



PRESIDENT'S MESSAGE

As we attend to our day to day business in geochemistry, at times addressing tasks that seem routine and mundane, it can be helpful to pause a moment and consider what we are really trying to accomplish and the scale we are working on.

To illustrate this point, I'd like to relate a favorite (and very short) story.

A gentleman came upon three stonemasons building a wall. He stopped and asked each in turn what they were doing, and received three answers:

- 1) "I'm mixing mortar"
- 2) "I'm chipping stone for that wall over there"
- 3) "I'm Building a Cathedral"

The third stonemason clearly had a different idea of what she was trying to accomplish. "Building a Cathedral" or making a worthwhile contribution is what many of us want to work on each day, rather than simply mixing mortar or chipping stone.



Paul Taufen

What does this have to do with our industry?

There is a potentially significant movement now underway in the Mining and Metals industry aimed at "sustainable development" in a Global Mining Initiative (website at www.globalmining.com). Twenty-seven mining companies are participating to improve how our industry operates. They all are working toward identifying ways of operating in the mining industry that are encouraged, not confronted by local communities, and seen by today's society as an integral part of everyone's future prosperity. This is in sharp contrast to a view of the Mining and Metals industry that sees miners as land destroyers and environment ravagers. For our industry and development within it to be sustained, we need to operate in a new paradigm or mode, one that can last.

How does this fit with geochemistry and the AEG?

This is our future. As we AEG professionals complete the mortar mixing and stone chipping aspects of exploration geochemistry surveys, we can keep an eye on understanding the natural environmental baseline element concentrations present in the survey area. We also can assess and begin to understand the interactions of rocks, soils, waterways, and sediments as sources, transport media, and sinks of elements within the geochemical element cycles active locally.

This understanding can help resource developers operate in the sustainable manner we want to evolve in the industry, cost efficiently discover new resources, and manage these resources in an environmentally sound way to contribute clearly to society. This approach to our work serves to make our industry more acceptable and appreciated by shareholders,

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AEG ANNUAL GENERAL MEETING

AGENDA — November 21, 2000

1. Call to Order – Establish Quorum*, Attendance and Apologies
2. August Minutes – Action Item Status – Minutes Review / Acceptance
3. Election Results
 - i. Councillors
 - ii. Regional Councillors
 - iii. Second Vice President
4. AGM Reports
 - i. Business Manager Report – B. Arseneault
 - ii. Secretary's Report – D. Smith
 - iii. Treasurer's Report
 1. Audited statement of accounts – G. Hall
 2. Appointment of Auditors
 3. Safeguarding AEG's Investment Funds
 - iv. Regional Councillor's Report – N. Radford
 - v. Committee Reports
 1. AEG EXPLORE – L. James
 2. Admissions – L. James
 3. GEEA – G. Hall
 4. New Membership – C. Smith
 5. Publicity
 6. Web Page – S. Amor
 7. Symposium – S. Amor
 8. Awards and Medals – E. Weiland
 9. Distinguished Lecturer – D. Garnett
 10. By-Laws – D. Garnett
 - vi. President's Report – P. Taufen
 1. Current Status of AEG — Progress and Future Direction
 - a. EXPLORE
 - b. Web Site
 - c. GEEA
 2. Revised AEG Committee Structure
5. Other Business.
6. Next Meeting
7. Adjournment

* 15 Fellows present in person or by proxy

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Information for Contributors to EXPLORE

Scope. This newsletter is the prime means of informal communication among members of the Association of Exploration Geochemists, but has limited distribution to non-members. EXPLORE is the chief source of information on current and future activities sponsored by the Association, and also disseminates technical information of interest to exploration and environmental geochemists and analytical chemists. News notes of members are appropriate. We welcome short- to moderate-length technical articles on geochemical tools for exploration, concepts for finding ore, mineral-related environmental geochemistry, new analytical methods, recent deposit discoveries, or case histories. The goal of this newsletter is communication among exploration geochemists, and to that end we encourage papers on new methods and unconventional ideas that are reasonably documented.

Format. Manuscripts and short communications should be submitted in electronic form to minimize errors and speed production. Files can be transmitted on IBM-compatible 3.5 inch diskettes or attached to email. Most popular text and graphics files can be accommodated. Figures and photos can be transmitted in hard copy (which we will scan) or as high quality digital files. Some issues are published with color pages for special maps and figures which should be planned by early communication with the editors.

Length: Technical communications can be up to approximately 1000 words, but special arrangements may be made for longer papers of special interest. High quality figures, photos, and maps are welcome if they present information effectively.

Quality: Submittals are reviewed and edited for content and style through peer reviews. The intent is to improve clarity, not suppress unconventional ideas. If time permits, the author will be shown changes to material, by FAX or email. Time constraints do not allow author review of galley proof from the printer.

All contributions should be submitted to Lloyd James by email (l-njames@central.com) or regular mail to 7059 East Briarwood Drive, Englewood, CO 80112, USA. Only in rare situations should FAX be sent (303-741-5199).

Information for Advertisers

EXPLORE is the newsletter of the Association of Exploration Geochemists (AEG). Distribution is quarterly to the membership consisting of 1200 geologists, geophysicists, and geochemists. Additionally, 100 copies are sent to geoscience libraries. Complimentary copies are often mailed to selected addresses from the rosters of other geoscience organizations, and additional copies are distributed at key geoscience symposia. Approximately 20% of each issue is sent overseas.

EXPLORE is the most widely read newsletter in the world pertaining to exploration geochemistry. Geochemical laboratories, drilling, survey and sample collection, specialty geochemical services, consultants, environmental, field supply, and computer and geoscience data services are just a few of the areas available for advertisers. International as well as North American vendors will find markets through EXPLORE.

The EXPLORE newsletter is produced on a volunteer basis by the AEG membership and is a non-profit newsletter. The advertising rates are the lowest feasible with a break-even objective. Color is charged on a cost plus 10% basis. A discount of 15% is given to advertisers for an annual commitment (four issues). All advertising must be camera-ready PMT, negative or file on disk. Business card advertising is available for consultants only*. Color separation and typesetting services are available through our publisher, Vivian Heggie, Heggie Enterprises.

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EXPLORE

Newsletter No. 109

OCTOBER 2000

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President's Message

Continued from Page 1

environmental groups, and local communities. Committing to this approach is more like building a Cathedral than mixing mortar!

Much of this issue of EXPLORE is directed toward describing the state of our Association in preparation for the AEG Annual General Meeting. While our industry appears to be turning a corner, as copper and nickel prices firm, our Association is healthy, and ready to participate in a future characterized by sustainable development.

The AEG stands on a tripod of the EXPLORE newsletter, the AEG Website, and GEEA, our new journal. I am happy to report that EXPLORE remains strong. Lloyd James has assumed editorship smoothly this year, and the newsletter has a new business manager, Dave Kelley, taking over from Owen Lavin. Thanks again to Owen for his many years of service to EXPLORE. The AEG website (www.aeg.org), has expanded dramatically under Steve Amor's guidance, and is building links and resources in the "members only" portion of the site that can assist any explorationist. The new journal has an exciting collection of papers ready for the first issue, and a publishing agreement with the Geological Society of London that provides authors with improved commercial rights to their contributed articles.

We also are looking forward to a first class international symposium next year in Santiago. Check the web site for details and updates.

In closing this message, I'd like to thank the AEG membership for support of the AEG through the first 9 months of this year. I urge you to continue your support, and contribute information to your colleagues that allow the AEG to help "build the cathedral" of sustainable development in our industry.

Paul Taufen

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Annual General Meeting

The Annual General Meeting will be held on November 21, 2000 at 4.00pm MDT (GMT -7) in telephone conference call format. If you are planning to participate please contact me in Canada at (613) 828-0199 or e-mail me at aeg@synapse.net before Friday, November 17 as I must ensure that there are a sufficient number of reserved phone lines. At that time I will give the member the necessary information on the telephone participation procedure.

Thank you,
Betty Arseneault
 Business Manager
 Phone: (613) 828 0199
 E-mail: aeg@synapse.net

1999 AGM Minutes

Minutes of the Annual General Meeting of the Association of Exploration Geochemists held in conjunction with the 19th International Geochemical Exploration Symposium, Vancouver, B.C., April 13, 1999.

I. Call to Order, Establishment of Quorum

President Weiland called the meeting to order at 6:05 PM PDT. Approximately 65 people were present, about 45 of these were Fellows in the Association of Exploration Geochemists.

II. Introduction of Executive

President Weiland introduced the 1999 Executive of the AEG:
 President: Erick Weiland
 First Vice President: Paul Taufen
 Secretary: David Smith
 Treasurer: Gwendy Hall

III. Establishment of Agenda

The agenda for the AGM was published in EXPLORE No. 103 (April 1999). All reports of the Executive and Committees were also published in EXPLORE. The President stated that he would not ask the Executive or Committee Chairpersons to read each published report, instead he would ask if there were additions, corrections, or comments for each report.

IV. December 16, 1998 AGM Minutes

The President asked if any comments or changes to minutes.

There were none. **It was moved (D. Garnett) and seconded (G. Hall) that the minutes as published in EXPLORE No. 103 be approved. The President asked for a vote on the motion and it passed without objection.**

V. Business Manager's Report – B. Arseneault

No additions or changes to the published report were noted. G. Hall pointed out that 767 members had paid 1999 dues to date and a reminder letter will be sent out soon to those 1998 members who have not as yet paid 1999 due.

VI. Reports of Executive/Council

Past President's Report – P. Simpson

No additions or changes to the published report were noted. President Weiland congratulated 1998 President Simpson for a job well done.

President's Report – E. Weiland

No additions or changes to the published report were noted. President Weiland reminded everyone at the AGM that the officers of the Association are there to help the membership. The AGM is an opportunity for the membership to express personally their concerns to the Executive.

Secretary's Report – D. Smith

No additions or changes to the published report were noted. Secretary Smith recognized the contributions to the Association of former Secretary Sherman Marsh.

