

New Targets and Trends Identified in Data from the British Columbia, Canada, Regional Geochemical Survey

Just how effective are large, reconnaissance scale geochemical surveys for finding new mineral resources? The Province of British Columbia regional geochemical survey (RGS) aims to identify areas of bedrock with higher geochemical values indicating a greater mineral potential. Outlining areas of higher mineral potential using RGS data allows mining companies and individual prospectors to better focus their exploration activities. Geological Survey of Canada (GSC) sample collection and analysis standards established when the GSC's national geochemical reconnaissance (NGR) program was originally started in 1974 have been adopted by the RGS. The seamless geochemical database, created by maintaining these standards, has been confidently used, not only for mineral exploration, but also for environmental monitoring and land use evaluation. At an average density of one sample per 13 km² it is unlikely that the RGS will detect the geochemical expression of every mineral occurrence. However, there have been recent examples in British Columbia where prospecting follow up of subdued stream sediment Au values has resulted in the discovery of significant precious metal mineralization.

Ideally reconnaissance scale geochemical sampling should be able to detect element variations over a range of contrasting surface environments. British Columbia's climate ranges from a temperate, high rainfall zone along the coast, to continental semi arid conditions in the interior of the province. Topography varies from high mountain ranges to undulating plateaus. Landforms commonly reflect the effects of continental and alpine glaciation and much of the bedrock is concealed beneath a complex veneer of glacial sediment. Stream sediment is the preferred RGS sample media. Over 50,000 stream sediment and water samples, covering over 70 percent of the province, have been collected since the RGS program was started in 1976. Moss is often sampled as an alternative to drainage sediment in mountains because finer textured material is often depleted in fast flowing streams, but is captured by the moss. Lakes are numerous in low relief, swampy areas where streams are absent or poorly developed, thus Lake-bottom organic sediment sampling is often more feasible in these areas for reconnaissance surveys. More detailed

Newsletter for the Association of Applied Geoscientists

AAG Presidential Address



Rob Powell

At the end of May I was fortunate to attend the Society of Economic Geology's conference in Vail. The theme of the meeting was "Wealth creation through the minerals industry". Several senior mining executives including Pierre Lassonde, Chip Goodyear and Rob McEwen gave their impressions of the mining industry and specifically, the role of exploration.

The AAG through Graham Closs and Dave Kelley organized an excellent workshop on the application of geochemistry in the exploration, development and closure of mining operations with contributions from several of our members. I would like to thank all participants for their hard work and involvement that made the workshop so enjoyable, educational and a good reflection of the tremendous knowledge base in the association. Several

continued on page 2

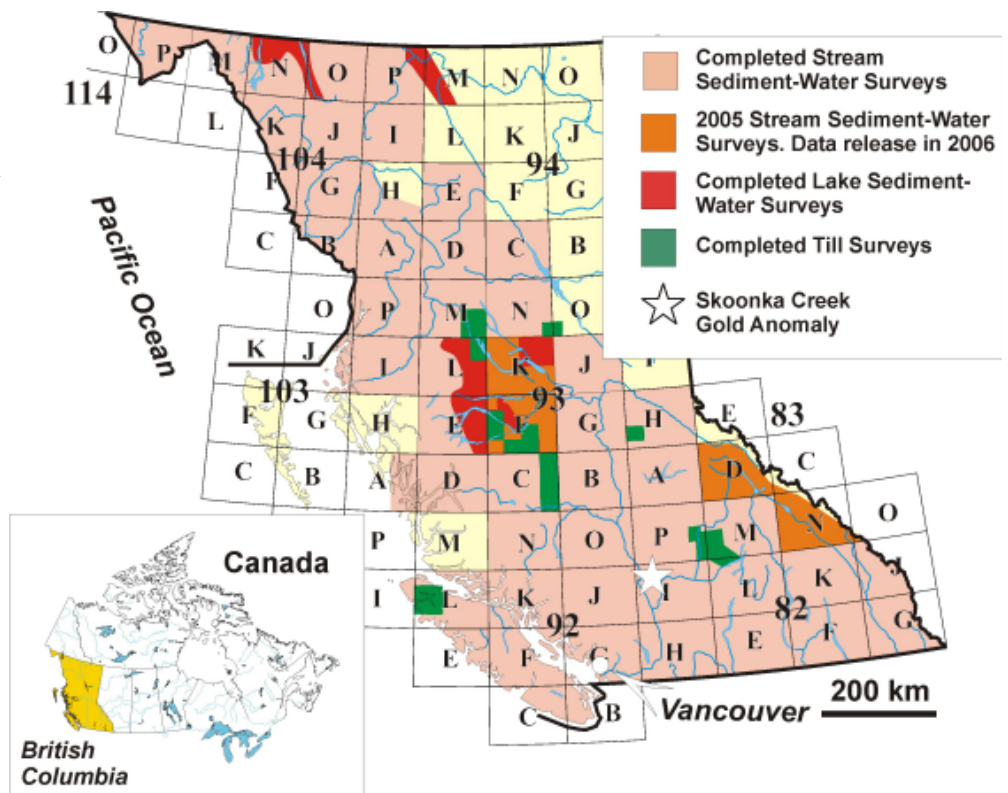


Figure 1. Regional Geochemical Survey coverage in British Columbia, Canada and the location of the Skoonka Creek mineral property.

continued on page 3

EXPLORE NEWSLETTER wishes to thank our Corporate Sponsors



President's Message... *continued from page 1*

attendees inquired about membership and it was reassuring to see a number of students attending the workshop.

The conference, for me, confirmed a number of trends in the minerals industry that we as an association should seek to address. Firstly, that greater skill and understanding will be required, in future, to locate and develop mineral deposits to replace rapidly decreasing resources. Most speakers cited deep ore bodies as the future target for mining companies, yet the discovery of deposits like Midway in Nevada and Las Cruces in Spain reflect the fact that near-surface deposits may still be discovered.

However, whether deep or relatively shallow or in unexpected geological terrains a better appreciation of the geological characteristics will be essential in the next generation of targets. I would argue further (admittedly from a biased view) that geochemical characterization of metallic (and many non-metals) deposits will be essential if companies are to explore successfully and so replenish consumed resources. Despite this, I was greatly surprised and a little disturbed that some of the invited speakers at the SEG conference attributed little success to geochemistry being involved in exploration with a few being highly critical of the role of geochemistry. I would like to counter this image of our science. To this end, I would be interested in hearing from any members (contact details on the back page) who can demonstrate (or provide a reference) where an original mineral deposit

discovery can be attributed to geochemistry or where geochemistry played an integral role in the discovery of an economic ore deposit that became a working operation. Only by documenting the contribution of our discipline can we hope to gain just recognition.

Secondly, I was surprised to see just how limited the funding of geological, especially economic geology, research really is. Mr Lassonde reflected, in his presentation, that whilst pharmaceutical companies on average spend more than 50% of their turnover on research and Microsoft some 37% the highest portion of spending in mining is somewhere around 5% of turnover and that is on every aspect of mining. Exploration is probably not even the highest receiver from this 5%. Despite this inequality the merits of research in pharmacy or software development can only be reaped for seven years, thereafter the patent expires and exclusivity is lost. By comparison, discovery of a major mineral deposit can result in an exclusive use of a resource for decades or even a century or more so the actual return on value is significantly greater. Currently council is finalizing the Distinguished Geochemists Fund that we hope to announce in the next months. This fund, in honour of some of our most eminent members, will we hope provide some support for applied geochemistry; be it through research, fieldwork or conference attendance. We hope that as many members as possible will support this fund and provide it with a firm foundation to support the next generation of applied geochemists.

continued on page 3

New unique
techniques for
the detection of
GOLD and **PGE**
in WATER, ROCK,
SOIL, SEDIMENT,
HUMUS and
VEGETATION



Canada • Australia • Chile • Peru

Quality Analysis . . .
Innovative Technologies

Activation Laboratories Ltd.



1-888-228-5227 • www.actlabsint.com • ancaster@actlabsint.com

President's Message... *continued from page 2*

However not all trends were so pessimistic, I was also pleased to see at the conference a number of students attending the meeting, thanks to sponsorship from the mining companies. One evening was given over to a “mentoring event” and I was pleased to meet not only a student from my old university but one who shared the same tutor. The AAG also hopes to foster our students and promote their studies in applied geochemistry. To this end we have lowered the membership price for students and hope many of them will benefit through the Distinguished Geochemists Fund. So if you are involved in educating students in applied geochemistry, please encourage them to sign up and get the benefit of being a member.

Rob Bowell, President AAG



TABLE OF CONTENTS

New Targets and Trends Identified in Data from the British Columbia, Canada, Regional Geochemical Survey 1

AAG President's Message 1

Calendar of Events 7

Summary of the SEG Workshop *Geochemistry in Mineral Resource Development* 9

Recent Papers 11

2006 Student Paper Competition 14

23rd International Symposium, Oviedo, Spain 15

New Members and Fellows 16

AAG Needs You as a Councillor 16

Modular Course on Exploration Geochemistry 17

Geological Association of Canada and Geological Survey of Canada Joint Publication 18

Exploration '07: Exploration in the New Millenium 20

ioStipend 21

Application for Membership 22

New Targets and Trends... *continued from page 1*

till and heavy mineral sampling is used to complement reconnaissance scale sediment surveys for better defining exploration targets. Orientation surveys help refine geochemical survey techniques for different styles of mineralization (Lett and Jackaman, 2000; Lett and Friske, 2006). Figure 1 (see page 1) shows the RGS coverage by the different types of geochemical surveys in British Columbia.

Routine sediment sample collection, analysis and quality control

Systematically recording information about the sample site during the survey and maintaining strict quality control are key factors for ensuring the high quality RGS geochemical database. The present field data collection forms are designed for helicopter-supported surveys where careful collection and accurate information

continued on page 4

Geosoft Inc. www.geosoft.com Africa. Australia. Europe. Latin America. North America.



Essential Software for Exploration

Geosoft software solutions support exploration companies from initial target identification through to resource development.

Oasis montaj

Rapidly view and analyze all your exploration data in **Oasis montaj**, Geosoft's powerful mapping and processing software for large volume geophysical, geochemical and geological data.

Target for ArcGIS

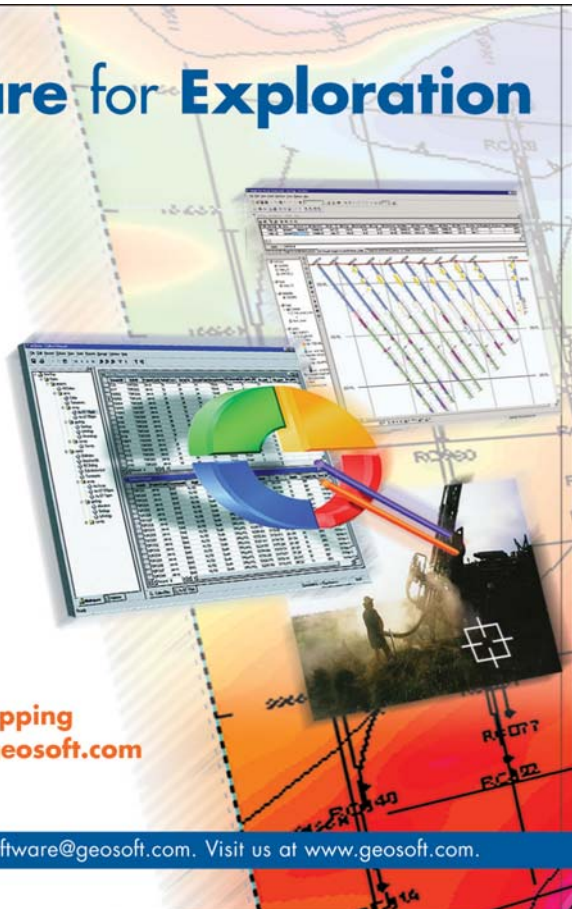
Simplify your surface and drillhole mapping with Geosoft's **Target** and **Target for ArcGIS** software.

acquire

Manage your data and streamline reporting with **Exploration Essentials**, one affordable solution for exploration that combines Metech's acQuire data management system with Geosoft's Target mapping and Chimera geochemical analysis software.

Geosoft releases Oasis montaj 6.1 mapping and processing software. Visit www.geosoft.com for new release information.

For more information contact Geosoft at software@geosoft.com. Visit us at www.geosoft.com.



