committee, and Committee on Membership renewal. Member since 1970.

J.M. McNeal. Geologist, Branch of Exploration Geochemistry, U.S.G.S., Denver. Ph.D. Penn State University. Eight years experience U.S.G.S. Three years assistant Professor at Delphi University. Admissions Committee Member 1982. Member since 1982.

W.C. Riese. Project Geochemist, Anaconda Minerals, Denver, Colorado. M.Sc. University of New Mexico, 1973. Twelve years industrial experience. Member since 1976.

W.D. Goodfellow. Geochemist, G.S.C., Ottawa, Canada. Ph.D. University of New Brunswick, 1975. Eight years experience with G.S.C. Ordinary Councillor 1982-83. Member of Appalachian Symposium Committee. Member since 1973.

R.W. Klusman. Professor, Colorado School of Mines, Golden, Colorado. Ph.D. University of Indiana, 1969. Fifteen years university and government experience with particular emphasis on vapour geochemistry. Member since 1981.

C.F. Gleeson. President, C.F. Gleeson and Associates, Ottawa, Canada. Ph.D. McGill University, Montreal. Twenty years experience with G.S.C. SOQUEM and as a consultant. Ordinary Councillor 1970-74, Vice-President 1974-75. Member since 1970.



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R.W. Lewis Jr.

Twelve Voting Members of the Association have been nominated for Ordinary Councillors for 1984-86. Six incumbent Ordinary Councillors will retire at the upcoming Annual General Meeting in March 1984. Consequently, Members are asked to cast five votes by erasing seven names of candidates you do not wish to vote for from the Balloting List. The persons whose names are not erased from the Balloting List will each receive one vote in the Balloting.

Any Balloting List will be deemed invalid if the number of names not erased therefrom shall be more than five.

Limited information on each candidate is included on the reverse page.

Voting Members should not sign or otherwise identify themselves on the Balloting List. Place the completed Ballot in the green envelope marked "AEG Ordinary Councillor Ballot" and seal. Place this envelope in the white envelope bearing the permanent address of the Association, seal, stamp and mail to arrive in Rexdale no later than March 4th, 1984.