Treasurer's Report – G. Hall

No additions or changes to the published report were noted. Treasurer Hall pointed out that the 1997 expenses were summarized in EXPLORE because the Association has not yet come to terms with Elsevier funds. **It was moved (A. Coope) and seconded (T. Wakefield) that the 1998 auditor's report be published in EXPLORE as soon as it is approved by Council. The President asked for a vote on the motion and it passed without objection.**

Regional Councilor Report – P. Taufen

No additions or changes to the published report were noted. Vice President Taufen pointed out that some of the Regional Councilors and their constituents do not have e-mail and communication is often difficult. He also pointed out that the Regional Councilors had continually stated to him that environmental geochemistry is very important to the members with whom they communicate. These members wanted to see the Association place greater emphasis on this area of geochemistry. This led to an active discussion regarding the balance the Association should seek between exploration geochemistry and environmental geochemistry. While some of the Fellows present felt that a change in name of the Association would be appropriate, the general consensus seemed to be that the AEG's new journal (GEOCHEMISTRY: Exploration, Environment, Analysis) and continued sponsoring of meetings such as the International Symposium on Environmental Geochemistry would give increased visibility to environmental geochemistry while the Association maintained its primary focus on exploration

1999 AGM Minutes *Continued from Page 3*

VII. Editor – Journal of Geochemical Exploration – G. Hall

No additions or changes to the published report were noted. Treasurer Hall pointed out that the Association was in the last year of its contract with Elsevier. Vol. 65 of the Journal of Geochemical Exploration will be a regular volume. Vol. 66 will consist of papers presented at the 18th International Geochemical Exploration Symposium (IGES) held in Israel. Vol. 67 will be the proceedings volume for the 19th IGES held in Vancouver and will be the final volume under the Elsevier contract. This volume will likely come out in May or June, 2000.

VIII. Newsletter – T. Nash and S. Marsh

No additions or changes to the published report were noted. T. Nash, **EXPLORE** Editor, pointed out to the attendees that **EXPLORE** is “your” voice. He expressed a level of disappointment that more AEG members were not taking advantage of the newsletter. He is looking to recruit new associate editors who are closer to regional membership and hopes that these individuals can be successful in soliciting contributions to the newsletter from members.

IX. Committee Reports

Admissions and Applications – L. James

No additions or changes to the published report were noted.

Bibliography – G. Closs

No additions or changes to the published report were noted. There was a comment from the audience that the Bibliography was very useful.

By-Laws Revision – D. Garnett

No additions or changes to the published report were noted. D. Garnett stated that the Committee would soon have a draft of the revised By Laws and these would be published in **EXPLORE** for comments from membership.

Distinguished Lecturer – D. Garnett

No additions or changes to the published report were noted. D. Garnett congratulated current AEG Distinguished Lecturer G. Hall for her excellent job.

Environmental – D. Glanzman

No additions or changes to the published report were noted. D. Glanzman pointed out that members of the Association who are in the field of environmental geochemistry are anxious to find ways to serve the Association.

Geoscience Councils

Canada – B. McClenaghan

No additions or changes to the published report were noted.

Australia – G. Murphy

No additions or changes to the published report were noted. D. Garnett passed along G. Murphy’s apologies for not being able to attend the 1999 AGM.

Medal Awards – P. Simpson

No additions or changes to the published report were noted.

New Membership Committee – S.C. Smith

No additions or changes to the published report were noted. S.C. Smith announced the other members of the Committee: Todd Wakefield, Germano Melo, Jr., and Mark Stanley.

Publicity – B. McClenaghan

No additions or changes to the published report were noted. B. McClenaghan encouraged all members to have a look at Association’s web site. There was a suggestion to put the minutes from AEG Council meetings on the web site.

Short Course – C. Dunn

No additions or changes in the published report were noted. C. Dunn pointed out that AEG should probably have various short course modules that could be molded to meet the requirements of any potential customer. The Association could advertise these types of courses in **EXPLORE**. There was a question concerning whether the Association would be putting on courses where honoraria were offered to presenters. It was agreed that this was a matter that Council should discuss.

Student Paper Competition – I. Robertson

No additions or changes in the published report were noted. I. Robertson noted that this year’s winner would be announced at the IGES banquet. He also pointed out that students can’t be considered for the award unless the paper in question has been published. He emphasized that members should encourage students to published results of their studies.

Symposium Committee – F. Siegel

No additions or changes to the published report were noted.

19th IGES (1999) Vancouver

Reno Meeting 2000

AEG is co-sponsor for this meeting and S.C. Smith is the AEG’s liaison with the Geological Society of Nevada

20th IGES (2001) Chile

P. Rogers made a short presentation on the proposed meeting site (Santiago, Chile).

21st IGES (2003) Ireland

X. Introduce 1999 Councilors – E. Weiland

President Weiland introduced the 1999 AEG Councilors:

Mary Doherty
Graham Taylor
Shea Clark Smith
Steve Amor
Steve Day

Todd Wakefield (assuming the last year of R. Lett’s term)

XI. Motion to Destroy Ballots

It was moved (S. Marsh) and seconded (N. Radford) that the ballots for the election of the 1999 AEG Councilors be destroyed. President Weiland asked for a vote on the motion and it passed without objection.

1999 AGM Minutes *Continued from Page 4*

XII. Appointment of Auditors for 1999

It was moved (A. Coope) and seconded (D. Garnett) that the AEG appoint McDay, Duff and Company of Ottawa, Ontario as auditors for the Association. President Weiland asked for a vote on the motion and it passed without objection.

XIII. Other Business

G. Closs acknowledged T. Nash for contributions as EXPLORE editor.

P. Rogers stated he felt that AEG was rather remote as far as South America is concerned. He felt AEG needed to take better advantage of the World Wide Web to get its message out to potential members in countries in South America. He also felt the Association should consider Spanish language papers in the journal and on its web site. He also encouraged Council to take a strategic look at the direction of AEG.

L. Bettenay said he felt the real issue for AEG is that we are a very apathetic profession. It is difficult to get people to do anything for the Association.

A. Coope felt Council needs to develop a marketing strategy for both the association and its products. This would help with potential members outside North America.

XIV. Motion to Adjourn.

It was moved (S. Marsh) and seconded (T. Nash) that the 1999 AGM adjourn. President Weiland asked for a vote on the motion and it passed without objection.

President Weiland thanked all attendees and adjourned the meeting at 7:32 PM PDT.

David B. Smith
Secretary



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COMMITTEE REPORTS

AEG Admissions Committee Annual Report - 2000

We have reviewed fifty-one applications for membership (8 Fellows, 36 Members, and 7 Students) in the nineteen months since the 1999 AGM. These are not particularly encouraging numbers. Hopefully, things will improve significantly with the advent of the new journal.

Lloyd James
Chairman Admissions Committee

Bibliography Committee Report

The bibliography committee had another active year as evidenced by the Recent Papers section in each issue of EXPLORE.

Graham Closs
Chairman Bibliography Committee

Business Manager's Report

Our membership base of 939 compares to 1005 in the previous year. This total comprises 306 Fellows (voting members), 592 Members (affiliate), 17 Corporate, 15 Student, 7 Explore only and 2 Honorary memberships.

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Contact: David Garnett / Helen Waldron

Committee Reports ... continued from Page 5

As you know, our contract with Elsevier to publish the AEG journal ended Dec 31, 1999. Your association has a new journal set for publication in 2001 entitled "Geochemistry: Exploration, Environment, Analysis" (GEEA). We are now accepting papers for GEEA which will be published by the Geological Society of London (GSL) in partnership with us (at a LOW institutional price). Our journal office is in the same location as previously:

c/o Marcia Scrimgeour, Editorial Assistant, GEEA,
72 Robertson Road, P.O. Box 26099
Nepean, ON K2H 9R0, CANADA
Tel: (613) 828-1222 Fax: (613) 828-2567
E-mail: geea@compmore.net

As a reminder, your AEG membership for 2000 (\$70) covers the cost of a hard-cover book entitled "Drift Exploration in Glaciated Terrain" edited by Beth McClenaghan and others. Unfortunately, the publication of this book has been delayed due to unforeseen circumstances. It is now scheduled for distribution in the first half of next year. Your membership fee of course continues to include Explore and any other services the AEG can offer you.

During 1999 we purchased a file back-up system and we converted our membership database application from Alpha 4 to Microsoft Access.

I look forward to another year of serving the membership to the best of my ability and invite each of you to contact me if I can be of any assistance.

Betty Arseneault
AEG Business Manager
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email: aeg@synapse.net

By-Laws Review Committee

A number of modifications to the By-Laws are required and it was intended that these would have been put to members for ratification by now. However, rather than reviewing the By-Laws in a piecemeal fashion the By-Laws Committee felt that it would be better to await final clarification on important outstanding issues. These include the break with Elsevier, which gives us greater freedom to promote our new journal, including the opportunity to reintroduce corporate membership. The other major issue is the reopening of the debate on the scope of the AEG and its definitions of eligibility for membership (see Nigel Radford's review in **EXPLORE** No 108). The Committee will review comments from members with a target of presenting proposals for revision of the By-Laws to Council by the end of this year. This will mean that the proposed revisions will be circulated to members in the first half of 2001.

David Garnett
Chairman By-Laws Review Committee

Geochemistry: Exploration, Environment, Analysis - Editor's Report

Publication of the AEG's new journal, *Geochemistry: Exploration, Environment, Analysis (GEEA)* commences in 2001, in partnership with the Geological Society of London (<http://www.geolsoc.org.uk>). GEEA's scope is similar to our old Journal of Geochemical Exploration but expanded to cover the geochemistry of the environment surrounding mineral deposits and mines. It will be available in hard and electronic copy and has the support of the Association of Research Libraries (ARL). ARL will operate with the Scholarly Publishing and Academic Resources Coalition, SPARC, an alliance of libraries and institutions established as an ARL initiative but with membership reaching beyond ARL ranks. GEEA's subscription price to libraries is to be low, well under typical charges by Elsevier.

Mike Collins is the Geological Society's editor responsible for GEEA in Bath, UK. The structure of the Board is as follows:

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G.E.M. Hall (Canada)

Associate Editors

C.R.M. Butt (Australia)
J.G. Farmer (Scotland)
P. Freyssinet (France)
M. I. Leybourne (USA)
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R.J. Goldfarb (USA)	E.F. Weiland (USA)
E.C. Grunsky (Canada)	X. Xie (China)
N. Imai (Japan)	

Two of the four issues scheduled for 2001 are: *Gold in the Yilgarn*, edited by Charles Butt; and *Evolution and remediation of acid-sulfate groundwater systems at reclaimed minesites*, edited by Joe Donovan and Art Rose. Instructions to authors may be found at the aeg website (<http://www.aeg.org>). We are seeking regular papers within the scope of this new journal; manuscripts may be submitted to:

Marcia Scrimgeour, Editorial Assistant, GEEA,
72 Robertson Road, P.O. Box 26099
Nepean, ON K2H 9R0, CANADA
Tel: (613) 828-1222 Fax: (613) 828-2567
E-mail: geea@compmore.net

Gwendy Hall, Editor-in-Chief,
Geochemistry: Exploration, Environment, Analysis

Continued on Page 7

Committee Reports ... *continued from Page 6*

Newsletter Editor's Report

EXPLORE has continued to be published on a quarterly basis. The close involvement of Tom Nash, who retired from the Editorship early in the year after long service, is sorely missed, but fortunately he is always available for advice when needed. Sherman Marsh is also accessible, and continues to oversee the packaging and mailing side of the business, a not insignificant task. We continue to benefit from the skills and dedication of Vivian Heggie, our graphics and production editor. Dave Kelley has recently taken over the position of Business Manager following Owen Lavin's retirement after innumerable years of dedicated service to EXPLORE in a variety of capacities. David is currently examining ways in which we can increase our advertising revenues so that EXPLORE can become more self-supporting.

