

# GEOLOG

The Newsmagazine of the Geological Association of Canada

GEOLOG's 30th Year!

## GEOSCIENCE IN THE INFORMATION AGE

### "Keeping up with a Changing World!"

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The Canadian geoscience community is gradually embracing the new requirements of the information age. The dramatic advances in data management and communications technology during the last decade have presented both opportunities and challenges for government, academia and business. Within the Canadian geoscience community, the 90's were a period of rapid adoption of digital methodology. This evolution was particularly evident in the field of geological mapping. By the end of the decade, methodology development in field systems (e.g. Fieldlog), analysis tools (e.g. Weights of Evidence), GIS-based project data management, and digital cartography, that were initially independent, had coalesced into integrated digital acquisition, interpretation, and mapping systems. It is now possible for geological data to remain in the digital domain from field acquisition through to publication and be efficiently integrated with other geoscience data. At the project and agency levels, this system has resulted in significant improvements including; improved mapping efficiency and the ability to publish project and map data in digital form.

"It is not the fittest of the species which survives, nor the most intelligent, but the ones most responsive to change."

*Charles Darwin 1809 - 1882*

During the same period that geological mapping and other geoscience activities became increasingly "digital", other changes were occurring that placed new expectations on the geoscience community and geological surveys in particular. The rapid growth of the Internet as a source for scientific and other knowledge and dramatic improvement in the available software and hardware for network-based geospatial data dissemination led to a worldwide recognition of the value of developing network-based knowledge infrastructures at national and global levels.

Geological surveys in Canada saw a gradual expansion of their mission during the decade from geoscience research, frontier exploration, and support for national resource exploration, to include support for sustainable economic growth, environmental management, and health and safety. With this change has come the realization that traditional geoscience products and delivery methods often do not meet the needs of users who are not geoscientists. It has become clear that improving access to our geoscience knowledge and delivering it in a consistent, easily-understood form is a key strategy for increasing recognition of the importance of geoscience to Canada and Canadians and thereby increasing investment in geoscience research.

While the digital methodology developments in the 90's produced useful and internally-consistent agency and project databases, it became apparent that the different standards used for each database made it difficult to link, integrate, or exchange data between databases. To rectify this problem, many geological surveys around the world are currently developing systems to provide Internet access to their knowledge assets and integrate them into national and international geospatial data infrastructures. Within Canada, the GeoConnections Initiative (<http://geoconnections.org>) has been established by the federal government to develop the Canadian Geospatial Data Infrastructure that will integrate Canada's geographic information sources and provide Internet access to geospatial services and information. GeoConnections is enabling partnerships between federal, provincial and territorial governments, the private sector, and the academic community aimed at harmonizing Canada's geospatial databases, including topography, aerial photography, satellite imagery, nautical charts, census maps, and, of course, geoscience.

In the Geological Association of Canada's new action plan Towards a New Era of Earth Science Integration, (<http://www.gac.ca/GAC/brochure1.htm>) effective management and use of electronic geoscience information is one of the key strategies to promote geoscience in Canada. The GAC's principal focus in this new and growing area of activity will be on facilitating the development of data standards that can be applied through the latest information technology and helping to establish national metadata standards and models for geoscientific information by: contributing technical expertise; forming participant groups; and facilitating discussion of this process.

In "Towards a New Era of Earth Science Integration", the GAC's new action plan, one of the key strategies is to promote effective management and use of electronic geoscience information.

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## GEOLOGICAL ASSOCIATION OF CANADA

The MISSION of the Geological Association of Canada is to facilitate the scientific well-being and professional development of its members, the learned discussion of geoscience in Canada, and the advancement, dissemination and wise use of geoscience in public, professional and academic life.

The VISION of the Geological Association of Canada is a geoscience community that is knowledgeable, professionally competent and respected, whose input and advice is relevant, widely sought and utilized, and whose vital contribution to the economic prosperity and social well-being of the nation is widely acknowledged.

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*the great grand niece of Sir William Logan*

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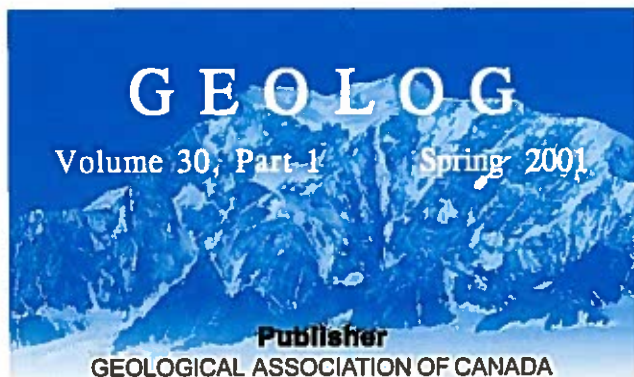
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**RECEVEUR DES POSTES:** Veuillez faire parvenir les changements d'adresse à l'Association Géologique du Canada, dont l'adresse est indiquée ci bas.