New Targets and Trends... *continued from page 3*

recording must be balanced by collection efficiency (Fig. 2). Routine quality control starts with randomly selected field duplicate samples taken at a frequency of one duplicate pair in every batch of 20 samples. Samples are preferably dried in the field and screened in the laboratory to minus 80 mesh (< 0.177 mm). Analytical duplicate samples and standard reference materials are randomly inserted into each batch of 20 prepared samples before analysis.



Figure 2. Helicopter supported stream sediment and water sampling in northwestern British Columbia. Roughly 2 kg of fine textured sediment is being collected from a stream bar in the active channel above the current low water level. Extremely high or low energy stream sites are avoided where ever possible so that the sample is representative of the sediment. A 250 ml bulk water sample is also being taken from the stream for later analysis of pH and other elements.

The minus 80 mesh fraction of sediment is analyzed by aqua regia digestion and inductively coupled plasma mass spectrometry (ICP-MS) to determine the following elements: Al, Ag, As, Ba, Bi, Cd, Ca, Cr, Co, Cu, Ga, Au, Fe, La, Pb, Mg, Mn, Hg, Mo, Na, Ni, P, K, Sb, Sc, Se, Sr, S, Te, Tl, Th, Ti, W, U, V and Zn. It is also analyzed by instrumental neutron activation (INAA) for: Au, Ag, Sb, As, Ba, Br, Cd, Ce, Cs, Cr, Co, Eu, Hf, Ir, Fe, La, Lu, Mo, Na, Ni, Rb, Sm, Sc, Se, Ta, Tb, Th, U, Yb, Zn and Zr.

Mobile Metal Ion Geochemistry

High Resolution, Deep Penetrating

- Commodity element leaches for ultra-low level analysis.
- MMI-M — Single multi-element leach (choice of 30+ elements).
- Superior anomaly to background definition.
- Premium quality data — robust, repeatable, and globally available.
- Industry proven surface geochemical technique for difficult terrains and complex soils.

Successful global case studies, press releases, and research reports available for precious, base metal, nickel, and diamond exploration.



Phone: +61 8 9472 7344
www.mmigeochem.com
mmi@mmigeochem.com

Atomic absorption spectrophotometry (AAS) was employed after aqua regia digestion to determine metals present in earlier surveys. Sediment samples are also analysed for loss on ignition (LOI) at 500° C and for fluoride by a fusion-specific ion electrode method. Samples with anomalous Au contents are routinely checked by a second Au analysis. Unfiltered stream water samples are routinely analysed for pH, conductivity, uranium and fluoride. Selected water samples are filtered and acidified in the field and later analysed for trace and major elements by ICP-MS.

Geological trends and prospecting targets

British Columbia bedrock geology reflects periodic post Paleozoic collision and accretion of oceanic plates against the Precambrian North American continent to form a series of northwest trending tectonically distinct belts or terranes (Fig. 3). The rocks comprising each terrane host different types of mineralization. They can



Figure 3. Principal tectonic belts and metal mines in British Columbia.

also have a distinct geochemical signature that may be identified by variations in regional stream sediment geochemistry. Neutron activation results are perhaps best suited for detecting lithogeochemical patterns because the technique determines almost total element abundances. A number of REE that can help discriminate between terranes are also determined by neutron activation. La to Lu ratios plotted in Figure 4 highlight an area in southeastern British Columbia where volcanic and intrusive rocks may have been contaminated by older crustal rocks during tectonic evolution. Source areas for stream sediment with elevated La:Lu ratio have the potential to host skarn and Fe oxide Cu-Au deposits.

Among the more common styles of base and precious metal mineralization in British Columbia are volcanogenic massive sulphide, porphyry Cu-Au, porphyry Cu-Mo and epithermal Au deposits. Elevated As, Sb and Hg levels are commonly associated with epithermal Au mineralization.

continued on Page 5

New Targets and Trends... continued from page 4

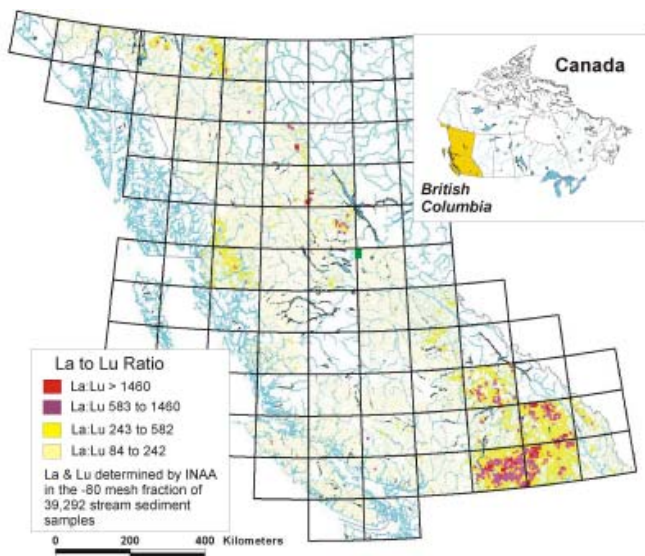


Figure 4. Lanthanum to lutetium ratio in RGS stream sediment samples as determined using INAA values. High neutron activation La:Lu ratios in southeast British Columbia may reflect contamination of intrusive rocks by crustal rocks during evolution.

This pathfinder element signature in stream sediment can outline belts where there is a greater opportunity for discovering this type of deposit. Figure 5 shows the distribution of stream sediment samples with As and Sb and Hg values above the 90th and 95th percentiles. An especially strong As-Sb-Hg trend in northwestern British Columbia reflects the “Golden Triangle” where there are many Au occurrences including the world class Eskay Au-Ag mine (Fig. 5).

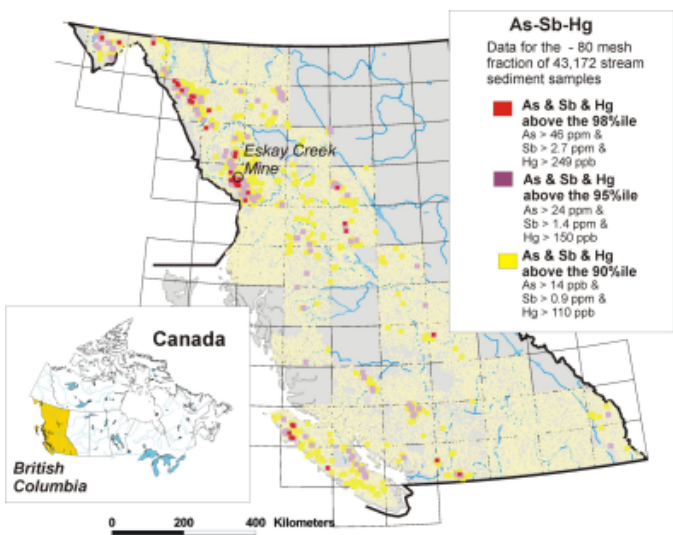


Figure 5. The As+Sb+Hg signature in RGS stream sediment samples. Arsenic and Sb have been determined by aqua regia digestion – AAS or ICP-MS. Mercury was determined by aqua regia digestion and cold vapour – AAS or ICP-MS. In northwestern British Columbia there are several significant Au deposits including the Eskay Creek Au-Ag mine.

One simple method for identifying new Au prospects using RGS geochemical data is to screen the database for samples with Au values above the 99th percentile (> 120 ppb Au) and with a similar Au value in the recheck analysis. Anomalous samples located on a mineral claim and < 3 km from a known mineral occurrence are also excluded. In mid March 2006 screening revealed that there were 23 RGS sites that met these criteria. Closer examination of the area surrounding these 23 anomalous samples using the BC Geological Survey MapPlace site (<http://www.em.gov.bc.ca/Mining/Geolsurv/MapPlace/>) showed that many of the sites were close to existing mineral claims or were in areas of active exploration.

Weaker geochemical anomalies may be less attractive as targets, but can also reflect the presence of a significant mineral occurrence. An example is the discovery of the Skoonka Creek Au property near Spences Bridge in southern British Columbia by a junior mining company, Almaden Minerals, in 2003. Prospecting in a tributary of Skoonka Creek where a value of 21 ppb Au in the stream sediment had been reported from a previously published government geochemical survey (Jackaman and Matysek, 1994) led to the discovery of quartz vein float containing over 55 ppm Au. Further prospecting resulted in discovery of mineralized quartz veins that are hosted by the Spences Bridge Group, a Cretaceous volcanic assemblage previously unexplored for Au. The discovery of the veins illustrates the value of re-examining previously published geochemical data. While the original RGS had been carried out in 1983, the samples were only analysed for Au by INAA in 1994 as part of an RGS archive sample re-analysis program. Almaden staff examined the weakly anomalous Au values in 2003 and focused their prospecting on the Skoonka Creek area. The location of the mineral property is shown in Figure 1 and a detailed map of the RGS stream sediment Au geochemistry in the area is shown in Figure 6.

Clearly low contrast reconnaissance scale sediment Au anomalies can be a useful guide to mineralization. A further screening of the RGS database was used to identify samples with Au in the 95 to 98-percentile range (17 to 40 ppb) with a similar Au value in the repeat analysis. Again, anomalous sites were excluded if located on a mineral claim and < 3 km from a known mineral occurrence. In addition, only sites with > 20 ppm As in

continued on page 6



Robert G. Jackson

Consulting Geochemist

3D Zonation Modeling and Vectoring Methods to discover Blind Deposits Survey Designs and Data Interpretation

Seeking new target possibilities through 3D visualization

3 Leamont Terrace
Dartmouth, N.S., Canada B2Y 1V1
rgjackson@eastlink.ca 902-463-6910

New Targets and Trends... *continued from page 5*

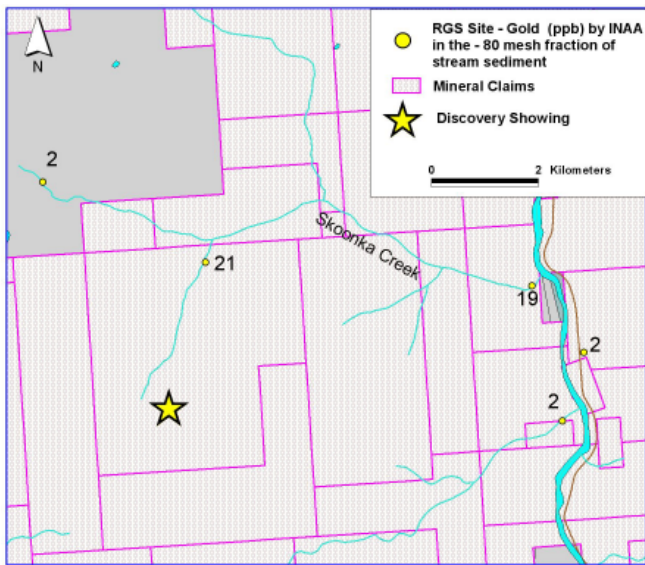


Figure 6. Skoonka Creek Claims showing the original RGS stream sediment sample location, as well as the location of subsequent discovery of the Au-rich quartz vein material.

the sediment were selected. A total of 36 sites meeting these criteria were identified and their locations are shown on Figure 7. Closer examination of the area around the 36 selected sites reveals that more than half of them have no known bedrock source of precious metal.

While there are other techniques of interpreting RGS survey data to identify prospecting targets in British Columbia (Smyth, 2005), simple screening based on criteria such as those described above can be very effective as a preliminary approach.

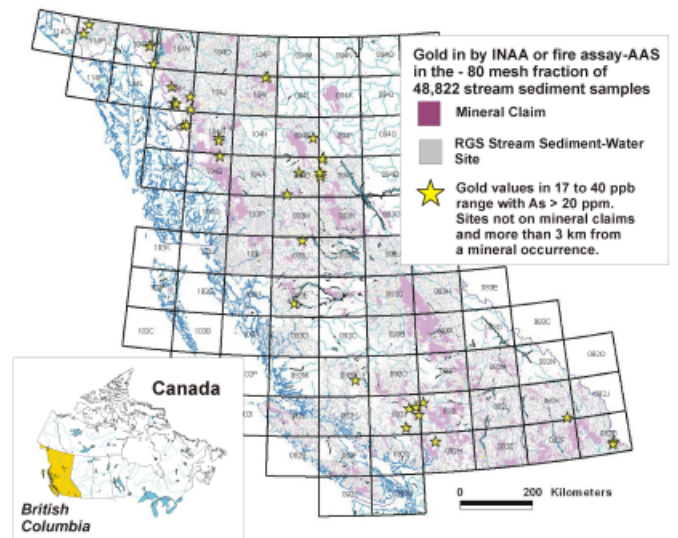


Figure 7. Thirty-six prospecting targets identified using the following criteria: 1) Gold values in the 17 to 40 ppb range with a similar Au value in the repeat sample; 2) are not located on a claim; 3) are > 3 km from a mineral occurrence; and 4) contain > 20 ppm As.