Although quality technical contributions continue to be received as a result of the efforts of editorial staff we could always do with more. The newsletter is designed to be a platform for members. Don't hesitate to come forward if you have something to report or something to say, as long as it is not libellous!

Lloyd James
Editor

New Membership Committee

The Committee has focused its energy on the creation of student chapters around the world.

Mark Elliott (elliottmark@bigpond.com) is organizing the students at James Cook University, while David Cohen (d.cohen@unsw.edu.au) is working on several fronts: University of New South Wales, University of Wollongong, ANU, AGSO, and CRC LEME, all in Australia. Bill Burstow (savant@mstg.net) is banging on the brickwork along the Colorado Front Range from Golden to Fort Collins, and Matt Leybourne (mleybo@utdallas.edu) is gathering interest at the University of Texas, Dallas.

Meanwhile, the AEG Student Chapter at the University of Nevada, Reno is already very active. President Mark Coolbaugh (mfc@scs.unr.edu) and faculty advisor Gina Tempel (gina@mines.unr.edu) are planning an active year of lectures from local and visiting geoscientists. Last year, Todd Wakefield, Clark Smith, and graduate students Marcus Johnston and Mark Engle were the lunchtime speakers. This school season began with a presentation by Patrick Highsmith during a hosted lunch by ALS-Chemex.

A Student Chapter Corner has been created on the AEG Website to feature our student chapters, to provide information about them, and to exchange ideas amongst the chapters and the membership. In the coming months, this will be a very active corner and one you should visit regularly.

Mark Elliott has assumed the responsibilities of Chair of the Student Affairs Committee, which is currently a subcommittee of the New Membership Committee. The SAC will directly assist the creation of student chapters and allow the NMC to attend to the other tasks of encouraging new membership.

On other fronts, the NMC is studying ways to improve exposure at conferences. The AEG booth was at the Geological Society of Nevada's Symposium 2000 in Reno last May where several promotional publications were available. The booth will

be updated to announce our new journal (Geochemistry: Exploration, Environment, Analysis) before being shipped to Santiago for the next IGES in May, 2001. Since exploration is still very active in South America, this should be an excellent venue for new members.

The NMC will be working hard on these and many other programs through 2001 and expect to see a significant increase in AEG membership in the coming years. We welcome any and all ideas the general membership would like us to consider.

Shea Clark Smith
Chairman New Membership Committee

Review of Regional Councillors' Activities for 2000.

Much of the work of the AEG's Regional Councillors is unseen by most of our Members. More often than not, their work for AEG is done just by word of mouth, talking to their colleagues and associates, and occasionally helping a new member into the Association. A full list of the Regional Councillors can be found on the AEG website at www.aeg.org. We would encourage all members to keep in touch with their Regional Councillors, if only to say G'Day!

However, some of the Regional Councillors end up, from time to time, taking more proactive roles in matters geochemical. Since the last AGM in Vancouver in April 1999, Regional activities in Africa have seen a workshop on regolith geochemistry being presented by Charles Butt in his role as distinguished lecturer. The efforts of Charles Okujeni have resulted in a proposal for an International Geochemical Exploration Symposium (IGES) to be held in Durban, South Africa, at some future date.

The Regional Councillors in South America are involved in the organisation of the 20th IGES, to be held in Santiago de Chile from 6 to 10th May 2001. The conference is entitled "Geochemistry and Exploration: 2001 and beyond". Further details including the call for papers for this most exciting of conferences can be found under "Forthcoming Events" on the AEG website at www.aeg.org.

In eastern Australia, the AEG is establishing a student chapter at the James Cook University in Townsville, North Queensland. This will be only the second AEG student chapter, and the first outside North America. This provides an excellent way to encourage young earth science students to join our Association, and thanks are due to Mark Elliott for pursuing it. In Western Australia, AEG has helped convene two conferences in the last 12 months, one on "Geochemistry for the New Millennium" and a two day symposium on the "Geology of the Yandal Belt". Both events were well attended and stimulated much debate. Since then, Dr Cliff Stanley of Acadia University in Nova Scotia, Canada, presented a one day workshop on the application of Pearce Element Ratio Analysis in litho geochemistry. This latter event was co-sponsored by the University of Western Australia's Student Chapter of the Society of Economic Geologists.

In the UK and Ireland, Chris Johnson is retiring from his role as Regional Councillor; thanks for your help over the years Chris. So far we have one nomination to replace Chris from Dee Flight from the British Geological Survey. Any other nominations out there? Send them in quickly via the AEG website prior to the AEG on 21 November. The UK and Ireland members will have their work cut out providing the backing for the 21st IGES which is to be held in Dublin, Ireland in 2003.

Continued on Page 8

Committee Reports ... *continued from Page 7*

Elsewhere in Europe we get updates from J. B. de Smeth in Holland, and from Clemens Reimann in Norway. Clemens has now agreed to be the AEG's next Distinguished Lecturer. He is also moving to South East Asia shortly, so there will be another Regional Councillor vacancy. Any offers?

In Asia, our Regional Councillor in China, Dr. Guangshung Yan has recently been replaced by Dr Wang Xueqiu. We welcome Dr Wang and look forward to hearing news from geochemists in China in the near future.

The Regional Councillors are there to help you, the members of the Association. I urge all of our members to find out who your local Councillor is, and drop him or her an e-mail, see what events might be coming up. Perhaps you can offer some help with a conference or workshop. You might perhaps be prepared to talk to a student body at your local university and try to encourage some new blood into the veins of the AEG! New blood always seems to flow faster than old! New blood we need! Please lend a hand, and let's make the AEG even more relevant to our science!

Nigel Radford
Vice President

Secretary's Report

Since the Association's last Annual General Meeting in April 1999, AEG Council and Executive held five regularly scheduled meetings by telephone conference in July 1999, October 1999, January 2000, April 2000, and August 2000. Significant accomplishments included:

1. Establishing a formal protocol for proposing, discussing, and voting on motions via email. This protocol allows for a full airing of all issues pertaining to a motion and allows Council to conduct more efficient phone conferences.
2. Development and approval of new guidelines for groups wishing to host the International Geochemical Exploration Symposium.
3. Development and approval of revised guidelines for awarding honorary membership to the Association.

David B. Smith
Secretary

Symposium Committee Report

The last IGES was held in Vancouver, Canada, in April 1999 and outgoing Symposium Committee Chairman Fred Siegel presented a report for the AGM that was held during the Symposium and appeared in **EXPLORE** 103. Thanks Fred! General impressions of the Symposium were favourable and I am happy to report, in addition, that an overall profit of about \$7,500 (Canadian) was made. Subsequent to the Vancouver IGES I took over Chairmanship of the Committee which now comprises seven other members, including four who served under Fred's chairmanship.

A set of Symposium Guidelines was drafted and after many frank exchanges, and almost as many revisions, was approved by Council in November 1999. I would like to thank everyone who contributed to this important document, a PDF of which can be downloaded from the Website.

Planning is well under way for the 2001 IGES, to be held in Santiago, Chile from May 6th to 10th and the 2nd Circular

should be out, and appearing elsewhere in the newsletter, by the time this report appears. Hotel accommodation to suit a variety of budgets has been secured, and there will be field trips to localities of interest in Chile, Peru and Brazil. Planning for at least six short courses is under way, and the number and quality of abstracts received to date are encouraging.

The 2003 IGES will be held in Dublin, Ireland, the organizers of which submitted a superb proposal which was unanimously approved by Council. I can email a PDF of this document to any AEG member who requests it. Plans for the 2005 IGES have not been made, nor serious proposals received. It is probably time to solicit bids from interested organizations.

AEG was a co-sponsor of the symposium "Geology and Ore Deposits 2000: The Great Basin and Beyond" organized by the Geological Society of Nevada in Reno and Sparks from May 15th-18th. A workshop entitled "Geochemical Methods for Buried Ore Deposits" attracted more than 60 participants, and featured more than 20 speakers, including a significant contribution by students of the University of Nevada at Reno.

The Association will also be co-sponsoring "Global Exploration 2002-Integrated Methods for Discovery", organized by the Society of Economic Geologists in Denver in April 2002. An Exploration Geochemistry workshop aimed for geologists, geophysicists and remote-sensing specialists has been proposed for pre-meeting.

We have received a request to participate in, and assist in publicizing, the 25th Peruvian Mining Convention and the 2nd International Congress ProEXPLO 2001 in Lima on June 8, 2001. A request that AEG participate in the technical program of NWMA 2000 in Spokane this December, with a Geochemistry Session and a Geochemist Chairman, appear to have gone unanswered as no session is scheduled in the program.

Steve Amor
Chairman, Symposium Committee
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Burlington, ON, Canada
L7S 2K9
email: steveamor@compuserve.com

Treasurer's Report

During the course of this year, Eion Cameron handed over the responsibility of AEG investment manager to HSBC Asset Management, Vancouver. Before doing so, he carried out a thorough evaluation of potential firms by: (a) preparing a Financial Management and Investment Policy (FMIP) for the AEG; (b) sending a request for proposal (with the FMIP) to 27 companies listed by the Investment Dealers Association of Canada; (c) creating a short list of four companies for follow-up interviews; and (d) selecting the optimum firm according to established criteria of capitalization, performance and global expertise. Eion put a lot of effort, thought and time into this exercise for which the AEG is extremely grateful. Any requests made by the Treasurer to transfer monies out of securities/mutual funds (e.g. when cash flow is low) will be agreed upon beforehand (and documented) by the AEG President, Vice-President and Secretary.

The audit for 1999 by McCay, Duff and Co., our chartered accountants, was finalised only recently as Elsevier was slow to complete its final financial statement for our last year with them as publisher of the journal. Any member of the AEG may request the full auditor's report from the AEG office or myself.

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Committee Reports *Continued from Page 8*

I would like to thank McCay, Duff (especially Bob Shantz), Betty and Al Arseneault of the Business Office, and Eion Cameron for all their input to the AEG financial records and activities.