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## Préambule



# Presidential Preamble



## GAC's MEMBERSHIP CHALLENGE

Perhaps the biggest challenge facing geoscience organizations in Canada in the next decade will be the challenge of stabilizing membership numbers in the face of the inevitable demographics of the baby boom. In the geoscience community, as elsewhere in our society, the boomers are fast approaching the age of retirement. There is already a trickle of increasing retirements from GAC as the first geoboomers reach the magic age and in a relatively few years, this trickle will become a flood.

The first baby boom retirements are already occurring, and they are aggravating a trend of slowly-declining membership numbers that has been evident in our membership statistics through the 1990's. GAC's membership reached a maximum in the mid- to late-1980's and in 1990 stood at about 3000. Since then, membership numbers have declined steadily to about 2400. During the last decade, then, significantly more of our members have retired or resigned than were replaced by new recruits at the beginning of their geoscience careers resulting in a 20% decrease in membership. I think we can expect that the challenge of replacing retiring members is going to get larger rather than smaller in the decade to come.

GAC Council recognized and began to address the upcoming challenge of maintaining membership in GAC some years ago. Council has undertaken a number of positive steps, including changes to recruitment and members services, to help alleviate the inevitable downward pressure on our membership numbers in the coming decade.

The future of any association is its youngest members. GAC Council believes that one essential element of ensuring our future is attracting students to the association and in recent years, we have taken a number of student-oriented initiatives. Recognizing the fiscal challenges of being a student, we have tried to keep GAC student membership fees at an affordable level, one which barely meets our costs but provides students with most of the benefits of GAC membership including access to journals and publications at member costs. In addition, many Sections and Divisions offer free membership to students. We also work to make GAC known to students through scholarships and student prizes, and through the Student Internship Program which has sponsored students to attend GAC/MAC meetings. These initiatives have been extraordinarily successful and GAC's membership roles in any given year typically include in the area of 300 students. At its February meeting, Council endorsed a plan to sponsor GAC student chapters on university campuses, and approved funding to provide these chapters with resources to further their aims. Our hope is that these will introduce students to GAC, foster an appreciation of the benefits of GAC membership and ultimately encourage these students to become full members after they graduate.

It is more important than ever that we demonstrate to prospective members the solid value in belonging to GAC. To this end, GAC has worked hard to improve member services. This, of course, poses special challenges in a time of declining membership, because a very large proportion of our operating revenue comes from membership fees and declining membership numbers inevitably equate to a declining operational budget. Nonetheless, we continue to improve our member services in ways that add value to membership in the association. For example, major changes have been made to both Geolog and Geoscience Canada, and I believe that both offer particularly fine value as a membership benefit.

GAC is also taking steps to improve the members services provided by our publications. Most members are no doubt aware that GAC publications have declined in number in recent years. This decline reflects, in part, the increasing difficulty of running a modern publications house almost entirely with volunteers. Publications are a very important part of

GAC's business. They offer an important member service by providing a venue for dissemination of scientific information, and have the potential to make an important contribution to our continued fiscal health. Recent Councils have been persuaded that a viable GAC publications stream cannot be maintained under the current structure and have worked hard to develop a new way forward. A new Publications Business Plan was developed by our Publications Committee and approved by Council at its February meeting. As part of this plan, GAC will engage a full time Publications Director, to take over the day to day operation of our publications unit. We expect that this will allow the association to significantly increase the number of publications that we produce annually. Council anticipates that this will add significant value to the organization as a purveyor of scientific information, and contribute new revenue that will allow us to continue to offer and improve the non-revenue generating member services that are critical to our continued ability to attract new members.

One way of doing more with less is, of course, working with partners. GAC has been very proactive in promoting cooperation among geoscience societies in Canada and will continue to do this. We are, of course, long standing partners with MAC in our annual meeting, and partnerships with other societies such as CSPG at annual meetings are becoming the norm rather than the exception. We were an active partner in GeoCanada 2000, which brought together six geoscience societies in a spectacularly successful meeting. We continue to support the Canadian Geoscience Council in its efforts to provide a unified voice for Canadian geoscience. Part of the vision for our restructured publications unit is that it may eventually provide a resource and publications opportunity for the broader geoscience community beyond GAC. We firmly believe that cooperation among Canadian geoscience societies in all aspects of their operations is important, and will become critical in the next decade if geoscientists are to be effectively represented by their associations in the future.