Adding value to the RGS

The British Columbia RGS has created a high quality geochemical database that helps identify areas of high mineral potential and also new prospecting targets. Current activities that will add value to the present RGS include:

- Conducting new regional geochemical surveys.
- Re-analysing archive geochemical samples by INAA and aqua regia digestion with ICP-MS.
- Conducting orientation studies designed to improve existing geochemical survey methods.
- Adding new information to the database.

There are several ways of gaining public access to RGS data. Digital data can be downloaded from the

continued on page 7

ACME
ANALYTICAL LABORATORIES LTD.
Serving Mining, Exploration and Research Worldwide Since 1971
Canada - Chile - Argentina - Brazil - Peru - Ecuador

852 East Hastings St. Vancouver, Canada V6A 1R6
Phone: 604-253-3158 Fax: 604-253-1716 Toll Free: 1-800-990-2263
www.acmelab.com email: acmeinfo@acmelab.com

GENALYSIS
LABORATORY SERVICES PTY LTD
"Specialising in quality analyses"

Genalysis, now in it's 30th year of operation, is proud to be a major sponsor of the IGES 2005 conference in Perth, Western Australia.

An invitation to delegates is extended to visit our analytical facility and attend a social function as part of your IGES 2005 experience.

Contact us on:
Telephone +61 8 9459 9011 Facsimile +61 8 9459 5343
Email genalysis@genalysis.com.au Website www.genalysis.com.au
15 Davison Street PO Box 144
Maddington 6109 Gosnells 6990
Western Australia Western Australia

New Targets and Trends... *continued from page 6*

British Columbia Geological Survey Regional Geochemistry page:

<http://www.em.gov.bc.ca/Mining/Geolsurv/Geochinv/rgs.htm>

ARC shape files that can be imported into most Geographic Information (GIS) software may be downloaded from:

<http://www.em.gov.bc.ca/Mining/Geolsurv/MapPlace/geoData.htm>

Metadata for the RGS database can be viewed at:

http://www.em.gov.bc.ca/Mining/Geolsurv/MapPlace/Metadata/geochem_metadata.htm

RGS values can also be viewed on the British Columbia Geological Survey interactive MapPlace site in combination with other geoscience themes such as bedrock geology, topography, drainage, road and rail routes, communities, parks, mineral occurrence information from the MINFILE database, rock geochemistry, and mineral tenure.

<http://www.em.gov.bc.ca/Mining/Geolsurv/MapPlace/>

Acknowledgements

A critical review of this paper by Brian Grant, BC Geological Survey is very much appreciated.

References

- Jackaman, W. and Matysek, P.F. 1994. Regional Geochemical Survey 921 - Ashcroft, BC. *Ministry of Energy, Mines and Petroleum Resources* RGS 40; *Geological Survey of Canada* Open File 2666.
- Lett, R.E.W. and Friske, P.W.B. 2006. The Bowser Basin Geochemical Survey, North-Central British Columbia Follow-up, 2005. (NTS 104A), *BC Ministry of Energy, Mines and Petroleum Resources*, Paper 2006-1, pages 53 - 61.
- Lett, R.E.W. and Jackaman, W. 2000. Geochemical techniques for plutonic-related gold deposits in southern British Columbia. *BC Ministry of Energy and Mines*, Paper 2000-1, pages 225 - 235.
- Smyth, C.P. 2005. Workshop on multi-element and multiregional geochemical survey (RGS) anomalies meriting follow-up work in British Columbia. *BC Ministry of Energy and Mines*, Paper 2005-1, pages 361 - 365.

Ray Lett

*British Columbia Geological Survey
Ministry of Energy, Mines & Petroleum Resources
5th Floor, 1810 Blanshard Street (PO 9333 STN PROV GOVT)*

*Victoria, BC, Canada, V8W 9N3
Ray.Lett@gov.bc.ca 250-952-0396*



CALENDAR OF EVENTS

International, national, and regional meetings of interest to colleagues working in exploration, environmental and other areas of applied geochemistry. These events also appear on the AAG web page at:

www.appliedgeochemists.org

- July 2-7, 2006 **18th AGC: Australian Earth Science Convention 2006** Melbourne Exhibition and Convention Centre, Melbourne, Australia. Website www.earth2006.org.edu.org
- July 3-7, 2006 Protection and Restoration of the Environment VIII. Chanoa island, Crete, Greece. Website www.pre8.enveng.tuc.gr
- August 21-23, 2006. **6th International Mining Geology Conference**, Darwin, Australia Website: www.ausimm.com/imgc2006
- August 27– September 1, 2006 **16th Annual VM Goldschmidt Conference 2006** Melbourne Exhibition and Convention Centre, Melbourne, Australia. Website www.goldschmidt2006.org
- September 11-13, **2006 Environmental Toxicology 2006** – 1st International Conference on Environmental Toxicology. Mykonos island, Greece. Website www.wessex.ac.uk/conferences/2006/toxic06/index.html
- September 13-15, 2006 **First International Seminar on Mine Closure**, Perth, Western Australia. Website www.acq.uwa.edu.au
- September 24-29, 2006 **2006 IGCP 486 Au-Ag-telluride-selenide deposits**. Field Workshop, Izmir, Turkey. Email ismet.ozgenc@deu.edu.tr
- September 25-27, 2006 **Advances in Mineral Resources Management and Environmental Geotechnology** (AMIREG 2006). Chania, Crete, Greece. Website <http://heliotopos.conferences.gr/amireg2006>

continued on page 9

Analytical & Sample Preparation
Services for Mineral Exploration




ALEX STEWART GEOCHEMICAL SERVICES
INCORPORATING OMAC LABORATORIES

Offices in 68 countries with laboratories in
Argentina, Bolivia, Iran, Ireland, Kyrgyzstan,
Liberia, Mongolia, Sierra Leone, Tanzania, Turkey.



Contact: Steve Walker

Tel: +44 151 548 7777 Fax: +44 151 548 0714 | Email: steve.walker@alexstewart.com



ROCKLABS

**REFERENCE MATERIALS
FOR GOLD ASSAYING QA/QC**

Quality Reference Materials affordable for use on an every batch basis. Wide range of values.

Available in sachets for geologists or 2.5 kg jars for laboratories.

Used in over 30 countries.

Check Certificates and range at www.rocklabs.com

ROCKLABS LTD 161 NEILSON STREET, P.O BOX 18-142
AUCKLAND, NEW ZEALAND

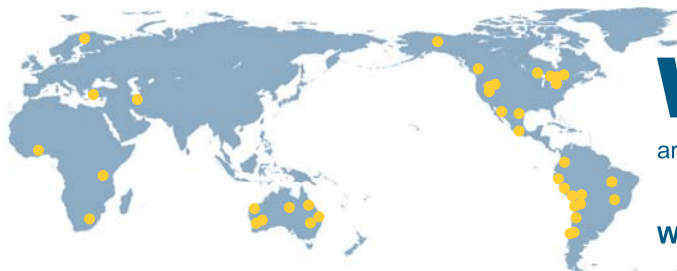
Telephone: 64 9 634 7696
Fax: 64 9 634 6896
E-mail: rocklabs@clear.net.nz

ALS Laboratory Group

ANALYTICAL CHEMISTRY & TESTING SERVICES



Mineral Division - ALS Chemex



We are a global analytical testing company serving the mining and mineral exploration industry in 17 countries around the world.

We specialise in:

- Assaying and geochemical analysis for mining and mineral exploration projects
- On-site contract mine laboratory management
- Environmental monitoring for mining operations
- Acid mine drainage studies

Contact the ALS Chemex laboratory nearest to you to find out how we can help you with all of your project's analytical needs. Detailed contact information for individual locations can be found on our website.

www.alschemex.com

*Right solutions....
....Right partner*



CALENDAR OF EVENTS

continued from page 7

- September 25-30, 2006 **7th International Symposium on Environmental Geochemistry (2006)** Beijing, China
- October 22-25, 2006. **Geological Society of America (GSA) Annual Meeting**, Philadelphia, USA website: www.geosociety.org/meetings/2006
- December 6-8, 2006. **Northwest Mining Association Annual Meeting**, Reno, USA. Website: www.nwma.org/
- December 13-15, 2006. **9th Australasian Environmental Isotope Conference and 2nd Australasian Hydrogeology Research Conference: Integrating Research and Innovation**. CRC-LEME, Adelaide, Australia. Website: <http://crcleme.org.au/NewsEvents/Events/newconf.html>

2007

- January 29 - February 1, 2007 **Mineral Exploration Roundup 07**. Vancouver, B.C. Canada. Website: amebc.ca/roundupoverview.htm
- March 4-7, 2007. **Prospectors and Developers Association of Canada Annual Convention** Toronto, Canada. Website: www.pdac.ca
- May 27-31 2007. **IMWA Symposium: Water in mining environments**. Cagliari, Sardinia, Italy. University of Cagliari, Department of Earth Sciences, E-mail Rosa Cidu @ cidur@unica.it
- June 14-19, 2007 **23rd International Applied Geochemistry Symposium**, Oviedo, Spain
Contact: Jorge Laredo, University of Oviedo, Spain
Email: jlaredo@correo.uniovi.es
- September 2007 **Exploration 07** Toronto, Canada. <http://www.exploration07.com/>
- October 22-24, 2007 **World Gold 2007** Cairns, Australia. Website: www.ausimm.com/gold2007

Please let this column know of your events by sending details to:

Beth McClenaghan
Geological Survey of Canada
601 Booth Street
Ottawa, Ontario
CANADA K1A 0E8
Email: bmcclena@nrcan.gc.ca
613-992-7805



Summary of the SEG Workshop Geochemistry in Mineral Resource Development

The workshop "Geochemistry in Mineral Resource Development" was conducted on May 12th 2006 as part of the Society of Economic Geologists Wealth Creation in the Minerals Industry meeting held in Keystone, CO, USA. This workshop consisted of an international panel of eleven speakers who addressed a diverse range of current applications of geochemistry in mineral exploration/exploitation. In line with the wealth creation theme of the conference, many of these talks focused on the importance of sound geochemical investigations to minimize financial and "lost opportunity" risks associated with improper sampling and/or analytical problems in mineral resource development. The presentations were divided into two broad sessions: *Mineral Resource Development Sequence* and *Evolving Scientific and Technical Developments and Trends*. The following is a brief description of the talks (not in order).

The speakers in the *Mineral Resource Development Sequence* section outlined the important roles that geochemical investigations play in efficient resource development. Graham Closs and Robert Jackson outlined the methodology of early stage (reconnaissance) exploration and target definition/testing, respectively. Both speakers stressed the necessity of understanding the target commodity, appropriate deposit and secondary dispersion models, and local geologic/geomorphologic conditions to develop effective exploration strategies. Sound exploration strategies lead to appropriate sampling methods, precise analytical data, and ultimately appropriate data interpretation, and as illustrated by Robert Jackson, inappropriate sampling can lead to "missed opportunity". Bill Chavez and Rob Bowell used numerous real-life examples to illustrate how geochemistry is applied to risk minimization in mine planning and operations monitoring/remediation, respectively. Chavez discussed the fundamental importance of ore and waste classification to most effectively process complex ores and appropriately handle wastes in an appropriate responsible manner. Bowell provided a similar discussion, but added examples of ore recovery issues and remediation decisions that are driven by geochemical considerations.

continued on page 10

Shea Clark Smith
MINERALS EXPLORATION &
ENVIRONMENTAL GEOCHEMISTRY
*Advanced survey, analytical and interpretational methods
for exploration through exotic overburden.*
PLANT + SOIL + GAS + ROCK + STANDARDS
SPECIALTY SAMPLE PREPARATION
P.O. Box 18325, Reno, Nevada 89511
Tel: 775-849-2235 • Fax: 775-849-2335
SheaClarkSmith@compuserve.com

SEG Workshop...

continued from page 9

Barry Smee offered two talks in this section that addressed estimation of risk using quality control data and the role of the Qualified Person in resource evaluation. In the first talk, Smee outlined the general guidelines for how to collect field, preparation and pulp duplicates. He then showed how these data can be used to assess the variation (errors) in geochemical data resulting from collection, preparation and analysis of inherently heterogeneous geologic samples. His second talk outlined the various regulatory descriptions of Qualified Persons and the QP's vital role in verifying and assessing all aspects of resource delineation (i.e. much of the previously discussed material). These responsibilities include verification and assessment of field sampling media and methods, sample preparation, laboratory analytical techniques and data reproducibility.