Summary of Audited Financial Statements (in US \$), as of Dec. 1999

	1999	1998
Current Assets		
Current (cash + securities)	464,085	425,949
Capital	2,688	1,712
Total	466,773	427,661
Current Liabilities		
Accounts payable	26,480	13,885
Deferred revenue	19,692	734
Member donations payable	5,454	4,370
Total	51,626	18,989
Members' Equity		
Unrestricted	409,187	403,688
Invested in capital assets	2,688	1,712
Reserve for Geoanalysis	3,272	3,272
Total	415,147	408,672
Revenue		
Dues	66,450	70,705
Symposium and workshops	13,334	7,022
Interest and dividends	28,385	25,913
Publications-book orders	2,484	5,079
Royalties	24,114	29,658
Miscellaneous	4,246	234
Total	139,013	139,511
Expenditures		
General and administration	44,346	28,834
Publications and Newsletter	53,410	52,095
Total	97,756	80,929
Net Revenue from Operations	41,257	58,582

ALS Chemex Ad

Gwendy Hall, AEG Treasurer
Oct 2, 2000

Website Report

The writer became AEG Webmaster in the summer of 2000, though the exact date when this became official is hazy. As well as the updating of committee listings and other administrative details, a number of changes have been enacted, including the following:

- Weekly updates (if necessary)
- A brochure and online "Interest Survey" for the upcoming Santiago IGES
- Online voting for the upcoming election of Ordinary Councilors
- A revamped, updated and expanded "Links" page
- A "Student Chapters" page, currently occupied only by the University of Nevada at Reno. More are in the pipeline, I am assured

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Committee Reports ... *Continued from Page 9*

- A “Chemical Elements” page, listing exploration applications of commonly analyzed elements. It is planned to expand this to cover more elements, including the more “difficult” ones — preferably through contributions from browsers
- A page for the AEG’s new journal, “*Geochemistry: Exploration, Environment, Analysis*”

Future improvements that are envisaged include:

- A revised bibliography in relational database format
- Downloadable PDFs of EXPLORE
- Online payment of membership dues
- A bulletin board or chat room
- The new version of “Writing Geochemical Reports”
- Regional Councillor’s reports
- Software downloads

We also need to raise the site’s profile on the major search engines.

I invite everybody to visit, comment on and contribute to this website. JPEG or GIF photos of geochemists at work, especially outside of North America, are particularly needed.

Steve Amor
AEG Webmaster
steveamor@compuserve.com



Geosoft

TECHNICAL NOTE

Aspects of EDTA Partial Digest Extractions in Variable pH Terrains – the Vulnerability of Unbuffered Digests

Introduction

Partial digest solutions are used as a geochemical exploration tool, particularly for base metals, to enhance anomaly contrast in areas of surface or near surface mineralisation, or to produce lower order but still significantly contrasting anomalies over buried mineralisation which may not be visible using conventional ‘total digest’ techniques.

This paper serves to reinforce recent comments from experienced geochemists (Smee, 1999) that changing soil conditions may adversely affect the recovery of targeted elements when using weak or poorly buffered partial digests solutions.

Geological Setting

The test area lies within the Olary district of South Australia approximately 170 km west of the mining town of Broken Hill in western New South Wales. The terrain is typified by the development of only a thin unstructured residual soil (rudisol) with minor colluvium/alluvium resting on saprolite. The soils closely reflect underlying lithologies.

Host rocks are Lower to Mid Proterozoic quartzofelspathic, pelitic and calcsilicate metasediments and schists. The calcsilicates are associated with minor ferruginous quartzites and calcitic marble, which are inferred to be the host stratigraphy for zinc mineralisation.

A single line traverse of -2mm soils were screened from within the top 20 cms of the soil profile along a traverse in an area of known zinc mineralisation.

Analytical Method

Di-sodium ethylene diamine tetra-acetic acid (EDTA) has been used extensively in the environmental sciences as a powerful complexing agent for a variety of elements, particularly base metals. It has been used to extract metals freshly adsorbed onto organic matter (Luoma and Jenne, 1976, Miller et al, 1986), to extract trace metals from Fe-oxide or Fe-hydroxide species (Miller and McFee, 1983) and to release metals by dissolution of carbonates (Stover et al 1976).

A 0.0002M EDTA solution was selected to remove weakly bound zinc from soils developed over poorly exposed zinc mineralisation and to enhance anomaly contrast over existing ‘total digest’ features. Twenty grams of unpulverized -2mm soil was digested for 1 hour at room temperature in 40mls of 0.0002M EDTA.

A second digest using 0.0002M EDTA was also carried out on a duplicate set of samples. This time each soil solution was checked for pH by a calibrated pH electrode. Individual samples were then titrated to a final solution pH of between 4 and 4.5. Samples with a pH in excess of 4.5 were adjusted to pH 4 using concentrated acetic acid. Once the targeted pH range had been achieved the samples were left for 1 hour to reach equilibrium. Aliquots were then removed and centrifuged.

A single highly alkaline soil sample (50 gms) was also titrated in a solution with a fixed concentration of 0.0002M

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Aspects of EDTA Partial Digest ...

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EDTA (100ml). Progressively increasing amounts of acetic acid were added after a small aliquot was removed. Aliquots were removed at 1 hour intervals and pH recorded. All aliquots were centrifuged and zinc was determined using a VARIAN Spectra AA55 Atomic Absorption Spectrometer. A "total" digest was carried out using a combination of hydrofluoric, nitric, perchloric and hydrochloric acids.

Results

The titration of a single alkaline soil sample (figure 1.) indicates that the optimum pH for maximum extraction of weakly bound zinc for this soil lies between 3.8 and 5.

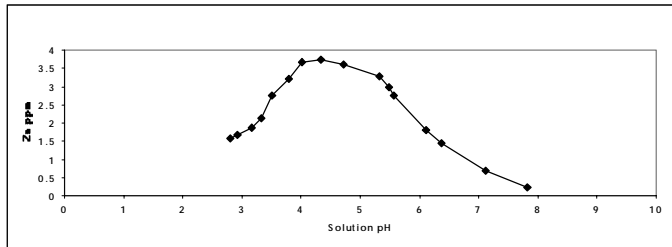


Fig.1. Titration of sample B81. Solution pH vs solution Zn ppm.

In an alkaline soil, zinc is most likely to form carbonate, bicarbonate and hydroxide surface adsorption species making it difficult for direct complexation by EDTA. Increasing acidification results in the formation of free Zn cations which become effectively chelated by EDTA. Below a pH of around 3.6 the Zn-EDTA complex becomes less stable and protonated EDTA is likely to be the more stable species.

Profiles of recovered zinc using unbuffered EDTA, EDTA titrated to a pH of between 4 and 4.5 and total digest zinc are shown on figure 2.

The total digest profile defines a feature between samples B79 and B84. The unbuffered EDTA profile also establishes large features over these two zones although naturally alkaline samples show significantly compromised zinc recovery.

Samples B81 and B83 have natural soil pH's (determined on slurries with soil:water ratios of 1:5) 9.76 and 9.53 respectively. The addition of unbuffered EDTA has resulted in a solution pH for these samples of 8.04 and 6.04. The graph in figure 1 indicates that this will lead to reduced zinc recovery. Further titration (acidification) to the target pH of between 4 and 4.5 has clearly improved zinc recovery.

If the total digest profile is used as a control, it can be seen that the subsequent titration has improved the responses so that the profiles now follow those defined by the total digest.

Anomaly to background plots are shown in figure3. The background was calculated by using the 25th percentile for each digest data-set.

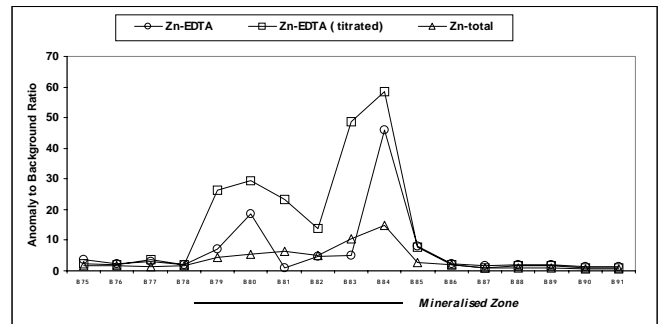


Fig.3. Anomaly to Background Ratio using 25th percentile as background.

Conclusions

Partial digests can be powerful tools in detecting low level dispersion or enhancing anomaly contrast. They may involve the use of reagents and procedures that are unfamiliar to many explorers. The provision of additional information such as final leach solution pH or Ca concentration assumes the recipient is in a position to interpret its significance. An alternative suggestion is that those laboratories or chemists advocating partial digests understand the limitations of their techniques, communicate these to end-users and work within those limitations.

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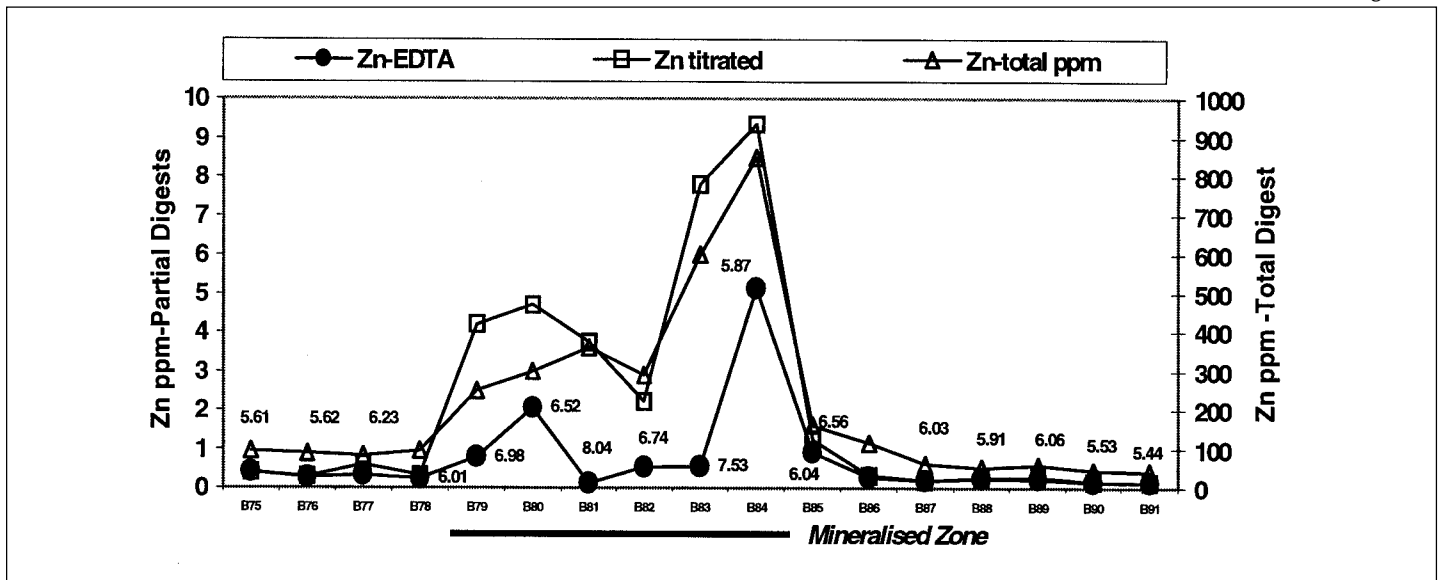


Fig.2. Zinc recovery using unbuffered EDTA, EDTA titrated to pH 4 and total zinc. Final solution pH shown for unbuffered EDTA.