"So," you say, "I'm convinced and I'd like to help. What can I do to help GAC maintain a critical mass of members through the next decade?" Well, I'm glad you asked!

Each of us can make a significant contribution to GAC's continued health by becoming active promoters of GAC and, particularly, by encouraging our colleagues and associates to become GAC members. There are many ways of doing this. You can introduce your co-workers to Geolog and Geoscience Canada (emphasizing that these are available to GAC members as part of their membership), show them the newsletter of the Mineral Deposits Division, the Environmental Earth Sciences Division, or whichever other Division addresses their particular interests, and point them to the GAC website ([www.gac.ca](http://www.gac.ca)) where they can see for themselves how GAC can add value to their professional lives. In addition, talk to the managers of organizations that are engaged in geoscience and show them how a corporate sponsorship in GAC can benefit the organization through, for example, access to CJES at less than the cost of a third party subscription, free subscriptions to Geolog, Geoscience Canada, free publications, and corporate promotion in our newsletters, our website, and at our annual meeting. We should never underestimate the potential impact of personal efforts to promote GAC or the influence of personal enthusiasm on those around us. Those of us who belong to GAC are best placed to demonstrate its value to others. For those of us who believe in the value of GAC, this presents an important opportunity to provide for its future.

Scott Swinden  
GAC President

# From the Geolog Editor



## GIT Explained

There is too much data, overwhelming heaps of information, only limited amounts of knowledge and not enough wisdom.

This is the information age and as geologists we need to find and use tools that help us wade through the data mire and come out smelling like roses. The tools exist. But Geoscience Information Technology (GIT) is developing at a dizzying rate, viral as they say in the biz, and acronyms are created and modified daily. This GEOLOG presents the latest and the greatest Canadian developments in on-line tools and handshakes to applications, data and information. Some tools herein are part technological, part database, part application, but all are informative and as real as the hard working people dealing with the standards and metadata behind the scenes.

The showcase is lead by the National Geological Surveys Committee's "Canadian Geoscience Knowledge Network" initiative and associated programs spearheaded by the GSC, but the provinces and even our newest territory are leading the world in technological applications of geoscience information. So here's your chance to get up to speed on the latest development and reap the associated rewards. If you don't know your CGDI from your CGPD, or get XXML mixed up with your Z39.50 or NADM, we've provided a glossary on page 19.

## April 20th, Go for a Logan Walk

This is a unique time. Never before have so many Canadians been aware of Sir William Logan and his achievements. We need to seize the moment and take advantage of the opportunity given us by politicians and the media and make Logan's birthday on April 20th, a national event! Gordon Winder suggests that we go for a walk. Why not? Lets go for a walk, the Logan Walk. Why not have a Logan Walk in every city in Canada where geologists exist.

Make a big deal of it, maybe our GAC President could take the Prime Minister for a walk, or GAC councillors could take a Premier for a walk, call up your MP and take them for a walk. Organize a walk for your community, call the media, make a party of it. After a long winter, a brisk walk is just the ticket to get the blood flowing and seguey into summer traversing.

Craig Hart, Editor

## Oscillations

James Harrison, the late former director of the GSC has been inducted into the CIM Mining Hall of Fame • Glen Caldwell of the University of Western Ontario and Steve Blasco of the GSC have each been awarded the Order of Canada (details within these pages) • As well, a special issue of the CJES has been published in honour of Glen Caldwell, to recognize his career achievements as a scholar and in research in paleontology, biostratigraphy and evolution of sedimentary basins • Geolog Editor Craig Hart of the Yukon Geology Program is at the University of Western Australia undertaking a PhD at the Centre for Global Metallogeny • Brendan Murphy is on sabbatical at the University of Western Australia • David Mossman of Mount Allison University is at UBC on sabbatical leave • Steve Calvert of UBC has been elected a Fellow of the American Geophysical Union in recognition of his exceptional achievements in the field of sedimentary geochemistry • Jennifer McKay and Craig Nichol of UBC each received an "Outstanding Student Paper Award" at the AGU Fall Meeting last December in San Francisco. Jennifer's paper is entitled "The Paleocyanography of the Western Canadian Continental Margin" and Craig's paper is entitled "A Transient Tracer Test in Unsaturated Mine Waste Rock." • Cliff Stanley, now at Acadia University, has, among other things, taken on the role of associate editor for the CIM's Exploration and Mining Geology Journal • Mark Hannington of the GSC takes over as the new Editor of the journal, Economic Geology • At the University of Manitoba, Frank Hawthorne has been appointed as a Canada Research Chair • Christine Clark of U of Manitoba is a recipient of the Ludo Frevel Crystallography Scholarship Award as awarded by the International Centre for Diffraction Data • Anton Chakhmouradian, previously undertaking post-doctoral research work with Roger Mitchell at Lakehead University is the newest addition at U of Manitoba • We're over a year late on these ones, but David Lentz made the jump to University of New Brunswick • Karl Butler, previously of Queen's University has replaced Ken Burke as UNB's new geophysicist • Murrey Gingras is the new sedimentologist at UNB having recently arrived from U of Alberta. Two of Queen's University geology faculty have recently retired - Ray Price and Leigh Smith. It was Ray's fourth retirement (twice from the GSC and twice from Queen's), but Leigh's first.