The *Evolving Scientific and Technical Developments and Trends* session was conducted in the afternoon and included two 'scientific' talks. David Kelley opened with an overview of dispersion, focusing on a wide variety of secondary dispersion processes. This discussion had direct bearing on planning exploration strategies, as discussed in the morning session. Brenda Caughlin discussed the evolving, increasingly interactive relationship between laboratories and clients. She included several important issues pertinent to the duties of qualified persons, including the need to verify

laboratory analytical technique accreditation, understand variation in reference material and project standard analyses, and select appropriate analytical techniques based on project objectives and budgets. The final talk of the day was given by Erik Grunsky, who presented case studies of statistical techniques for mapping geology and/or ore deposits using multi-variate data.

Sandwiched between these presentations were 'evolving technologies' talks that described three evolving exploration techniques. Gwendy Hall discussed selective extraction analysis used for exploration of deeply buried deposits. She included sample data and graphics, impacts of various parameters on leaching results, and proposed mechanisms for element transfer to the shallow sampling depth. Soil gas technology, an alternative exploration tool for buried deposits, was discussed by Jeffrey Jaacks. Jaacks outlined soil gas measurement instrument types and costs, and showed case studies (including a comparison to selective extraction data) illustrating the potential of this technique in some geologic environments. The final evolving technologies presentation was presented by Richard Glanzman who talked about field portable X-ray fluorescence, Near-Infrared and Shortwave Infrared and Raman instruments. These instruments, originally developed for remote and military applications, are now commercially available and can provide real time field-based chemical and mineralogical data.

As an economic geologist with the bulk of my experience in grass roots exploration, I felt that this workshop provided, as advertised, a broad stroke overview of the role of geochemistry in various aspects of mineral resource development. While I would have been interested in more specific talks on ore deposit geochemistry and data presentation, the wide range of topics within this workshop had broad-based appeal. Although slight reorganization of the talks may have made it easier to inter-relate topics, the individual talks were generally well arranged and concise. Inclusion of the printed and digital versions of the talks was very advantageous and has already proven useful. Overall, the workshop was very worthwhile. Thanks to the workshop chairs Graham Closs and David Kelley and all presenters for their time and effort in making this workshop a success.

Garth Graham

U.S. Geological Survey
Box 25046 MS 973 DFC
Denver, CO, USA 80225-0046



A rock solid reputation for absolute accuracy

Since 1982, Becquerel Laboratories has been meeting the analytical requirements of clients in the geological and mineral exploration sector.

Our company is a world leader in Neutron Activation Analysis (NAA). An ultra-sensitive technique, NAA is an ideal quality control procedure to complement and verify results from other analytical techniques. It provides cost-effective, timely analysis and one simple method can analyze over 30 separate elements.

For absolute accuracy, trust the analytical expertise of Becquerel Laboratories.

For more information call 905-826-3080
or visit www.becquerellabs.com



*ISO 17025
For Scope of Accreditation No. 422
Pour la portée d'accréditation no. 422

*Accredited to ISO 17025 by the Standards Council of Canada as a testing laboratory for specific tests.

Becquerel
LABORATORIES

6790 Kitimat Road, Unit 4
Mississauga, Ontario
Canada L5N 5L9

absolute accuracy



Association of Applied Geochemists
Student Membership: \$10 US

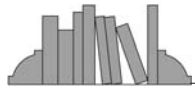
Encourage a student to join!



RECENT PAPERS

This list comprises titles that have appeared in major publications since the compilation in **EXPLORE** Number 130. 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 paper) 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**.

- Alexandre, P., et al., 2005. Alteration Mineralogy and Stable Isotope Geochemistry of Paleoproterozoic Basement-Hosted Unconformity-Type Uranium Deposits in the Athabasca Basin, Canada. *EG* 100(8): 1547-1563.
- Andersen, J.C.O., Thalhammer, O.A.R. and Schoenberg, R., 2006. Platinum-Group Element and Re-Os Isotope Variations of the High-Grade Kilvenjarvi Platinum-Group Element Deposit, Portimo Layered Igneous Complex, Finland. *EG* 101(1): 159-177.
- Alexander, W.R., et al., 2006. Natural immobilization processes and the understanding of long-term evolution of deep geological radioactive waste repositories. *Geochemistry: Exploration, Environment Analysis* 6(1): 3-4.
- Asahara, Y., et al., 2006. Application of Sr isotopes to geochemical mapping and provenance analysis: The case of Aichi Prefecture, central Japan. *Applied Geochem.* 21(3): 419-336.
- Bachler, D. and Kohl, T., 2005. Coupled thermal-hydraulic-chemical modeling of enhanced geothermal systems. *Geophy. J. Intern.* 161(2): 533-
- Barnett, C.T. and Williams, P.M., 2006. Mineral Exploration Using Modern Data Mining Techniques (Chapt. 15). *in* Doggett, M.D. and Parry, J.R., (eds.), *Wealth Creation in the Minerals Industry: Integrating Science, Business, and Education*. Soc. Econ. Geol. Spec. Pub. No. 12: 193-213.
- Barnett, T.J., Maclean, W.H., and Areback, H., 2005. The Paleoproterozoic Kristineberg VMS deposits, Skellefte district, Northern Sweden. Part II: Chemostratigraphy and alteration. *Min Deposits.* 40(4): 368-395.
- Barron, J., Barron, L.M., and Duncan, G., 2005. Eclogitic and Ultrahigh-Pressure Crustal Garnets and Their Relationship to Phanerozoic Subduction Diamonds, Bingara Area, New England Fold Belt, Eastern Australia. *EG* 100(8): 1565-1582.
- Bouzari, F. and Clark, A.H., 2006. Prograde Evolution and Geothermal Affinities of a Major Porphyry Copper Deposit: The Cerro Colorado Hypogene Protore, I Region, Northern Chile. *EG* 101(1): 95-134.
- Brimhall, G.H., Dilles, J.H., and Proffett, J.M., 2006, *The Role of Geologic Mapping in Mineral Exploration* (Chapt. 11). *in* Doggett, M.D. and Parry, J.R., (eds.), *Wealth Creation in the Minerals Industry: Integrating Science, Business, and Education*. Soc. Econ. Geol. Spec. Pub. No. 12: 221-241.
- Bundschuh, J., Bhattacharay, P., and Chandrasekharam, D. (eds.), 2005. *Natural Arsenic in Groundwater: Occurrence, Remediation, and Management*. A.A. Balkema. 365 p.
- Campbell, I.H., 2006. Large Igneous Provinces and the Mantle Plume Hypothesis. *Elements* 1(5): 265-269.
- Camprubi, A. et al., 2006. Mineralogy, Fluid Characteristics, and Depositional Environment of the Paleocene Epithermal Au-Ag Deposits of the EL Barqueno District, Jalisco, Mexico. *EG* 101(1): 235-247.
- Cerny, P. and Ereit, T.S., 2005. The classification of granitic pegmatites revisited. *Can. Mineralogist* 43(6): 2005-2026.
- Charlet, L. and Polya, D.A., 2006. Arsenic in Shallow, Reducing Groundwaters in Southern Asia: An Environmental Health Disaster. *Elements* 2(2): 91-96.
- Corteel, C., Dini, A., and Deyhle, A. (eds.), 2005. *Special Issue on Element and Isotope Mobility during Water-Rock Interaction Processes*. *Physics and Chem. of the Earth* 30(17/18): 993-
- Demage, T. et al., 2006. The Salsigne Au-As-Bi-Ag-Cu Deposit, France. *EG* 101(1): 199-234.
- Derome, D., et al., 2005. Mixing of Sodic and Calcic Brines and Uranium Deposition at McArthur River, Saskatchewan, Canada: A Raman and Laser-Induced Breakdown Spectroscopic Study of Fluid Inclusions. *EG* 100(8): 1529-1545.
- Doggett, M.D. and Parry, J.R. (eds.), 2006. *Wealth Creation in the Minerals Industry: Integrating Science, Business, and Education*. Soc. Econ. Geol. Spec. Pub. No. 12. 329 p.
- Dolgoplova, A., et al., 2006. Use of isotope ratios to assess sources of Pb and Zn dispersed in the environment during mining and ore processing within the Orlovka-Spokainoe mining site (Russia). *Applied Geochem.* 21(4): 563-579.
- Dominique, J., et al., (eds.), 2006. *Extended Abstracts of the 7th Symposium on the Geochemistry of the Earth's Surface*. *J. Geochem. Explor.* 88(1/3):
- Dudkin, O.B., 2005. Mineralogical-geochemical indices of the super-large endogenous deposits of phosphorous. *Proc. Russian Min. soc.* 134(1): 34-
- Ednie, H., 2006. Uranium exploration breaks ground with new techniques. *Bull. C.I.M.* (May): 19-21.
- Emery, X, Bertini, J.P., and Ortiz, J.M., 2005. Resource and reserve evaluation in the presence of imprecise data. *C.I.M. Bull.* 98(1089): 88-
- Enders, M.S. et al., 2006. The Role of Bacteria in the Supergene Environment of the Morenci Porphyry Copper Deposit, Greenlee County, Arizona. *EG* 101(1): 59-70.