Call for Papers

The 20th International Geochemistry Symposium "Geochemistry and Exploration" Santiago de Chile -

TECHNICAL PROGRAMME - Monday May 7th to Thursday May 10th, 2001

We are assembling a diverse programme to address most exploration and environmental issues which will cover many case histories including the following:

1. Exploration for concealed gold, porphyry copper and other base metal deposits,
2. Geochemical Methods,
3. Arid saline environment exploration geochemistry,
4. Port site sea water and sea bed geochemistry
5. Exploration in deeply weathered areas emphasizing partial extractions,
6. Isotope geochemistry applied to ore search,
7. Industrial Minerals exploration for Lithium, Iodine, Boron, Borates and Nitrates,
8. Geochemical Bridges : Environment and Exploration Applications.

Abstracts are due no later than January 31st 2001. Format is 1 page or 500 words maximum to be sent by email or mail in Word or similar format. Complete papers may be sent to the Association of Exploration Geochemists (aeg@synapse.net) or Symposium Technical Chair, Colin Brooks (colbrx@ibm.net) for review and possible acceptance for publication in the post symposium volume. Instructions for authors may be found at www.aeg.org.

PRE-SYMPOSIUM FIELD TRIPS

From Monday April 30th to Saturday May 5th 2001

Our intention is to offer a choice of ore hosting environments with emphasis on appropriate geochemical exploration methods. Each leader will provide background information as required. **Note that all trips are pre-conference and that the registrant is responsible to arrange travel to and from the starting point of each of the field trips. Registration deadline is January 15th 2001 and a minimum of 10 people are required for each trip.**

- F1. Northern Chile Porphyries, Alvaro Puig, Codelco.
- F2. Southern Peru Porphyries, Chris Benn, BHP.
- F3. Northern Peru Epithermal Gold Deposits, Todd Wakefield, Newmont
- F4. Brazil, Carajas Region, Amazon, Marcondes da Lima, University of Belem.

Abstracts received to date

Geochemical mapping in Italy. Benedetto De Vivo, Napoli, Italia.
Geochemistry of soil and stream sediments around a Porphyry Copper deposit in Mongolia. Mary E. Doherty, Colorado, USA.
Gold Prospecting in Northern Portugal. Amelia Paula Marinho Rei, Aviero, Portugal.
A rapid method (from 70 ppb) determination of gold in the field. Tommaso Tosiani, Caracas, Venezuela.
Styles of Pacific Rim epithermal gold. Greg Corbett, North Sydney, Australia.
Breccias in Pacific Rim gold-copper deposits. Greg Corbett, North Sydney, Australia.
Results of selective extractions over a concealed Pb-Zn massive deposit in glaciated, permafrost terrain, Yukon territory, Canada. W.K. Fletcher and J.Bond, Vancouver, Canada.
Dispersion of gold in a rain forest stream in S.Kuli region, Sabah, Malaysia: implications for exploration. W.K. Fletcher and J. Muda, Vancouver, Canada.
Problems in low density regional sampling programmes for gold in mountainous terrain. J. Hobday and W.K. Fletcher, Vancouver, Canada.

Exploration geochemistry of surficial deposits and stream sediments at the Pascua/ Lama high sulphidation deposit, Chile-Argentina. Emily Chastain and W.K. Fletcher, Vancouver, Canada.
Geochemical maps of Sardinia, Italy. Maria Boni, Largo San Marcellino, Napoli, Italy.
Asian Mineral exploration. Laurence P. James, Pusan, Republic of Korea.
Location and characterization of late hydrothermal channels using lithochemical methods, coast Cordillera, Venezuela. Simone E. Rodriguez, Caracas, Venezuela.
Dispersion of Se in rock-soil-plant system. Hyo-Taek CHON, Seoul, Korea.
Northern Chile Sulphur Isotope regional geochemistry and the origin of the Nitrate deposits. Chris Oates, London, UK.
Geochemistry of ore forming elements in sediments of Cenozoic depressions in the Baikal rift zone. Natalia N. Brukhanova, Irkutsk, Russia.
Exploration Geochemistry in Egypt. Mohamed A. Morsy, Alexandria University, Egypt.

Chemical Exploration Symposium (IGES) Exploration 2001 and Beyond” May 6th to May 10th, 2001

POST-SYMPOSIUM PROFESSIONAL SKILLS UPGRADING WORKSHOPS

From Friday May 11th to Saturday May 12th 2001.

We are pleased to offer a wide variety of 2 day courses for professional skills upgrading. Full details of the courses will be posted on the web at www.aeg.org. Please note that the deadline for registration is January 31st 2001. The following workshops are being offered :

- W1. Regolith geochemistry. Ian Robertson and Mel Lintern, CSIRO, Perth
- W2. Lithocaps, Richard Sillitoe, London, UK.
- W3. High Sulphidation Ag-Au Systems, Greg Corbett, Sydney, Australia.
- W4. Standard Quality Control, Richard Beane,
- W5. Stream Sediment Drainage Geochemistry, K.Fletcher, Vancouver, Canada
- W6. Spectral & Hyperspectral Remote Sensing in Mineral Exploration, Bob Agar, Lesmurdie, Australia.
- W7. Environmental Geochemistry, William Chavez, USA.

Further information via:

AEG website at www.aeg.org

Email: IGES20@netup.cl

Fax: 562 748 6772 (Acme Chile)

Information Phone: 562 748 6771 (Acme Chile)

Mail: 20th IGES, c/o Acme Analytical Laboratories (Chile) Ltda.

Av. Oceanica 7152, Pudahuel, Santiago, CHILE

te include the following :

Hydrogeochemical Exploration for Concealed Ni and Au deposits in a Hyper saline Playa Lake Environment. Michelle Carey, WMC Resources / Monash University, Australia..

Integrated Regional Geochemistry, Geophysics and bedrock mapping targets Proterozoic Mineralization in Western Australia. Paul Morris, Geological Survey of Western Australia.

Geochemistry of Ni-Co laterite deposits of the Eastern Goldfield, use of biogeochemistry in exploration. Dennis Arne, Kalgoorlie, Australia.

Baseline and pollutant concentration in seabed sediment cores from natural and anthropogenic sources, selection problems and partitioning. Frederik R.Siegel, USA.

The application of soil and partial leach geochemistry to exploration in the Eastern Highlands of Victoria, Australia. Keith Scott, CRC LEME - CSIRO Exploration and Mining, Australia.

Recovery of metals from remediation of polluted soil. Henrik K. Hansen, Denmark.

Environmental Contamination and Risk Assessment of Toxic Heavy Metals by Past Au-Pb-Zn Mining Activity. Jin-Soo Lee, Seoul, Korea.

Environmental studies Province San Juan, Argentina. Walter L. Plueger, Aachen, Germany.

Identification of Cu, Pb, Zn and As as metal bearing phases in tailings samples using sequential extractions. Eduardo Anselmo Ferreira and Carla Alexandra Figueiredo Patiuha, Aviero, Portugal.

Heavy Metals in groundwater around massive sulphide deposits : exploration and environmental aspects. Helene Pauwels, BRGM, Orleans, France.

Environmental geochemical exploration in the area of an old Copper mine, Asturias, Spain. Jorge Loreda, Oviedo, Spain.

Industrial minerals from Geothermal water of Puga, India. S.K.Sharma, Dehradun, India.

Aspects of EDTA Partial Digest ...

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Acknowledgments

The Directors of Basin Minerals Ltd (formerly Craton Resources NL) are thanked for permission to use the data. Terry Wheeler of Genalysis Laboratory Services Pty Ltd is thanked for his permission to publish this paper.

References

- Luoma, S.N., and Jenne, E. A. 1976. Estimating bio-availability of sediment-bound trace metals with chemical extractants. *Trace Subst. Environ. Health* 10:343-351.
- Miller, W.P., Martens, D. C., Zelazny, L. W., and Kornegay, E. T., 1986. Forms of solid phase copper in copper-enriched swine manure. *Jour. Environ. Qual.* 15: 69-72.
- Miller, W.P., and McFee, W. W. 1983. Distribution of Cd, Zn, Cu and Pb in soils of industrial north western Indiana. *Jour. Environ. Qual.* 12:29-33.
- Stover, R. C., Sommers, L. E., and Silveira, D. J., 1976. *Jour. Water Poll. Control Fed.* 48: 2165-2175.
- Smee, B. W. 1999. The Effect of Soil Composition on Weak Leach Solution pH: a Potential Exploration Tool in Arid Terrains. *Explore* No 102: 4-7.

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RECENT PAPERS

This list comprises titles that have appeared in major publications since the compilation in *Explore* Number 109. Journals routinely covered and abbreviations used are as follows: *Economic Geology* (EG); *Geochimica et Cosmochimica Acta* (GCA); the USGS Circular (USGS Cir); and Open File Report (USGS OFR); Geological Survey of Canada Papers (GSC) and Open File Report (GSC OFR); *Bulletin of the Canadian Institute of Mining and Metallurgy* (CIM Bull.); *Transactions of Institute of Mining and Metallurgy, Section B: Applied Earth Sciences* (Trans IMM). Publications less frequently cited are identified in full. Compiled by L. **Graham Closs**, Department of Geology and Geological Engineering, Colorado School of Mines, Golden, CO 80401-1887, Chairman AEG Bibliography Committee. Please send new references to Dr. Closs, not to **Explore**.

Arbogast, B.F., Knepper, D.H., and Langer, W.H., 1999. The Human Factor in Mining Reclamation. *USGS Cir.* 1191. 28 p.

Arnason, J.G. and Bird, D.K., 2000. A Gold- and Platinum-Mineralized Layer in Gabbros of the Kap Edvard Holm Complex: Field, Petrologic, and Geochemical Relations. *EG* 95(5): 945-970.

Audetat, A., Gunther, D. and Heinrich, C.A., 2000. Magmatic-hydrothermal evolution in a fractionating granite: A microchemical study of the Sn-W-F-mineralized Mole Granite (Australia). *GCA* 64(19): 3373-3393.

Belzile, H., Chen, Y.W., and Xu, R., 2000. Early diagenetic behavior of selenium in fresh water sediments. *Applied Geochem.* 15(10): 1439-1454.

Blyth, A., Frapce, S., Blomquist, R., and Nissynen, P., 2000. Assessing the past thermal and chemical history of fluids in crystalline rocks by combining fluid inclusion and isotopic investigations of fracture calcite. *Applied Geochem.* 15(10): 1417-1437.