Oscillate recently? Tell [geolog@gov.yk.ca](mailto:geolog@gov.yk.ca)

## Information for Contributors/Directives aux Auteurs

Submissions are preferred as digital files sent as e-mail attachments to [geolog@gov.yk.ca](mailto:geolog@gov.yk.ca) or on a disc via the post to the Editor. Discs will be returned if sent with self-addressed mailer. Documents should be sent as unformatted text (\*.doc, \*.txt or \*.rtf) files. Graphics should be as CorelDraw v.8 (\*.cdr) or Windows metafiles (\*.wmf), and images should be at 300 dpi in formats without internal compression (preferably \*.tif). Files greater than 1MB should be compressed or zipped before sending via e-mail. Additional information on other file formats can be obtained from the Editor. Hard copy text, graphics and photo images are also welcome. All contributions may be edited for clarity or brevity.

The DEADLINE/ÉCHÉANCIER for submissions and advertising to GEOLOG in 2001 are 31 May, 31 August and 23 November.

Nous préférons que les articles nous soient soumis sous forme de fichiers numériques, annexés à un courriel, ou sur disquette, par courriel conventionnel adressé au Rédacteur en Chef. Les disquettes seront retournées si elles sont accompagnées d'une enveloppe affranchie avec adresse de retour. Les documents doivent nous parvenir en version texte non formaté (\*.doc, \*.txt ou \*.rtf). Les graphiques doivent avoir un format CorelDraw (\*.cdr) ou Windows metafiles (\*.wmf ou \*.eps), et les images doivent avoir une résolution de 300 dpi dans un format non comprimé (préféablement \*.tif). Les fichiers de dimensions supérieures à 1 Mo doivent être comprimés avant envoi par courriel. Veuillez communiquer avec le Rédacteur en chef en ce qui concerne la possibilité d'utiliser d'autres formats. Nous acceptons aussi une copie imprimée sur papier du texte, graphiques et images. Le Rédacteur en chef se réserve le droit de modifier l'article à des fins de clarification ou de brèveté.

# The Canadian Geoscience Knowledge Network (CGKN)

## The CGKN Vision ...

The principal national inter-governmental initiative to put Canadian geoscience data online is the National Geological Surveys Committee's Canadian Geoscience Knowledge Network (CGKN) initiative. The CGKN (<http://cgkn.net>) will become the geoscience node of the Canadian Geospatial Data Infrastructure. It will complement and integrate existing survey agency information services by providing a national Internet "window" to geoscience knowledge. The CGKN concept evolved in the last 3 years from requirements for improved access to more consistent geoscience knowledge expressed in a number of workshops and reports. Innovative Internet services such as "The Map Place" of B.C. Energy and Mines (<http://www.em.gov.bc.ca/mining/Geosurv/MapPlace/default.htm>), the GSC's "ResSources GSC" projects (<http://rgsc.nrcan.gc.ca>), and other agency projects were also instrumental in demonstrating the feasibility of Internet delivery of geoscience data. By working together, federal and provincial surveys are combining their resources to develop standards and tools much more efficiently than they could, working independently. As the CGKN evolves, efforts will be made to integrate other non-government geoscience information sources.

## What does CGKN offer now ...

The CGKN currently offers on-line services that facilitate discovery of information about available government geoscience products. The CGKN is proceeding with phased development of a suite of additional services that will provide more functionality to the user including online visualization of the data and ultimately access to the data itself. More detailed information on existing and planned CGKN services follows.