RECENT PAPERS

continued from Page 11

- Ewing, R.C., 2005. The nuclear fuel cycle versus the carbon cycle. *Can. Mineralogist* **43**(6): 2099-2116.
- Filzmoser, P., Garrett, R.G., and Reimann, C., 2005. Multivariate outlier detection in exploration geochemistry. *Computers and Geosciences* **31**(5): 379.
- Fleet, M.E., 2005. XANES Spectroscopy of sulfur in earth materials. *Can. Mineralogists* **43**(6): 1811-1838.
- Gammons, C.H., et al., 2005. Hydrogeochemistry and rare earth element behavior in a volcanically acidified watershed in Patagonia, Argentina. *Chem. Geol.* **222**(3/4): 249-267.
- Grenne, T. and Slack, J.F., 2005. Geochemistry of Jasper Beds from the Ordovician Lokken Ophiolite, Norway: Origin of Proximal and Distal Siliceous Exhalites. *EG 100*(8): 1511-1527.
- Hall, D.J. and Redwood, S.D., 2006. The Mineral Exploration Business: Innovation Required. *SEG Newsletter No. 65*: 1, 9-15.
- Hartley, A.J. and Rice, C.M., 2005. Controls on supergene enrichment of porphyry copper deposits in the Central Andes; A review and discussion. *Min. Deposita.* **40**(5): 515-525.
- Hitzman, M.W. and Valenta, R.K., 2005. Uranium in Iron-Oxide-Copper-Gold (IOCG) Systems. *EG 100*(8): 1657-1661.
- Hochella, M.F., Jr., et al., 2004. Direct observation of heavy metal-mineral association from the Clark Fork River Superfund Complex: Implications for metal transport and bioavailability. *GCA* **69**(7): 1651.
- Hoel, K.O., McNulty, T.P., and Schmidt, R., 2006. Metallurgical Advances and Their Impact on Mineral Exploration and Mining (Chapt. 13). *in* Doggett, M.D. and Parry, J.R. (eds.), *Wealth Creation in the Minerals Industry: Integrating Science, Business, and Education*. *Soc. Econ. Geol. Spec. Pub. No. 12*: 243-261.
- Holland, H.D., 2005. Sedimentary Mineral Deposits and the Evolution of Earth's Near-Surface Environment. *EG 100*(8): 1489-1509.
- Hollings, P., Cooke, D., and Clark, A., 2005. Regional Geochemistry of Tertiary Igneous Rocks in Central Chile: Implications for the Geodynamic Environment of Giant Porphyry Copper and Epithermal Gold Mineralization. *EG 100*(8): 887-904.
- Hook, S.J., et al., 2005. Mapping variations in weight percent silica measured from multi-spectral thermal infrared imagery – Examples from the Hiller Mountains, Nevada, USA and Tres Virgenes-La Reforma, Baja California Sur, Mexico. *Remote Sensing of Environment* **95**(3): 518-
- Hopenhayn, C., 2006. Arsenic in Drinking Water: Impact on Human Health. *Elements* **2**(2): 103-107.
- Horitaw, J., 2005. Review of stable isotope thermometry: There is more to it than temperature. *Geochem. J.* **39**(6): 481-
- Hudson-Edwards, K. and Hodson, M.E. (eds.), 2005. Special Issue on Speciation and Toxicity. *Min. Mag.* **69**(5):
- Huminicki, M.A.E., et al., 2005. Quantitative Mass Balance of Platinum Group Elements in the Kelly Lake Ni-Cu-PGE Deposit, Copper Cliff Offset, Sudbury. *EG 100*(8): 1631-1646.
- Jambor, J.L., Racidsepp, M., and Mountjoy, K., 2005. Mineralogy of permeable reactive barriers for the attenuation of subsurface contaminants. *Can. Mineralogist* **43**(6): 2117-2140.
- Jonsson, J., Jonsson, J., and Lorgren, L., 2006. Precipitation of secondary Fe (III) minerals from acid mine drainage. *Applied Geochem.* **21**(3): 437-445.
- Kelly, J.G., et al., (eds.), 2003. Europe's Major Base Metal Deposits. *Irish Assoc. Eon. Geol.*
- King, D., Ramsey, M., and Swayze, G. (eds.), 2004. *Infrared Spectroscopy in Geochemistry, Exploration Geochemistry, and Remote Sensing*. *Min. Assoc. Canada Short Course Notes. V. 33.* 284 p.
- Klein, C., 2005. Some Precambrian banded iron-formations (BIFs) from around the world: Their age, geologic setting, mineralogy, metamorphism, geochemistry, and origins. *Am. Min.* **90**(10): 1473-
- Kusky, T.M., (ed.), 2004. *Precambrian Ophiolites and Related Rocks*. *Develop. Precamb. Geol.* **13**. Elsevier. 800 p.
- Lazarenkov, V.G., et al., 2005. Platinum group metals and gold in supergene nickel ores of the Moa and Nikaro deposits (Cuba). *Lith. And Min. res.* **40**(6): 521-527.
- Lehtonen, M.L., et al., 2005. Glacial dispersal studies using indicator minerals and till geochemistry around two eastern Finland kimberlites. *J. Geochem. Explor.* **87**(1): 19-
- Lightfoot, P.C. and Zotov, I.A., 2005. Geology and geochemistry of the Sudbury igneous complex, Ontario, Canada: Origin of nickel sulfide mineralization associated with an impact-generated melt sheet. *Geol. Ore Deposits* **47**(5): 349-
- Lloyd, J.R. and Oremland, R.S., 2006. Microbial Transformations of Arsenic in the Environment: From Soda Lakes to Aquifers. *Elements* **2**(2): 85-90.
- Losh, S., et al., 2005. Geologic and geochemical study of the Picacho gold mine, California: Gold in a low-angle normal fault environment. *Min. Deposita.* **40**(2): 137-
- Luddington, S. et al., 2006. Regional Surficial Geochemistry of the Northern Great Basin. *EG 101*(1): 33-57.
- Maier, W.D., 2005. Platinum-group element (PGE) deposits and occurrences: Mineralization styles, genetic concepts, and exploration criteria. *J. African Earth Sci.* **41**(3): 165-
- Mark, G., Oliver, N.H.S., and Williams, P.J., 2006. Mineralogical and chemical evolution of the Ernest Henry Fe oxide-Cu-Au ore system, Cloncurry district, northwest Queensland, Australia. *Min. Deposita.* **40**(8): 769-801.
- Marshall, D., Anglin, C.D. and Mumin, H., 2004. *Ore Mineral Atlas*. *Geol. Assoc. Can., Min. Deposit Div.* 122 p.
- Martin, R.F. and DeVito, C., 2005. The patterns of enrichment in felsic pegmatites ultimately depend on tectonic setting. *Can. Mineralogist* **43**(6): 2027-2048.

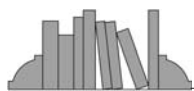


RECENT PAPERS

continued from Page 12

- McCaffrey, K.J.W., et al., 2005. Unlocking the spatial dimension: digital technologies and the future of geoscience fieldwork. *J. Geol. Soc.* **162**(6): 927-937.
- Mitchell, R.H., 2005. Carbonatites and carbonatites, and carbonatites. *Can. Mineralogist* **43**(6): 2049-2068.
- Monecke, T., Gemmell, J.B. and Herzig, P.M., 2006. Geology and Volcanic Facies Architecture of the Lovwe Ordovician Waterloo Massive Sulfide Deposit, Australia. *EG* **101**(1): 179-197.
- Moloshag, V.P., et al., 2005. Precious and rare metals in bornite ores of the Urals massive sulfide ore deposits. *Proc. Russian Min. Soc.* **134**(3): 53-77.
- Monecke, T., et al., 2005. Truncated fractal frequency distribution of element abundance data: A dynamic model for the metasomatic enrichment of base and precious metals. *Earth and Planetary Sciences Letters* **232**(3/4): 363-372.
- Morin, G. and Calas, G., 2006. Arsenic in Soils, Mine Tailings, and Former Industrial Sites. *Elements* **2**(2): 97-101.
- Mungall, J.E., (ed.), 2005. Exploration for Platinum-Group Element Deposits. *Min. Assoc. Canada Short Course Notes*. V. 35. 526 p.
- Naldrett, A.J., 2005. A history of our understanding of magmatic Ni-Cu sulfide deposits. *Can. Mineralogist* **43**(6): 2069-2098.
- Nkoane, B.B.M., et al., 2005. Identification of Cu and Ni indicator plants from mineralize locations in Botswana. *J. Geochem. Explor.* **86**(3): 130-140.
- O'Day, P.A., 2006. Chemistry and Mineralogy of Arsenic. *Elements* **2**(2): 77-83.
- Ohta, A., et al., 2005. Application of multi-element statistical analysis for regional geochemical mapping in central Japan. *Applied Geochem.* **20**(5): 1017-1027.
- Page, K.D. and Murphy, J.B., 2004. Mercury concentrations in the bedrock of southwestern Nova Scotia: A reconnaissance study. *Atlantic Geol.* **40**(2): 31-40.
- Parsons, I. and Lee, M.R., 2005. Minerals are not just chemical compounds. *Can. Mineralogist* **43**(6): 1959-1992.
- Parsons, M.B. and Percival, J.B. (eds.), 2005. Mercury: Sources, Measurements, Cycles, and Effects. *Min. Assoc. Canada Short course Series* V. 34. 297p.
- Phillips, N., 2006. Australia's Declining Exploration Share: The Problem and a Solution. *AusIMM Bull.* No. 2): 44-48.
- Plant, J.A., et al., 2005. Chemicals in the environment: Implications for global sustainability. *Applied Earth Sci.* **114**(2): 65-74.
- Polito, P.A., et al., 2005. A Paragenetic and Isotopic Study of the Proterozoic Westmoreland Uranium Deposits, Southern McArthur Basin, Northern Territory, Australia. *EG* **100**(6): 1243-1260.
- Reimann, E. and Garrett, R.G., 2005. Geochemical background – concept and reality. *Sci. of the Total Environment* **350**(1-3): 12-21.
- Roslyakov, N.A., Belevantsev, V.I., and Kalinin, Yu. A., 2005. Supergene gold in manganese-bearing weathered rocks. *Geochem. Intern.* **43**(9): 928-937.
- Salzsauler, K.A., Sidenko, N.V., and Sherriff, B.L., 2005. Arsenic mobility in alteration products of sulfide-rich, arsenopyrite-bearing mine wastes, Snow Lake, Manitoba, Canada. *Applied Geochem.* **20**(12): 2303-2314.
- Sarkar, B.C., 2005. Developments in geomathematical modeling and computer applications in mineral resources assessment. *J. Geol. Soc. India.* **66**(6): 713-724.
- Saunders, A.D., 2006. Large Igneous Provinces: Origin and Environmental Consequences. *Elements* **1**(5): 259-263.
- Scherbarth, N.L. and Spry, P.G., 2006. Mineralogical, Petrological, Stable Isotope, and Fluid Inclusion Characteristics of the Tuvatu Gold-Silver Telluride Deposit, Fiji: Comparisons with the Emperor Deposit. *EG* **101**(1): 135-158.
- Seabrook, C.L., Cawthron, R.G., and Kruger, F.J., 2005. The Merensky Reef, Bushveld Complex: Mixing of Minerals Not Mixing of Magmas. *EG* **100**(6): 1191-1206.
- Seltmann, R., Gerel, O. and Kirwin, D. (eds.), 2005. Geodynamics and Metallogeny of Mongolia with a Special Emphasis on Copper and Gold Deposits. *Center for Russian and Central Eurasian Mineral Studies, IAGOD Guidebook Series* 11. London. 225p.
- Shaw, D.M., 2006. Trace Elements in Magmas: A Theoretical Treatment. *Cambridge Univ. Press.* 243 p.
- Sihong, J. and Fengjun, N., 2005. Geological and geochemical characteristics of the Zhulaz gold deposits in Inner Mongolia, China. *Acta Geologica Sinica.* **79**(1): 87-97.
- Sillitoe, R.H. and Thompson, J.F. H., 2006. Changes in Mineral Exploration Practice: Consequences for Discovery (Chapt. 10). *in* Doggett, M.D. and Parry, J.R., (eds.). *Wealth Creation in the Minerals Industry: Integrating Science, Business, and Education.* *Soc. Econ. Geol. Spec. Pub. No. 12:* 193-219.
- Simakov, S.K., 2006. Redox state of eclogites and peridotites from sub-cratonic upper mantle and a connection with diamond genesis. *Contrib. Min. Petrol.* **151**(3): 282-291.
- Southam, G. and Saunders, J.A., 2005. The Geomicrobiology of Ore Deposits. *EG* **100**(6): 1067-1084.
- Sproule, R.A., et al., 2005. Chalcophile Element Geochemistry and Metallogenesis of Komatiitic Rocks in the Abitibi Greenstone Belt, Canada. *EG* **100**(6): 1169-1190.
- Stanley, C.R., 2006. Numerical transformation of geochemical data: 1. Maximizing geochemical contrast to facilitate information extraction and improve data presentation. *Geochemistry: Exploration, Environment, Analysis* **6**(1): 69-78.
- Stanley, C.R., 2006. Numerical transformation of geochemical data. 2. Stabilizing measurement errors to facilitate data interpretation. *Geochemistry: Exploration Environment, Analysis* **6**(1): 79-88.

continued on page 14



RECENT PAPERS

continued from Page 13

- Tam, T.A., et al., 2005. Rare earth element geochemistry of the Zigzag-Klondyke sedimentary rock formations: Clues to the evolution of the Baguio mineral districts (Luzon), Philippines. *Resource Geol.* **55**(3): 217-224.
- Thomson, I. and Joyce, S., 2006. Changing Mineral Exploration Industry Approaches to Sustainability (Chapt. 8). *in* Doggett, M.D. and Parry, J.R. (eds.), *Wealth Creation in the Minerals Industry: Integrating Science, Business, and Education.* Soc. Econ. Geol. Spec. pub. No. 12: 149-169.

- Ujhe-Mikoshiba, M., et al., 2006. Geochemical mapping in northern Honshu, Japan. *Applied Geochem.* **21**(3): 492-514.
- Vander Weijden, C.H. and Pacheco, F.A.L., 2006. Hydrogeochemistry in the Vouga River basin (central Portugal): Pollution and chemical weathering. *Applied Geochem.* **21**(4): 580-613.
- Van Helvoort, P.J., Filzmoser, P. and van Gaans, P.F.M., 2005. Sequential Factor Analysis as a new approach to multivariate analysis of heterogeneous geochemical data sets: An application to a bulk chemical characterization of fluvial deposits (Rhine-Meuse delta, The Netherlands). *Applied Geochem.* **20**(12): 2233-2251.
- Vaughan, D.J., 2006. Arsenic. *Elements* **2**(2): 71-75.
- Velasco, F., et al., 2005. Mapping Fe-bearing hydrated sulphate minerals with short wave infrared (SWIR) spectral analysis at San Miguel mine environment, Iberian Pyrite Belt (SW Spain). *J. Geochem. Explor.* **87**(2): 45-
- Verly, G., 2005. Grade control classification of ore and waste: A critical review of estimation and simulation based procedures. *Math. Geol.* **37**(5): 451-
- Weber, P.A., Thomas, J.E., Skinner, W.M., and Smart, R. St. C., 2005. A methodology to determine the acid-neutralization capacity of rock samples. *Can. Mineralogist* **43**(4): 1183-1192.
- Williams-Jones, A.E. and Heinrich, C.A., 2005. Vapor Transport of Metals and the Formation of Magmatic-Hydrothermal Ore Deposits. *EG* **100**(7): 1287-1312.
- Wood, S.A. and Samson, I.M., 2006. The aqueous geochemistry of gallium, germanium, indium, and scandium. *Ore Geol. Rev.* **28**(1): 57-102.
- Yang, T.F., Italiano, F., and Heinicke, J., (eds.), 2005. Special Issue on Recent Progress in Gas Geochemistry. *Geochem. J.* **39**(5): 395-
- Yang, X.Z., Ishihara, S., and Zhao, D.H., 2006. Genesis of the Jinchuan PGE deposit, China: Evidence from fluid inclusions, mineralogy and geochemistry of precious elements. *Min. and Petrol.* **86**(1/2): 109-
- Yardley, B.W.D., 2005. Metal Concentrations in Crustal Fluids and Their Relationship to Ore Formation. *EG* **100**(4): 613-632.
- Yudovskaya, M.A., et al., 2006. Gaseous transport and deposition of gold in magmatic fluid: evidence from the active Kudryavy volcano, Kurile Islands. *Min. Deposita.* **40**(8): 828-848.
- Zhou, M.F., et al., 2005. Geochemistry, petrogenesis and metallogenesis of the Panzhihua-Gabbroiv layered intrusion and associated Fe-Ti-V oxide deposits, Sichuan province, SW China. *J. Petrol.* **46**(11): 2253.