Brown, W.M., Gedeon, T.D., Groves, D.I., and Barnes, R.G., 2000. Artificial neural networks: a new method for mineral prospectivity mapping. *Aust. J. Earth Sci.* 47(14): 757-770.

Chandrajith, R., Dissanayake, C.B., and Tobschall, H.J., 2000. Sources of stream sediments in the granulite terrain of Walawe Ganga Basin, Sri Lanka, indicated by rare earth element geochemistry. *Applied Geochem.* 15(9): 1369-1381.

Coad, P.R., Brisbin, D.I., Labine, R.J., and Roussain, R., 1998 (2000). Geology of the Owl Creek Gold Mine, Timmins, Ontario. *Explor. Mining Geol.* 7(4): 27-286.

Couture, J.F., 2000. Towards a new era of earth science integration. *Geoscience Canada* 27(3): 105-110.



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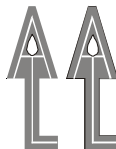
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Recent Papers ... *Continued from Page 14*


- Eckstrand, O.R. and Good, D.J. (Compilers), 2000. World Distribution of Nickel Deposits. GSC OFR 3791a. 19 p. (1 map and 1 diskette).
- Frempong, P.K., 1999. The development of a robust sampling strategy and protocol in underground gold mines. *Aus. IMM Proc.* **304**(2): 15-22.
- Hitrchon, B., 2000. "Rust" contamination of formation waters from producing wells. *Applied Geochem.* **15**(10): 1527-1533.
- Jubeli, Y., Al-Hilal, M., Rajia, G., and Al-Ali, A., 1998 (2000). Radiometric Profiles of Uranium Dispersal Pattern Adjacent to Cretaceous Phosphatic Sediments in Wadi Qasser Al-Hallabat Basin, Central Syria. *Explor. Mining Geol.* **7**(4): 313-319.
- Kirkham, R.V. and Dunne, K.P.E. (Compilers), 2000. World Distribution of Porphyry, Porphyry-Associated Skarn, and Bulk-Tonnage Epithermal Deposits and Occurrences. GSC OFR. 26 p. (1 map and 1 diskette).
- Moore, A.G., Cas, R.A.F., Beresford, S.W., and Stone, M., 2000. Geology of an Archean metakomatiite succession, Tramways, Kambalda Ni province, Western Australia: Assessing the extent to which volcanic facies architecture and flow emplacement mechanisms can be reconstructed. *Aust. J. Earth Sci.* **47**(4): 659-673.
- Perring, C.S., Pollard, P.J., Dong, G., Nunn, A.J., and Blake, K.L., 2000. The Lightning Creek Sill Complex, Cloncurry District, Northwest Queensland: A Source of Fluids for Fe Oxide Cu-Au Mineralization and Sodic-Calcic Alteration. *EG* **95**(5): 1067-1089.
- Plant, J.A. and Jones, D.G., 1999. Development of Regional Exploration Criteria for Buried Carbonate-Hosted Mineral Deposits: A Multi-disciplinary Study in Northern England. BGS Tech. Rept. WP/91/1.
- Richard, J.H., Lentz, D.R., Ford, K.L., and Taylor, R.P., 1998 (2000). Gamma-ray Spectrometric Applications to Volcanogenic Massive Sulfide Exploration in the Heath Steele Mines Area, Bathurst Camp, New Brunswick. *Explor. Mining Geol.* **7**(4): 287-299.
- Ruano, S.M., Rosua, F.J.C., Hach-Ali, P.F., Chacon, F., and Lopez, E.C., 2000. Epithermal Cu-Au mineralization in the Pali-Islica deposit, Almeria, southeastern Spain: fluid inclusion evidence for mixing of fluids as a guide to gold mineralization. *Can. Min.* **38**(3): 553-565.
- Sanchez-Espana, J., Velasco, F., and Yusta, I., 2000. Hydrothermal alteration of felsic volcanic rocks associated with massive sulphide deposition in the northern Iberian Pyrite Belt (SW Spain). *Applied Geochem.* **15**(9): 1265-1290.
- Sangster, D.F. and Hillary, E.M., 1998 (2000). SEDEX lead-zinc deposits – Proposed sub-types and their characteristics. *Explor. Mining Geol.* **7**(4): 341.
- Savage, K.S., Bird, D.K., and Ashley, R.P., 2000. Legacy of the California gold rush: Environmental geochemistry of arsenic in the southern Mother Lode gold district. *Intern. Geol. Rev.* **42**(5): 385-
- Schroeter, T.G., 2000. Workshop in subaqueous hot-spring deposits of Eskay Creek-type. *Geoscience Canada* **27**(2): 88-92.
- Schwartz, M.O., 2000. Cadmium in zinc deposits: Economic geology of a polluting element. *Intern. Geol. Rev.* **42**(5): 445.
- Shevenell, L.A., 2000. Water quality in pit lakes in disseminated gold deposits compared to two natural, terminal lakes in Nevada. *Environ. Geol.* **39**(7): 807-822.
- Simmons, S.F. and Browne, P.R.L., 2000. Hydrothermal Minerals and Precious Metals in the Broadlands-Okaaki Geothermal System: Implications for Understanding Low-Sulfidation Epithermal Environments. *EG* **95**(5): 971-999.
- Taner, M.F., Erict, T.S., and Gault, R.A., 1998 (2000). Vanadium-bearing magnetite from the Matagami and Chibougamau Mining Districts, Abitibi, Quebec, Canada. *Explor. Mining Geol.* **7**(4): 299-311.
- Therriault, R.D., Barnes, S.J., and Severson, M.J., 2000. Origin of Cu-Ni-PGE Sulfides Mineralization in the Partridge River Intrusion, Duluth Complex, Minnesota. *EG* **95**(5): 929-943.



ASSAYS AND GEOCHEMICAL ANALYSES



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Geoarchives/Preservation of Archival Materials

The International Union of History and Philosophy of Science (Division of History of Science) is very much interested in the preservation of archives relating to twentieth (and now twenty-first) century scientific achievements, which outnumber those of all previous centuries put together. Under the chairmanship of Professor R.W. Home of Melbourne University, its Commission on Bibliography and Documentation is therefore undertaking a world programme that aims to make the scientific community aware of the importance of preserving contemporary scientific archives.

The Bibliography and Documentation Commission has requested the assistance of the International Commission on the History of Geological Sciences (INHIGEO) in collecting information about the location of geoarchives and the encouragement of the preservation of the papers of notable geologists, geological organisations, and geological institutions.

At its meeting in Freiberg in September, 1999, INHIGEO nominated Professor K.S. Murty (India) to act as co-ordinator of information on the preservation of geoarchives. He will require the co-operation not only of Members of INHIGEO, but also of geologists, geological societies, and geological organisations all over the world, who can pass on to him relevant information concerning geoarchives in various countries.

Professor Murty may be contacted at
101 Sneh Chaya Apts, 28 Hindustan Colony,
Amaravati Road, Nagpur 440 010, India
(Tel. 91 712 557 984; Fax 91 712 549 521; E-mail
<ankush99_99@yahoo.com>).

Please send him names and addresses of contact persons (*e.g.* archivists), locations of significant geoarchives, the names and appropriate addresses of recently deceased important geoscientists whose papers should be preserved.

In addition, information on the following aspects of the preservation of geoarchives is requested:

1. Names and addresses of the key organisations involved in Earth Heritage Conservation;
2. Techniques being used to preserve the archival materials;
3. Details of catalogues, *etc.*, pertaining to geoarchives, or information about books or other documents that list geoarchives in any parts of the world;
4. Information about plans to produce further information of such kinds (item 3).

CALENDAR OF EVENTS

International, national, and regional meetings of interest to colleagues working in exploration, environmental and other areas of applied geochemistry.

- November 13-16, 2000, **Annual Meeting of the Geological Society of America**, Reno, Nev. INFORMATION: TEL 1-800-472-1988, meetings@geosociety.org.
- December 2-7, 2000, **Geochemistry of Crustal Fluids, Granada, Spain**. INFORMATION: J. Hendekovic, European Science Foundation, 1 quai Lezay-Marnésia, 67080 Strasbourg Cedex, France, phone 33-388-767135, fax 33-388-366987.
- December 4-6, 2000, **Sixth MIGA African Mining Investment Symposium, Ouagadougou, Burkina Faso**. Also technical excursions. INFORMATION: M. Barry, tel 202-473-3561, fax 202-522-2650, e-mail: mbarry2@worldbank.org
- December 14 - 19, 2000, **Pacificchem 2000**, Honolulu. INFORMATION: Congress Secretariat, c/o American Chemical Society, 1155 16th St. N.W., Washington, D.C. 20036, fax: 202-872-6128. E-mail: pacificchem@acs.org.
- December 15-19, 2000, **AGU Fall Meeting**, San Francisco, CA. INFORMATION: AGU Meeting Department, 2000 Florida Ave., NW, Washington, DC 20009, TEL: 202-462-6900. FAX: 202-328-0566. E-mail: meetings@kosmos.agu.org.
- March 12-14, 2001, **Northeastern GSA Sectional Meeting**. Chair: Barry Doolan, Burlington, Vermont.
- April 5-6, 2001, **Southeastern GSA Sectional Meeting**. Chair: Edward Stoddard, Raleigh, North Carolina.
- April 9-11, 2001, **Cordilleran GSA Sectional Meeting**. Chair: Peter Weigand, Northridge, California.
- April 23-24, 2001, **North-central GSA Sectional Meeting**. Chairs: Robert G. Corbett, Skip Nelson, Bloomington- Normal Illinois.
- April 29-May 2, 2001, **South-central and Rocky Mountain GSA Sectional Meeting**. Chair: Kevin Urbanczyk, Albuquerque, New Mexico.
- May 6-10, 2001, **Geochemistry and Exploration in Latin America, Santiago de Chile**. 20th International Geochemical Exploration Symposium, Santiago, Chile. INFORMATION: Phone: 56 2 748 6771. E-mail: proper3@attglobal.net.
- May 27-30, 2001, **Joint Annual Meeting of Geological Association of Canada - Mineralogical Association of Canada**, St. Johns, Newfoundland, Canada, by the Geological Association of Canada and the Mineralogical Association of Canada. INFORMATION: E-Mail: dgl@zeppo.geosurv.gov.nf.ca
Web: <http://www.geosurv.gov.nf.ca>
- June 10-15, 2001 **WRI-10: International Symposium on Water-Rock Interaction, Sardinia, Italy**, by the International Association of Geochemistry and Cosmochemistry. INFORMATION: Rosa Cidu, Department of Science della Terra, via Trentino 51, I-09127 Cagliari, Italy, E-Mail: cidur@unica.it
- June 24-28, 2001, **Earth systems processes, Edinburgh, Scotland**. GSA-GSL International meeting. INFORMATION: Ian Datzel, Ian@utig.ig.utexas.edu or Ian Fairchild, i.j.fairchild@keele.ac.uk.
- July 29-August 2, 2001, **International Conference on the Biogeochemistry of Trace Elements**, University of Guelph, Guelph, Ontario, Canada. INFORMATION: Dr. Kim Bolton,

Continued on Page 22

Elsevier Special Book Offer

In addition to their standard offer of 30% discount off list price to AEG members who purchase any of their technical books, Elsevier Science has agreed to a special price of US \$118.00 (40% discount off list price) on the recently published 572 page, hardbound book "Geochemical Remote Sensing of the Sub-Surface", provided they get an order for at least 25 copies

Any members interested in acquiring this book should place their order with Betty Arseneault at the address below so that she can forward the order to Elsevier once 25 orders have been received. Orders must be accompanied by a cheque or visa or mastercard authorizations.

Betty Arseneault, AEG Business Manager, PO Box 26099
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Handbook of Exploration Geochemistry, 7 Geochemical Remote Sensing of the Sub-Surface (ISBN: 0-444-50439-7)

**Edited by M. Hale, International Institute for Aerospace Survey and Earth Sciences and Delft University of Technology,
Delft, The Netherlands.**

Description

This volume documents the techniques for geochemical remote sensing of the subsurface, to present case-history evidence of their successes and limitations, and to consider their further potential. The chapters in Part I focus on the mechanisms and models of dispersion that give rise to the patterns we attempt to detect. Part II deals with the detection of dispersion patterns that owe their origins to processes, such as leakage, that are allied to resource emplacement. Part III describes the detection of dispersion patterns that are generated by processes, such as radiodecay and oxidation, taking place in deposits after their emplacement. Every chapter brings a fresh perspective. Radon has met with much success in uranium exploration, whilst thorough research studies on helium and mercury lead to conclusions that tend to discourage use of these gases in mineral exploration. The case for light hydrocarbons is one of compelling simplicity whilst elaborate mathematical and electrochemical models are advanced for metal migration.

Recommended

For geologists, researchers, scientists and those interested in mineral exploration geochemistry.

Contents

Part and chapter headings:

Preface.
Genetic Models of Remote Dispersion Patterns.
Genesis, Behaviour and Detection of Gases in the Crust (M. Hale).
Goelectrochemistry and Stream Dispersion (O.F. Putikov, B. Wen).
Spontaneous Potentials and Electrochemical Cells (S.M. Hamilton).
Remote Dispersion Patterns of Co-Genetic Provenance.
Carbon Dioxide Dispersion Halos Around Mineral Deposits (M. Zhang).
Light Hydrocarbons for Petroleum and Gas Prospecting (V.T. Jones et al.).
Gas Geochemistry Surveys for Petroleum (T. Ruan, Q. Fei).
Aerospace Detection of Hydrocarbon-Induced Alteration (H. Yang et al.).
Remote Dispersion Pattern of Post-Genetic Provenance.
Sulphur Gases (M.E. Hinkle, J.S. Lovell).
Sulphide Anions and Compounds (X. Sun).
Helium (C.R.M. Butt et al.).
Radon (W. Dyck, I.R. Jonasson).
Mercury (G.R. Carr, J.R. Wilmshurst).
Discrimination of Mercury Anomalies (Z. Hu).
Oxygen and Carbon Dioxide in Soil Air (J.S. Lovell).
References.
Author index.
Geographical index.
Petroleum and mineral deposit index.
Subject index.

DISTINGUISHED LECTURER - 2001

Clemens Reimann

The AEG is pleased to announce that Clemens Reimann has agreed to be the Distinguished Lecturer for the Year 2001. Clemens has had a distinguished career in the fields of exploration and environmental geochemistry. He holds a M.Sc. in Mineralogy and Petrology ("Diplom-Mineraloge") from the University of Hamburg (Germany), a Ph.D in mining geology ("Dr. mont.") from the Mining University Leoben (Austria) and a D.Sc. ("Habilitation") in Applied Geochemistry from the same University. He worked as a lecturer at the Institute for Mineralogy and Petrology at Leoben Mining University, as a project geologist in gold exploration in Eastern Canada, as a contract researcher in environmental sciences in Austria and as chief of laboratory in a large Austrian cement company, before joining the Geological Survey of Norway. He will be soon transferring to Indonesia to take up a new position.

He has suggested five possible lecture topics, the abstracts of which are presented below.

THE BALTIC SOIL SURVEY (BSS)

Agricultural soils were collected from 10 European countries over an area of 1,800,000 km² surrounding the Baltic Sea. The sampling density was one site per 2500 km². Two samples were

taken at each site: Topsoil 0-25 cm (ploughing layer, A -horizon) and subsoil (bottom samples, usually B- or C-horizon) at an approximate depth of 50-75 cm, well below the ploughed layer. The samples have been analysed for total element concentrations of 41 elements by WD-XRF. Further analyses by different extractions (ammonium acetate, aqua regia and multi acid extraction on milled samples), finished by ICP-AES, ICP-MS and GF-AAS, are presently underway.

Total element concentrations in both layers are quite comparable. However, large differences between element concentrations and variations can be observed for most elements when different countries are compared. The Nordic countries show considerably higher concentrations and variations for quite a number of elements (Al, Fe, (Mg, P), Ti, Ba, Sc, Sr, V) in their agricultural soils. This is an expression of geology, the relatively younger age of the soils here and of the climatic conditions (reduced weathering rates). Regional geochemical maps demonstrate that geology overwhelmingly dominates the total concentration of chemical elements as observed in the agricultural soils. The four large tectonic units (Caledonian Mountain Chain, Fennoscandian Shield and Northern and Southeastern European Platforms) composing this area are all reflected in the regional maps. Important ore fields in Norway and Sweden are also clearly visible in the regional maps. This demonstrates the potential of low-density geochemical mapping for mineral exploration. The maps give a reliable estimate of background concentrations for many elements in agricultural soils in a very large area. This is important knowledge for defining background levels and setting meaningful action levels. Information on the large-scale geochemical distribution of the elements allows to better understand element sources (e.g., geogenic or anthropogenic) and pathways.

GEOCHEMICAL MAPPING – TECHNIQUE OR ART?

Good, reliable geochemical maps are needed in mineral exploration as well as in environmental studies. Many different mapping techniques have been suggested for geochemical data during the last 20 years. Government authorities in different parts of the world have released geochemical atlases. When studying these atlases it becomes obvious that there is no established and generally accepted mapping technique for geochemical data. This is surprising considering that the regional distribution of chemical elements has important implications for many political decisions that may cost society billions of dollars. When looking through a selection of geochemical atlases even the non-expert will note that there are big differences in presentation, readability and, last but not least, "beauty".

What makes the difference between a poor and a "good" or, even more important, "reliable" geochemical map? And what are the techniques used to transfer analytical results to a geochemical map? Different approaches have been used to present geochemical data in black-and-white point-source maps. In some of the oldest examples, the actual data value was written at each sample site in the map. These maps are very difficult to read. The next step was the assignment of symbols to certain element ranges and then mapping these symbols according to the regional distribution of the sample sites. The choice of symbols has an enormous effect on the readability of the resulting map. In addition, the reliability of a map, based on data assigned to different classes, depends crucially on the choice of limits for each class. Later maps using symbols (mostly dots) which grow continuously in relation to the measured element concentration were introduced, avoid-

Continued on Page 19

The Association of Exploration Geochemists



is pleased to announce the

XRAL

2000 AEG Student Paper Competition

The Association of Exploration Geochemists will hold its thirteenth biennial Student Paper Competition this year. Papers eligible¹ for the competition must address an aspect of exploration geochemistry and represent research performed as a student. The student must be the principal author, and the paper must have been published in any refereed scientific journal no more than five years after completion of the degree for which the research was performed. A nomination may be made by anyone familiar with the work of the student. Nominations must be accompanied by four copies of the paper. The deadline for receipt of the nominations is December 31, 2000.

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The prize consists of a \$500 Canadian cash prize, donated by **XRAL Laboratories**, a Division of SGS Canada, a two-year membership to the Association of Exploration Geochemists with receipt of **Geochemistry - Exploration, Environment, Analysis and EXPLORE**, and up to US \$500 for expenses to attend an AEG sponsored meeting. A photograph and curriculum vitae of the author and an abstract of the prize-winning paper will be published in **EXPLORE** as soon as possible after the announcement of the award.

Mail to: Dr. Ian D.M. Robertson
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¹Full details are available from the Chairman of the competition (address above) or from the AEG Home Page (<http://www.aeg.org/>) or, more specifically at <http://www.aeg.org/studentspage.htm>.

Distinguished Lecturer... *Continued from Page 18*

ing the above problems. However, this approach has its own shortcomings - scaling the symbols is not always easy, especially in cases where there are a few very high data outliers. Different scaling approaches may have to be chosen, dependent on the resulting graphical appearance of the map. In addition, the main focus is given to the high and low ends of the distribution. Thus there is the indirect assumption that the information between the extremes (usually amounting to about 90% of all the information in a data set) has no importance. Growing-dot maps have the major advantage that they are very easy to read when compared to maps from all other approaches previously discussed. Statistically geochemical data behave often quite unusual. An approach using exploratory data analysis (EDA)-techniques tries to avoid the pitfalls of classical statistics applied to non-normally distributed data. By using the boxplot, and EDA symbols, designed to give an even optical weight in the resulting maps, it attempts to map the data structure. This is a very powerful technique to detect processes determining the geochemical distribution in space.

A classical approach to presenting geochemical data on a colour map is the use of smoothed contour, raster or colour-surface maps. Different smoothing techniques can be used, with the moving average (or median) technique probably most often applied. The more reliable kriging techniques are rarely used. In any case the impression gained from such maps will largely depend on the choice of the smoothing algorithm and search radius as well as class and colour selection. Class selection should, for example, preferably be tied to percentiles. A further important question is the kind of "background" information that should accompany a "good" geochemical map. There exist examples for both - too little and by far too much non-geochemistry information on such maps.

In conclusion, geochemical mapping includes aspects of both, art and technique. At present availability of adequate software is still a problem - GIS programs are not developed for presenting geochemical data. They often do not allow for more than a "good looking" presentation of data. However, the quality of a geochemical map is, last but not least, also dependent on the suitability for the purpose. There is probably no optimal "geochemical map" - but there are clearly technical mistakes that are often made when geochemical maps are prepared that can be avoided.

GEOCHEMICAL PROVINCES - DO THEY EXIST AND WHAT IS THEIR RELATION TO REGIONAL GEOLOGY?