The Association of Applied Geochemists

announces the

2006 AAG

Student
Paper
Competition



SGS

The AAG is calling for nominations for the 16th biennial Student Paper Competition. The paper must address an aspect of exploration geochemistry or environmental geochemistry related to mineral exploration and represent research performed as a student. The student must be the principal author and the paper must have been published in an English language refereed scientific journal no more than five years after completion of the degree. A nomination may be made by anyone familiar with the work of the student and must be accompanied by four copies of the paper (hard copy or digital).

**Deadline for receipt of nominations is
December 31, 2006.**

The winner will receive:

- A cash prize of **\$1000CAD** generously donated by **SGS Minerals Services**.
- A 2-year membership of AAG, including the society's journal (GEEA), EXPLORE newsletter, publication of an abstract and CV of the winner, a certificate of recognition and **\$500US** towards expenses to attend an AAG-sponsored meeting, courtesy of **AAG**.

Nominations should be sent to:

Dr David Cohen
Chair, Student Paper Competition
School of BEES
The University of New South Wales
UNSW NSW 2052
Australia
Email: d.cohen@unsw.edu.au

The results of the 2006 competition will be announced at the 23rd IGES in Oviedo, Spain, in June 2007.

Further details are available from the chair of the committee or the AAG Students' page at <http://www.appliedgeochemists.org/>



**Association of Applied Geochemists
web site:**

www.appliedgeochemists.org

23rd INTERNATIONAL GEOCHEMICAL EXPLORATION SYMPOSIUM and 2nd INTERNATIONAL APPLIED GEOCHEMISTRY SYMPOSIUM



EXPLORING OUR ENVIRONMENT

Jointly organized by the Department of Exploration and Mining of the University of Oviedo (Spain), the Geological and Mining Institute of Spain (IGME) and the Association of Applied Geochemistry

14 - 19 JUNE 2007. PRÍNCIPE FELIPE CONFERENCE HALL, OVIEDO, ASTURIAS, SPAIN

Preliminary Announcement

Technical Sessions • Poster and Trade Exhibition • Workshops • Social Programme
Field Visits • Accompanying Persons Programme



The 23rd International Geochemical Exploration Symposium and 2nd International Applied Geochemistry Symposium will be held in Oviedo, Spain, from the 14th to the 19th of June 2007.

Oviedo, with 215,664 inhabitants, is the capital of Asturias, in northern Spain. The Symposium will take place in the Conference Hall of the City, located in the heart of Oviedo and within walking distance to hotels and amenities.

The Organizing Committee has planned an assorted program about applied geochemistry, covering the latest advances in geochemical techniques for mining exploration and environment. Pre- and post-symposium field trips are being organized combining both technical and tourist visits in Spain and Portugal. A full slate of workshops will take place on the weekend during the Symposium (16th-17th June). An exciting social and cultural program will be organized for participants and accompanying persons, including a full program of one-day tours to places of interest in the region.

On behalf of the Organizing Committee and the Association of Applied Geochemistry, I have great pleasure to invite you to join in Oviedo in June 2007 to participate in this Symposium. We look forward to meeting you in Oviedo next year.

Jorge Loredo, 23rd IGES Chairman

The technical program will develop on four days, introduced by distinguished keynote speakers, leaders in their respective knowledge fields.

Tentative Technical Sessions are:

- New trends in applied geochemistry
- Litho geochemistry
- Soil geochemistry
- Hydrogeochemistry
- Biogeochemistry
- Applied isotope geochemistry
- Hydrocarbon geochemistry
- Geochemistry, environment and health
- Environmental geochemistry in old mine districts
- Role of geochemistry in mine rehabilitation
- Advances in analytical techniques
- Sample design
- Statistical treatment
- Geochemical mapping
- Commercial session.

		Thursday 14th	Friday 15th	Saturday 16th	Sunday 17th	Monday 18th	Tuesday 19th
Morning	9.00-9.30	Registration (8.00-10.00)	Keynote Speaker	WORKSHOPS / TOURIST EXCURSIONS		Keynote Speaker	Keynote Speaker
	9.30-11.00	Opening ceremony (10.00-10.30) Keynote Speaker (10.30-11.00)	Technical Session 4			Technical Session 8	Technical Session 12
		Coffee				Coffee	
	11.30-13.00	Technical Session 1	Technical Session 5			Technical Session 9	Technical Session 13
		Lunch				Lunch	
Afternoon	15.00-16.30	Technical Session 2	Technical Session 6			Technical Session 10	Technical Session 14
		Coffee				Coffee	
	17.00-18.30	Technical Session 3	Technical Session 7	Technical Session 11	Closure Ceremony		
Evening		Welcome Reception	Typical Dinner		Symposium Official Dinner		

Symposium Information:

Tel: 34-985104295/75

Fax: 34-985104245

Symposium Website: www.uniovi.es/IGES2007

The Organizing Committee invites you to submit papers for oral and poster presentations. Abstracts with a maximum extension of 500 words must be received before 20th December 2006 according to the format included in the web page.

Relevant information will be continuously updated on the web site.

New Members and Fellows

FELLOWS:

Mr. Christopher Gianatti

Laboratory Supervisor
Pilbara Iron (Rio Tinto Iron Ore)
PO Box 82
Paraburdoo, WA
AUSTRALIA 6754
Membership #3913

Mr. Paul Polito

Regional Geochemist
Anglo American Explor. Australia
1/16 Brodie Hall Drive
Bentley, Perth
WA AUSTRALIA 6102

Mr. Norman Richard Bailie

37 Bowtown Road
Newtownards, Co. Down
N. IRELAND BT23 8SH
Membership # 3049

Mr. Paul Burton

Exploration Data Analysis
PO Box 152
Greenacres, SA AUSTRALIA 5086
Membership # 3214

NON-VOTING MEMBERS:

Mr. Simon B. Rigby

Exploration Manager - Australia
Barrick Gold of Australia Ltd.
Locked Bag 12
Cloisters Square
Perth, WA
AUSTRALIA 6850
Membership # 3902

Mr. Jeffrey A. Winick

Geochemist
MWH Global
1475 Pine Grove Rd
Steamboat Springs,
CO, USA 80487
Membership # 3903

Mr. Hugo Caranza

General Manager
Alex Stewart Assayers Argent. S.D.
Las Marias 4942-Chacras De Coria
Lujan, Mendoza, ARGENTINA 5505
Membership # 3905

Mr. Donald M. Wright

Geologist/Geochemist
Cameco Corporation
2121 11th St. W.
Saskatoon, SK
CANADA S7M 1J3
Membership # 3906

Mr. Romy Matthies

Geochemist
SRK (UK) Ltd.
Windsor Court
1-3 Windsor Place
Cardiff, WALES, UK
CF10 3BX
Membership # 3908

Mr. Theophilus Davies

Professor
University of Jos
Dept. of Geology & Mining
University of Jos, Bauchi Rd.
Jos, Plateau State
NIGERIA, PMB 2084
Membership # 3910 -
Sponsored by the AAG

The AAG Needs You as a Councillor

Each year the President of the Association of Applied Geochemists issues a plea to AAG Fellows for individuals willing to stand for election to the position of "Ordinary Councillor". Unfortunately, this plea is usually relegated to the trash bin by most Fellows. Fortunately, however, each year some of our most outstanding Fellows are ready, willing, and able to meet this challenge. We thought that an article in **EXPLORE** summarizing the job and how one goes about getting on the ballot might entice more to step forward for election to this most important position.

Job Description

The AAG By Laws state that "the affairs of the Association shall be managed by its board of directors, to be known as its Council." The affairs managed by Council vary from reviewing and ranking proposals to hosting our biennial Symposium to approving application for new membership to developing marketing strategies for sustaining and growing our membership. These affairs are discussed and decisions made at Council teleconferences usually held 3-4 times per year. Each teleconference lasts about 90 minutes. In addition, there is often a running email discussion about a selected issue or two between each teleconference. So for a commitment of about 8 hours of your time per year, you can help influence the future of your Association. If you want to spend more than the minimum time required, there is plenty of opportunity to do so through committee assignments and voluntary efforts that greatly benefit the Association.

Qualifications and length of term

The only qualification for serving as Councillor is to be a Fellow in good standing with the Association. Please note the difference between being a Member of AAG and being a Fellow. A Fellow is required to have more training and professional experience than a Member. Consult the AAG web site, Membership section, for further details.

Each Councillor serves a term of two years and can then stand for election to a second two-year term. The By Laws forbid serving more than two consecutive terms, although someone who has served two consecutive terms can stand for election again after sitting out for at least one year. Elections are usually held in the fall of the year for a term covering the following two years. Our next election will be in the fall of 2006 for the term of 2007-08.

How to get on the ballot

If you are interested in placing your name into consideration for election to AAG Council, simply express your interest to the AAG Secretary (Dave Smith, dsmith@usgs.gov) by August 31, 2006 and include a short (no more than 250 words) summary of your career experience. All that is asked is that you bring energy and ideas to Council and are willing to share in making decisions that will carry the Association forward into a successful future. We look forward to hearing from you.

David B. Smith

Secretary, Association of Applied Geochemists



New Members... *continued from page 16***STUDENT MEMBERS:****Marcia Welch**

University of Texas
406 Jolee St.
Richardson, Texas 75080 USA
Membership # 3914

Mr. Agex Manuel

Student-Geochemistry
Carleton University
E-1921 St. Laurent Blvd.
Ottawa, Ontario
Canada K1G 1A3
Membership #3915

Mr. Patrick J. Sack

PhD Candidate
UTas, CODES
Private Bag 79
Hobart, Tasmania
AUSTRALIA, 7001
Membership # 3909

Mr. Manuel Padilla

Geologo de Distrito
Colorado School of Mines
Industrias Penoles
1909 Digger Dr. #95
Golden, CO, USA 80401
Membership # 3901

Mr. Jaime A. Poblete Alvarado

Student
Universidad of Chile
Tomás Moro 401 depto C-201
Las Condes
Santiago, CHILE 757-0112
Membership # 3904

Mr. Skya E. Fawcett

PhD Candidate
Queen's University
Miller Hall, Queen's University
Kingston, Ontario, CANADA K7L 3N6
Membership # 3907



Mineral Exploration Research Centre • *Centre de recherche en exploration minérale*



Modular Course in Exploration Geochemistry
06-15 December 2006
Mineral Exploration Research Centre,
Department of Earth Sciences, Laurentian University

This is a ten-day lecture- and laboratory-based course in exploration geochemistry covering the following topics: 1) sampling, sample preparation and analytical techniques in surficial and litho-geochemistry; 2) quality control and quality assurance; 3) introduction to litho-geochemistry, igneous processes, rock classification and applications to volcanic and intrusive stratigraphy; 4) alteration geochemistry, mass balance calculations and alteration indexes; 5) stable and radiogenic isotopes and applications; 6) partial and sequential extractions and applications to surficial geochemistry; 7) REDOX applications in surficial geochemistry; drift prospecting and applications to precious metals, kimberlite and diamond exploration; 8) mineralogy and application of microanalytical methods to exploration geochemistry and mineral processing; 9) tour of Laurentian University's Virtual Reality Laboratory and applications; 10) advanced topics and case studies in litho-geochemistry including: felsic and mafic volcanic rocks associated with VMS mineralization; hydrothermal sediment geochemistry and iron formations; magmatic Ni-Cu-PGE deposits; sediment-hosted ore systems; magmatic and orogenic gold deposits; and Sn-W deposits.

Confirmed Speakers: Gary Beakhouse, Wayne Goodfellow, Stewart Hamilton, Balz Kamber, Dan Kontak, Michael Lesher, Peter Lightfoot, Andy McDonald, Beth McClenaghan, Jan Peter, and Steve Piercey.

Additional information may be found at: http://www.earthsciences.laurentian.ca/coursework_msc.htm or obtained by contacting :

Steve Piercey (course organizer)
Mineral Exploration Research Centre
Department of Earth Sciences
Laurentian University
Phone: +1.705.675.1151 x2364
FAX: +1.705.675.4898
E-mail: spiercey@laurentian.ca

Laurentian University

Mineral Exploration Research Centre
Department of Earth Sciences
935 Ramsey Lake Road, Sudbury, Ontario, Canada P3E 2C6
Telephone: (705) 671-1151 x6575; Facsimile: (705) 675-4898
E-mail : DES@nickel.laurentian.ca

Université Laurentienne

Centre de recherche en exploration minérale
Département des sciences de la terre
935 Chemin du lac Ramsey, Sudbury (Ontario) Canada P3E 2C6
Téléphone: (705) 671-1151 x6575; Télécopieur: (705) 675-4898
Courrier électronique: DES@nickel.laurentian.ca



GEOLOGICAL ASSOCIATION OF CANADA GEOLOGICAL SURVEY OF CANADA



Forthcoming Joint Publication by the Geological Association of Canada and the Geological Survey of Canada

Mineral Resources of Canada A Synthesis of Major Deposit-types, District Metallogeny, the Evolution of Geological Provinces, and Exploration Methods

Edited by
Wayne D. Goodfellow

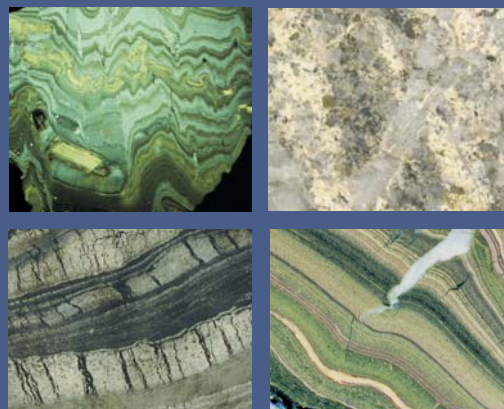
The volume is the culmination of a two-year Geological Survey of Canada CCGK project (X15) on the *Consolidation and Synthesis of Mineral Deposits Knowledge*, and represents our current understanding of mineral resources in Canada. It consists of five major themes:

- Value and history of mining in Canada
- Current synthesis of major deposit-types in Canada - a global perspective and a national focus. Major deposit-types are: 1) kimberlite diamonds, 2) magmatic Ni-Cu-PGE, 3) lode gold (three types), 4) VMS, 5) SEDEX, 6) MVT, 7) porphyry, 8) unconformity uranium, and 9) IOCG
- The metallogeny of economically important mining districts in Canada
- The evolution and metallogeny of geological provinces, i.e., Appalachians, Cordillera, Arctic Islands, Grenville, Slave, Churchill, Trans-Hudson and Superior
- Evaluation of geophysical and geochemical exploration methods from the perspective of what works for different deposit-types

The volume is estimated to contain 45 papers (see Table of Contents on back) comprising approximately 900 printed pages. The volume will be bound by hard covers and printed on and high quality glossy paper in unrestricted colour.

Mineral Resources of Canada A Synthesis of Major Deposit-types, District Metallogeny, the Evolution of Geological Provinces, and Exploration Methods

Edited by
Wayne D. Goodfellow



The volume will also contain a DVD containing the following digital data;

- National and global expert spreadsheets containing about 30 key parameters of nine major deposit-types
- National and global comprehensive GIS databases of the major deposit-types with geology and culture
- Ore Photo Library with supporting maps and diagrams of 30-40 major current or past producing ore deposits



Geological Association of Canada
Mineral Deposits Division



Mineral Resources of Canada: A Synthesis of Major Deposit-types, District Metallageny, the Evolution of Geological Provinces, and Exploration Methods

Edited by Wayne D. Goodfellow

Introduction and Mining History

- Mineral Resources of Canada - An Introduction and Summary of Findings.....*Wayne Goodfellow*
An Overview of the Value of Canada's Mineral Resources...*John Lydon*

Synthesis of Major Deposit-types

- Greenstone-hosted Quartz-carbonate Vein Deposits (Orogenic, Mesothermal, Lode Gold, Shear-zone-related Quartz-carbonate or Gold-only Deposits)....*Benoît Dubé and Patrice Gosselin*
Gold-rich Volcanogenic Massive Sulphide Deposits.....*Benoît Dubé, Patrice Gosselin, Mark Hannington and Alan Galley*
Epithermal Gold Deposits.....*Bruce Taylor*
Intrusive-associated gold deposits.....*Craig Hart*
Volcanogenic Massive Sulphide (VMS) Deposits...*Alan Galley, Mark Hannington and Ian Jonasson*
Sedimentary-Exhalative (SEDEX) Zn-Pb-Ag Deposits.....*Wayne Goodfellow and John Lydon*
Mississippi Valley-type (MVT) Lead-Zinc Deposits.....*Suzanne Paradis, Peter Hannigan, and Keith Dewing*
Magmatic Nickel-Copper-Platinum Group Element Deposits.....*O. Roger Eckstrand and Larry Hulbert*
Porphyry Deposits.....*W.D. Sinclair*
Iron Oxide Copper-Gold (\pm Ag \pm Nb \pm P \pm REE \pm U) Deposits: A Canadian Perspective.....*Louise Corriveau*
Unconformity Associated Uranium Deposits.....*C.W. Jefferson, D.J. Thomas, S.S. Gandhi, P. Ramaekers, G. Delaney, D. Brisbane, C. Cutts, P. Portella and R.A. Olson*
Kimberlite Diamond Deposits.....*Bruce Kjarsgaard*

Metallogeny of Major Mining Districts

- Red Lake District, Ontario.....*Benoît Dubé*
Yellowknife District, Northwest Territories.....*John Kerswell*
Mineral Occurrences of the Betts Cove Complex Baie Verte Peninsula, Newfoundland.....*Al Sangster*
Meguma Gold Deposits, Nova Scotia.....*A.L. Sangster and Paul K. Smith*
Metallogeny of the Sudbury Mining Camp, Ontario.....*Doreen Ames*
Voisey's Bay District, Labrador, Newfoundland.....*Tony Naldrett*
Magmatic Ni-Cu-(PGE) deposits of the Thompson Nickel Belt.....*Daniel Layton-Matthews and Michael Leshner*
Metallogeny of the Raglan district, northern Quebec...*Michael Leshner*
Overview of the Geology and Cr-PGE Potential of the Southern Québec Ophiolite Belt.....*Jean H. Bédard, J.-M. Schroetter, P. Pagé, A. Tremblay, and V. Bécu*

- Metallogeny of the Bathurst Mining Camp, New Brunswick.....*Wayne Goodfellow*
Flin Flon and Snowlake Districts, Manitoba.....*Doreen Ames and Alan Galley*
Metallogeny of the Noranda District, Quebec and Ontario.....*Harold Gibson, Alan Galley et al.*
Finlayson Lake District, Yukon.....*Jan Peter, Steve Piercey et al.*
Base Metal Metallogeny of the Selwyn Basin, Canada.....*Wayne Goodfellow*
Synopsis of the Belt-Purcell Basin.....*John Lydon*
Pine Point Mississippi Valley-Type Zinc-Lead District, Southern Northwest Territories.....*P.K. Hannigan*
Metallogeny of the Robb Lake Carbonate-hosted Zn-Pb district, Northeastern British Columbia.....*Suzanne Paradis and JoAnne Nelson*
Synopsis of the Polaris Zn-Pb-Cu District, Canadian Arctic Islands, Nunavut.....*Keith Dewing, Robert J. Sharp and Elizabeth Turner*

Evolution and Metallogeny of Geological Provinces

- Geological History, Mineral Occurrences and Mineral Potential of the Sedimentary Rocks of the Canadian Arctic Archipelago.....*Keith Dewing, Elizabeth Turner, and J.C. Harrison*
Tectonics and Metallogeny of the British Columbia, Yukon and Alaskan Cordillera, 1.8 GA to Present.....*JoAnne Nelson and Maurice Colpron*
Pre-Carboniferous metallogeny of the Canadian Appalachians.....*Cees R. van Staal*
Metallogeny of the Grenville Province.....*Louise Corriveau and Serge Perreault*
Geology and Metallogeny of the Superior Province, Canada.....*John A. Percival*
Geology and Metallogeny of the Trans-Hudson Orogen.....*David Corrigan*
Geology and Metallogeny of the Western Churchill...*Sally Pehrsson, Subhas Tella*
The Slave Craton: Geological and Metallogenic Evolution.....*Wouter Bleeker and Brian Hall*
Metallogeny of Large Igneous Provinces (LIPs).....*Richard Ernst*

Geophysical and Geochemical Exploration Methods

- Overview of Geophysical Signatures Associated with Canadian Ore Deposits.....*K. Ford, P. Keating and M.D. Thomas*
Application of Till Geochemistry and Mineralogy to Kimberlite Diamond Exploration.....*Beth McClenaghan and Bruce Kjarsgaard*
Aqueous Geochemistry in Mineral Exploration...*Matthew Leybourne*
Alteration Vectors to Metamorphosed Hydrothermal Systems in Gneissic Terranes.....*Anne-Laure Bonnet et Louise*



Toronto, Canada Sept 9 to 12, 2007

Invitation

- ✘ Theme
- ✘ Who should attend
- ✘ Information Booklet

Technical Program

- ✘ Publication of Proceedings

Training and Events

- ✘ Exhibition
- ✘ Field School
- ✘ Commercial Presentations
- ✘ Company Visits

Accommodations

Contact Us

Invitation

Exploration 07 is the fifth in a series of once-a-decade meetings organized by the Canadian mineral exploration community to review the major advances in exploration technology made over the previous 10 years.

Designed with the global exploration community in mind, earlier meetings were attended by up to 1,000 delegates from as many as 60 countries. In addition to a world-class set of presentations and supporting workshops, a full documentation of the proceedings is one of the established traditions of these decennial reviews.

As with previous meetings, Exploration 07 will present the state of the art in exploration technology, with the focus on geophysics, geochemistry, remote sensing, data processing and integration and the application of these disciplines to ore discovery.

The organizing committee of Exploration 07 invites its colleagues from around the world to convene in Toronto in September 2007 to network with their international colleagues, build on their exploration expertise and to celebrate another 10 years of advancement of the exploration geosciences.

Theme

Exploration 07 will review the current state of the art in geophysics, geochemistry, remote sensing, data processing and integration. Given the industry-wide emphasis of better integration of scientific capabilities and business imperatives, the meeting will seek to highlight the strategic linkage between the technological and commercial sides of the exploration industry from primary ore discovery to risk management through the entire mining cycle.

Who Should Attend

The activities of Exploration 07 will be of interest and value to a wide spectrum of stake holders in mineral exploration, including geologists, geochemists, geophysicists as well as managers, academics and government scientists involved with mineral exploration and mining-related environmental programs.

Information and Registration

To receive the information that you will need to participate as a delegate or exhibitor to Exploration 07, you should fill in the form on the [information booklet](#) and fax it back to the organizing committee at 1-905-474-1968, or email your contact details and items of interest to: interest@exploration07.com



ioStipend



In-kind Analytical Research Fund for BSc(Hons), MSc and PhD students

Much has been said and written about the broadening gulf between the demand for qualified explorationists and the supply coming out of our colleges, technical institutes and universities. One merely has to attend any geo-conference and gaze out over the sea of grey to fully grasp the situation our industry faces. This is all the more evident in the field of exploration geochemistry whose members have always been in short supply.

As consultants and service industries, we owe our livelihood to mining and exploration and thus have a vested interest in its development. We believe that any aid to promote fresh faces into our sector is helping to secure our future.