It has been proposed that there exist on the earth surface large-scale geochemical provinces, areas that are enriched or depleted in certain chemical elements. These geochemical provinces are so large, that they can easily be detected by ultra-low-density geochemical sampling (e.g., 1 site per 100 - 5000 km²). Their possible relationship to metallogenic provinces, and thus their value for regional exploration as well as the appropriateness of the term "geochemical province", is still disputed.

Results from a large regional geochemical mapping project, the "Kola Ecogeochemistry Project" and some other projects are used to once again demonstrate that regional-scale geochemical patterns do exist. Are these, however, geochemical provinces? It is demonstrated that the processes leading to the development of these large geochemical anomalies are very different. Some fit established lithological boundaries others follow lineament structures or reflect large-scale hydrothermal alteration halos. Some very large-scale patterns are directly related to regional geology. Due to the multitude of processes that can lead to the develop-

ment of a large geochemical anomaly it is questionable that the term "geochemical province" is a needed and clear description for such patterns. It is, however, rather obvious that geochemical anomalies can exist at very different scales.

The results presented demonstrate that there exists a need for a better understanding of the regional distribution of chemical elements at the earth surface. To be able to detect large-scale geochemical anomalies mapping on a continental or even global scale is necessary. Such data could then provide valuable input to the interpretation of the geological evolution of large regions. Although there may be no direct relation between metallogenic provinces and large geochemical anomalies, results of low-density geochemical mapping can be used to define prospective areas for more detailed mineral exploration.

THE KOLA PROJECT ENVIRONMENTAL GEOCHEMICAL MAPPING OF THE CENTRAL BARENTS REGION

An environmental geochemical atlas of the Central Barents Region, covering some 188,000 km², has been produced as the result of an international co-operation project by the Geological Surveys of Finland and Norway and Central Kola Expedition, Russia. Five different sample media (moss, topsoil, humus, B- and C-horizon of podzol profiles) were collected at more than 600 sample sites (average density 1 site/300 km²). These were analysed for up to 60 chemical elements, radioisotopes and other parameters.

The Russian part of the project area is heavily industrialised (i.e. nickel smelting and refining at Nikel, Zapoljarnij and Monchegorsk), whilst northern Finland is one of the most pristine regions in Europe. Comparison between the different sample media and results obtained from different extraction techniques allows a better understanding of the levels, sources, cycling and fate of chemical elements in the environment.

The project indicates that:

- (a) low density geochemistry is a powerful tool for environmental geochemical mapping and for area selection in mineral exploration;
- (b) the combination of many different media, carefully selected to reflect different parts of the ecosystem, helps in the understanding of geochemical processes and interpretation of mapped patterns;
- (c) different chemical extraction techniques can result in very different geochemical signatures for many elements and aid the interpretation of geochemical processes especially during weathering;
- (d) the impact of emissions from the metals industry on ecosystems may be overestimated in current environmental literature. Topics including "long range atmospheric transported air pollution", "lake water acidification" by "acid rain", and "critical loads" may need to be reexamined in the light of the results presented.



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THE ASSOCIATION OF EXPLORATION GEOCHEMISTS APPLICATION FOR NON-VOTING MEMBERSHIP*

Please complete the section relevant to the class of membership sought and supply your address on this form.
Mail the completed application, together with annual dues, to the address below.

***Details of requirements and application forms for voting membership (fellowship) can be obtained from the AEG website (<http://www.aeg.org>) or business office.**

MEMBER

I _____ wish to apply for election as a Member of the Association of Exploration Geochemists. I am presently employed by:

_____ as a _____
(employer) (employment title)

I am actively engaged in scientific or technological work related to geochemical exploration and have been so for the past two years. Upon receipt of the Code of Ethics of the Association I will read them and, in the event of being elected a Member, agree to honour and abide by them. Witness my hand this ____ day of _____ 19 ____.

(Signature of applicant)

STUDENT MEMBER

I _____ wish to apply for election as a Student Member of the Association of Exploration Geochemists. I am presently engaged as a full-time student at _____, where I am taking a course in pure or applied science. Upon receipt of the Code of Ethics of the Association and in the event of being elected a Student Member agree to honour and abide by them. Witness my hand this ____ day of _____ 19 ____.

(Signature of applicant)

Student status must be verified by a Professor of your institution or a Fellow of the Association of Exploration Geochemists. I certify that the applicant is a full-time student at this institution.

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Please note: Your completed form should be mailed to the Business Office of the Association and will be acknowledged upon receipt. The Admissions Committee reviews all applications and submits recommendations to Council, who will review these recommendations at the next Council Meeting or by correspondence. If no objection is raised the names, addresses and positions of candidates will be listed in the next issue of the Association Newsletter. If after a minimum of 60 days have elapsed following submission of candidate information to the membership no signed letters objecting to candidates admission are received by the Secretary of the Association from any Member, the Candidate shall be deemed elected, subject to the receipt by the Association of payment of required dues. Send completed application, together with annual dues to:

**Association of Exploration Geochemists, P.O. Box 26099, 72 Robertson Road, Nepean, Ontario, CANADA K2H 9R0
TEL: (613) 828-0199, FAX: (613) 828-9288, email: aeg@synapse.net**

NEW MEMBERS

To All Voting Members:

Pursuant to Article Two of the Association's By-Law No.1, names of the following candidates, who have been recommended for membership by the Admissions Committee, are submitted for your consideration. If you have any comments, favorable or unfavorable, on any candidate, you should send them in writing to the Secretary within 60 days of this notice. If no objections are received by that date, these candidates will be declared elected to membership. Please address comments to David B. Smith, Secretary AEG, USGS, Box 25046, MS 973, Denver, CO 80225, USA.

Editors note: Council has decided that all new applicants will receive the journal and newsletter upon application for membership. The process of application to the Nepean office, recommendation by the Admissions Committee, review by the Council, and publication of applicant's names in the newsletter remains unchanged.

MEMBERS

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Athlumney, IRELAND

STUDENT

Chastain, Emily

Dept. Earth and Ocean Sciences
University of British Columbia
Vancouver, BC. CANADA



NEWS OF MEMBERS

David Seneshen has left WMC in Denver to take up the position of Senior Geologist - Geochemical Mapping with the Alberta Geological Survey. Over the next three years, his responsibilities will comprise: conducting detailed multi-media orientation surveys to identify techniques for the detection of buried and exposed mineralization (diamonds, Au, Pb, and Zn) in northern Alberta (Year 1); testing promising sample media and techniques in more regional orientation surveys (Year 2) and conducting regional geochemical surveys, using the sample media and techniques chosen from the earlier work (Year 3). Dave can be reached at seneshen@telusplanet.net.

Another departure from WMC's Denver office is that of **Allan Kelly**, who has returned to Australia and is working as a geochemist at the company's Leinster Nickel Mine Operations.

Matthew Leybourne has moved from the Geological Survey of Canada to the University of Texas at Dallas where he is now an Assistant Professor in Environmental Geochemistry in the Department of Geosciences. Matthew has several areas of active research including: 1) Geochemistry (major and trace element) of ground and surface waters from diverse geological settings (mineral exploration and environmental applications). 2) Application of stable and radiogenic isotopes to ground and surface water systems. 3) The relationship between natural (geogenic) and human (anthropogenic) sources of metals in the environment. 4) Origin of saline waters in crystalline bedrock and sedimentary basins. 5) Igneous petrogenesis, including modern mid-ocean ridge systems and ancient systems. 6) Hydrothermal systems: alteration and genesis of massive sulfide deposits. 7) Processes controlling REE (rare earth element) distributions in terrestrial waters and sediments. The Department of Geosciences has a new ICP facility including ICP-OES and ICP-MS(DRC) machines. Matthew can be contacted at: Department of Geosciences, University of Texas at Dallas, Box 830688, Richardson, Texas, USA 75083-0688. Phone: 972-883-2403; Fax: 972-883-2537; e-mail: mleybo@utdallas.edu; Departmental website: www.utdallas.edu/dept/geoscience (April, 2000).

Terry Goodwin has recently accepted the position of Project Geochemist with the Nova Scotia Department of Natural Resources. He is responsible for all aspects of geochemistry for the Province of Nova Scotia, which is on the east coast of Canada. Terry can be reached at: Nova Scotia Department of Natural Resources, P. O. Box 698, Halifax, Nova Scotia, CANADA, B3J 2T9, Phone: 902-424-2438, Fax: 902-424-0527 or Email: goodwita@gov.ns.ca (March, 2000).

Keith Nicholson has left the Robert Gordon University, Aberdeen, Scotland to accept an invitation from Aalborg University, Denmark to a Research Professorship in environmental geochemistry. Keith continues to work in the areas of manganese and boron geochemistry; aquatic geochemistry and urban geochemistry. He can be contacted at the Institute for Water, Soil and Environmental Engineering, University of Aalborg, Sohngaardsholmsvej 57, DK-9000 Aalborg, Denmark. Telefax: (+45) 98 14 25 55
Telephone: (+45) 96 35 84 68 (direct)
Telephone: (+45) 96 35 84 91 (secretary)
e-mail: knicholson@europe.com
www.knicholson.co.uk (May, 2000)



Calendar of Events ...

Continued from Page 16

Department of Land Resource Science, University of Guelph, Guelph, Ontario, Canada, N1G 2W1, Phone: (519)824-4120 ext. 2531 E-Mail: icobte@lrs.uoguelph.ca Web: <http://icobte.crle.uoguelph.ca>

- August 27- 29, 2001, **The 6th Biennial Society For Geology Applied To Mineral Deposits, Mineral Deposits at the Beginning of the 21st Century**, Krakow, Poland. <http://galaxy.uci.agh.edu.pl/~sga>
- November 5-8, 2001, **Annual Meeting of the Geological Society of America**, Boston, Massachusetts. INFORMATION: TEL 1-800-472-1988, meetings@geosociety.org.
- Oct. 5-12, 2001, **27th Ann. Conf. of Federation of Analytical Chemistry & Spectroscopy Societies**. Detroit, MI. INFORMATION: Div. of Analytical Chemistry. FACSS, (505) 820-1648, fax (505) 989-1073, Internet: <http://FACSS.org/info.html>
- April 7-11, 2002, **223rd ACS Natl. Mtg. Orange County Convention/Civil Center, Orlando, Fla.** INFORMATION: ACS Meetings, 1155 16th St., N.W., Washington, D.C. 20036-4899, (800) 227-5558, (202) 872-4396, fax (202) 872-6128, e-mail: natlmrgs@acs.org
- October 27-30, 2002, **Annual Meeting of the Geological Society of America**, Denver, Colorado. INFORMATION: TEL 1-800-472-1988, meetings@geosociety.org.
- November 2-5, 2003, **Annual Meeting of the Geological Society of America**, Seattle, Washington. INFORMATION: TEL 1-800-472-1988, meetings@geosociety.org.

Please check this calendar before scheduling a meeting to avoid overlap problems. Let this column know of your events.

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