Acme Analytical Laboratories Ltd. and **ioGlobal** are taking the bold initiative of directly aiding students in the geosciences via the **ioStipend**. The **ioStipend** is a grant available to students conducting exploration-related geochemical studies at a recognized educational institution. The grant is in the form of analytical services using any package provided by Acme Analytical Laboratories Ltd. Students and/or their teachers/advisors can apply for the grant by submitting the application to ioGlobal who will vet the proposals.

The grant is intended to promote the collection of high quality, base-line data for comparison with more “esoteric data” (eg, isotopic data, partial digests, non-standard sample media) generated during the course of research, and to promote broad training in fundamental geochemical principals across the geosciences.

The **ioStipend** allows for amounts of approximately \$5,000 (AUD, CAD or equivalent) for in-kind analytical work. Successful applicants will also be provided with 3 academic licences of **ioGAS**, the new exploratory data analysis software package available from ioGlobal.

The application form is available at www.ioglobal.net.

It is envisaged that three or four of these awards will be made each year.

Applications are reviewed by an expert group of ioGlobal’s geochemists

Eligibility Criteria

Preference will be given to:

- students with no other source of funding
- students working on exploration geochemistry projects
- projects no or very minimal confidentiality requirements

The ioStipend is international. Applications are welcome from qualified institutions globally.

Some technical input may be provided by ioGlobal on request.

Requirements for receiving the ioStipend

Firstly, there are minimal strings attached. Recipients would have to agree to

1. Have their project promoted on the ioGlobal web site in an area devoted to R&D carried out under the program (couple of passport photo shots, brief description)
2. Acknowledge ACME Labs and ioGlobal for support in technical and public presentations of results
3. Write a short article for Explore describing the project outcomes, and allow this to be published on the ioGlobal web site.

David Lawie, John Gravel



Association of Applied Geochemists
APPLICATION FOR MEMBERSHIP*



Please complete only the relevant section for membership. See below for mailing instructions.

I, _____, wish to apply for election as a ___Member / ___Student Member of the Association of Applied Geochemists. I have read the Code of Ethics of the Association and in the event of being elected a Member/ Student Member agree to honour and abide by them.

MEMBER: *State Employer and Employee title*

I am actively engaged in scientific or technological work related to applied geochemistry exploration and have been so for the past two years.

_____ as a _____
(employer) (employment title)

STUDENT MEMBER: *Student status must be verified by a Professor of your institution or a Fellow of the AAG*

I certify that the applicant is a full-time student at _____ in pure or applied science.
(institution)

(Professor/ AAG Fellow Signature) (Printed Name and Title)

Witness my hand this _____ day of _____, 20_____. _____
(Signature of applicant)

NAME AND ADDRESS: PLEASE PRINT (to be completed by applicant)

Name: _____ Telephone bus: _____
Address: _____ fax: _____
_____ home: _____
_____ e-mail: _____

Annual Dues :

All applications must be accompanied by annual dues. All payments must be in US funds. Select one of the four listed below.

- | | | | | |
|---|--|------|--------------|-------|
| 1 | 2006 member dues | US\$ | 100 | _____ |
| 2 | 2006 student member dues | | 10 | _____ |
| | - If receipt required, include a self-addressed envelope and add | | 2 | _____ |
| | - If your check is not drawn from a U.S.A. or Canadian bank, add | | 15 | _____ |
| | | | TOTAL | _____ |

Payment by check, International Money Order, UNESCO Coupons, International Postal Orders, VISA, American Express and Master Card are acceptable. For credit cards users, minor variations in your billing may reflect currency exchange rate fluctuations at time of bank transaction.

Type: VISA ___ American Express ___ Master Card ___ Credit card account number: _____
Expiry date: _____ Name: _____ Signature: _____

***Application for voting membership requires the sponsorship of three voting members. Request a voting member application from the Association office.**

Please note: Your application form 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 AAG 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 Applied Geochemists
P.O. Box 26099, 72 Robertson Road, Ottawa, Ontario, CANADA K2H 9R0

TEL: (613) 828-0199, FAX: (613) 828-9288, email: office@appliedgeochemists.org WEBSITE: http://www.appliedgeochemists.org

EXPLORE

Newsletter No. 131

JULY 2006

Editor: Beth McClenaghan (bmcclena@nrca.gc.ca)

Assistant Editors:

Rob Bowell (rbowell@srk.co.uk/srk003@aol.com)

Richard Carver (RichardCarver@gxpclore.com)

Patrick Highsmith

Barry Smee (bwsme@attglobal.net)

Neil Adshead (neil_adshead@placerdome.com)

Business Manager:

David Seneshen, (303) 277-1694
(dseneshen@directgeochemical.com)Back Issues contact: Betty Arseneault
(office@appliedgeochemists.org)

EXPLORE is published quarterly by the Association of Applied Geochemists, P.O. Box 150922, Lakewood, CO 80215-0922, USA.

EXPLORE is a trademark of the Association of Applied Geochemists.

Type and layout of EXPLORE: Vivian Heggie, Heggie Enterprises, Thornton, CO (303) 288-6540; <vjmhggie@comcast.net>

ADVERTISING RATES

Full page (Black & White)	241h x 190w mm	(9.5h x 7.5w in)	US \$ 970
Full page (Color)			US\$1165
Half page (Black & White)	241h x 89w mm	(9.5h x 3.5w in)	US \$ 530
	or	124h x 190w mm	(4-7/8h x 7.5w in)
Half page (Color)			US \$635
Third page (Black & White)	241h x 51w mm	(9.5h x 2w in)	US \$420
	or	178h x 89w mm	(7h x 3.5w in)
Third page (Color)			US \$505
Quarter page (B&W)	124h x 89w mm	(4-7/8h x 3.5w in)	US \$300
	or	241h x 41w mm	(9.5h x 1-5/8w in)
Quarter page (Color)			US \$360
Eighth page (Black & White)	60h x 89w mm	(2-3/8h x 3.5w in)	US \$190
Eighth page (Color)			US \$230
Business Card (B&W)	51h x 89w mm	(2h x 3.5w in)	US \$ 50
Business Card (Color)			US \$ 60

Please direct advertising inquiries to:

DAVID SENESHEN, DIRECT GEOCHEMICAL
130 CAPITAL DRIVE, SUITE C • GOLDEN, CO 80401 • USA
(303) 277-1694 Fax: (303) 278-0104 (dseneshen@directgeochemical.com)

LIST OF ADVERTISERS

Acme Analytical Laboratories, Ltd.	6
Activation Laboratories Ltd.	2
ALS/Chemex	8
Becquerel Laboratories, Inc.-Canada	10
Geosoft	3
Genalysis	6
MEG Shea Clark Smith	9
MMI Technology	4
OMAC	7
Robert G. Jackson	5
Rocklabs	7
SGS	24

THE ASSOCIATION OF APPLIED GEOCHEMISTS

P.O. Box 26099, 72 Robertson Road, Nepean,
Ontario K2H 9R0 CANADA • Telephone (613) 828-0199
www.appliedgeochemists.org

OFFICERS

January - December 2006

Robert J. Bowell, President

SRK Consulting
Windsor Court, 1 Windsor Place
Cardiff, Wales CF10 3BX
TEL: 442920348150
FAX: 442920348199
email: rbowell@srk.co.uk

David B. Smith, Secretary

U.S. Geological Survey
Box 25046, MS 973
Denver, CO 80225, USA
TEL: (303) 236-1849
FAX: (303) 236-3200
email: dsmith@usgs.gov

Gwendy E.M. Hall, Treasurer

Geological Survey of Canada
601 Booth Street, Room 561
Ottawa, ON K1A 0E8, CANADA
TEL: (613) 992-6425
FAX: (613) 992-6425
email: ghall@nrcan.gc.ca

COUNCILORS

Councilor Emeritus
Sherman Marsh

2005-2006

Robert Eppinger
David Seneshen
Phil Baker
Allan Kelly

David Cohen
Stephen Cook
Jorge Loreda
Olle Selinus

2006-2007

Ray Lett
Cliff Stanley
David Lentz
David Garnett
William Coker

Brazil

Germano Melo Jr.

Chile

Brian Townley

China

Xueqiu Wang

Europe

J. B. De Smeth

Northern Countries

Vacant

Southeast Asia

Ifthikhar A. Malik

Southern Africa

Charles Okujeni

*UK and Republic**of Ireland*

Deirdre M. A. Flight

COMMITTEES

Australian Geoscience Council Representative

David Garnett

Awards and Medals Committee

Chair: William Coker
Robert G. Garrett
Günter Matheis
Barry W. Smee

Bibliography Committee

L. Graham Closs, *Chair*
Robert G. Garrett
Richard K. Glanzman
Eric C. Grunsky
Peter J. Rogers

Distinguished Lecturer Committee

Jeffrey Jaacks, *Chair*

Election Official

Sherman Marsh

EXPLORE

Beth McClenaghan, *Editor*
email: bmcclena@nrcan.gc.ca

Rob Bowell, *Assist. Editor*Barry Smee, *Assist. Editor*David Seneshen, *Bus. Manager*

Geochemistry: Exploration, Environment, Analysis

Gwendy E.M. Hall, *Editor-in-Chief*
e-mail: Ghall@nrcan.gc.ca

Admissions Committee

Nigel Radford, *Chair*
Paul Morris
Cliff Stanley

New Membership Committee

Robert Jackson, *Chair*

Publicity Committee

M. Beth McClenaghan, *Chair*
Sherman P. Marsh
J. Stevens Zuker
R. Steve Friberg

Regional Councilor Coordinator

Robert Bowell

Short Course Committee

Colin E. Dunn, *Co-Chair*
Vlad Sopuck, *Co-Chair*

Student Paper Competition

Chair: Vacant
J.B. de Smeth
Paul Morris
Owen Lavin

Symposium Committee

Paul Morris, *Co-Chair*
Nigel Radford, *Co-Chair*
Eion Cameron
Mario Desilets
Philippe Freyssiinet
Gwendy Hall
Virginia McLemore
Barry W. Smee
Graham F. Taylor

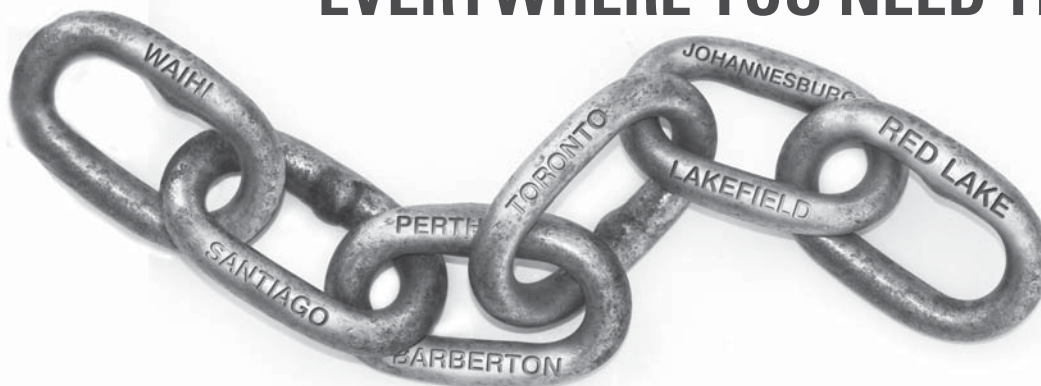
Web Site Committee

Robert Eppinger, *Chair*
Webmaster: Andrew Ransom

Betty Arseneault, Business Manager

P.O. Box 26099, 72 Robertson Road, Nepean, ON K2H 9R0 CANADA,
TEL: (613) 828-0199 FAX: (613) 828-9288, e-mail:
office@appliedgeochemists.org

ISO 17025 ACCREDITED LABORATORIES EVERYWHERE YOU NEED THEM



SGS Minerals Services boasts an unmatched network of international analytical laboratories. Our commitment to quality is exemplified by continuously expanding our chain of ISO 17025 accredited laboratories.

Complete scope of accreditation is available at www.met.sgs.com.

SGS Minerals Services
ca.min@sgs.com

Paid Advertisement

EXPLORE

Newsletter for The Association of Applied Geochemists

P.O. Box 150922, Lakewood, CO, 80215-0922, USA

Please send changes of address to:
Association of Applied Geochemists

P.O. Box 26099, 72 Robertson Road, Nepean, Ontario, K2H 9R0, Canada · TEL: (613) 828-0199 FAX: (613) 828-9288
e-mail: office@appliedgeochemists.org • <http://www.appliedgeochemists.org>

PR SRT STD.
U.S. POSTAGE
PAID
DENVER, CO
PERMIT NO. 3550