### a) Geoscience Data Discovery

As an important first step the potential user must be able to "discover", or find, the geoscience information that is available. Since 1998, the "CGKN Publications Directory" (<http://cgpd.cgkn.net>) service has supported searches of catalogues of federal, provincial, and territorial geoscience products, maps, and publications. This service is currently being expanded to include agency data holdings through the "CGKN On-line Data Catalog" project. This project is jointly funded by NGSC agencies and NRCan's Targeted Geoscience Initiative. The service will be on-line in early 2002.

### b) Geoscience Data Visualization

The next step will be to support on-line visualization of geoscience data. After "discovering" that information exists, the user typically wants to learn more about the data and its suitability for the intended application. CGKN will meet this need by supporting online viewing of images of data individually, or integrated with other data. Internet map server technology, such as the MapGuide and ArcIMS, will be implemented to support on-line visualization.

### c) Geoscience Data Access

Having discovered available information and determined that it is suitable, the logical next step is to "access", or acquire, the data. Providing direct access to NGSC data in consistent form is a long-term goal of CGKN, but initially CGKN will aim to link users to existing sources for government data.

## A CGKN Framework & Standards for Geoscience Knowledge

Provision of on-line data visualization and access of data from multiple sources, requires that certain basic standards be established for geoscience data. The CGKN Data Integration Working Group and Discipline Subgroups are currently working to identify the key requirements for each data type and collaborating on defining the standards and infrastructure needed to support web integration and visualization. Initially, the Discipline Subgroups will concentrate on bedrock geology, surficial geology, geophysics, geochemistry, and mineral deposits. In order to maximize compatibility with other national initiatives and take advantage of available software tools, CGKN participants are actively monitoring and participating in other international initiatives such as the North American Data Model (NADM). The establishment of geoscience data standards and models will take planning, coordination and long-term commitment. Simple file-based methodologies, such as ASCII file formats based on extensible markup language (XML), are being investigated in the interim.

There currently is a need for increased participation by geoscientists in the establishment of standards. Anyone interested is encouraged to contact Peter Davenport at GSC Calgary ([Peter.Davenport@nrcan.gc.ca](mailto:Peter.Davenport@nrcan.gc.ca)).

## The Future

As CGKN develops and agency geoscience information systems are refined, more dynamic Internet delivery systems can be developed that deliver data in a form matched to the user's geoscience expertise. Value will be added to geoscience data through customized delivery that supports both traditional and non-traditional uses and simplifies integration of geoscience data with other types of data. If this goal is achieved, new uses of geoscience data can be demonstrated and the value and relevance of geoscience will become more widely recognized by society, which should have a positive effect on funding of geoscience activities in the future.

In the longer term, there is also a need to move beyond standard static 2-D geoscience data products and services to provide more dynamic 3 and 4-

dimensional visualizations and interpretations that communicate the multi-dimensional nature of geoscience data more effectively. Currently, implementation of multi-dimensional systems is limited because available Internet bandwidth is often inadequate and the required software is not readily available; however, technology advances rapidly and now is the time to plan for the future.

This special issue of GEOLOG contains articles on a few of the many geoscience information tools and services now available, and some of the many ongoing projects. To help you unravel the complex matrix of relationships between the many projects and obtain more detailed information, please check out the "Glossary" in this issue. Hopefully, this GEOLOG issue will encourage you to use some of these new tools and services and possibly become involved in some of the projects.

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## CGKN Data Discovery Tools

In the recent past, the discovery of geoscience information was a tedious task. You would have to check publication lists, contact libraries or phone your colleagues to see if they had the required information. In early 1997, a proposal for an Internet directory was presented to the National Geological Surveys Committee (NGSC) which is composed of the directors of provincial and territorial geological surveys and the Geological Survey of Canada (GSC). The proposed Internet directory would provide graphical access to distributed metadata describing all Canadian geoscience publications. For the uninitiated, metadata refers to "data that describes other data". In the case of the proposed Internet directory this would consist of discovery metadata such as author, date of publication, spatial location, etc. In September of 1998, the discovery for geoscience information was made a lot easier with the introduction of the Canadian Geoscience Publication Directory (CGPD).

The CGPD is an Internet based geoscience map and publication discovery tool. This directory provides graphical access to distributed metadata describing all Canadian geoscience publications. The location of maps and reports are displayed in polygonal form on a backdrop generated from national and regional geological maps using popular web browsers and a free plug-in. Visit the CGPD on-line at <http://cgpd.CGKN.net>.

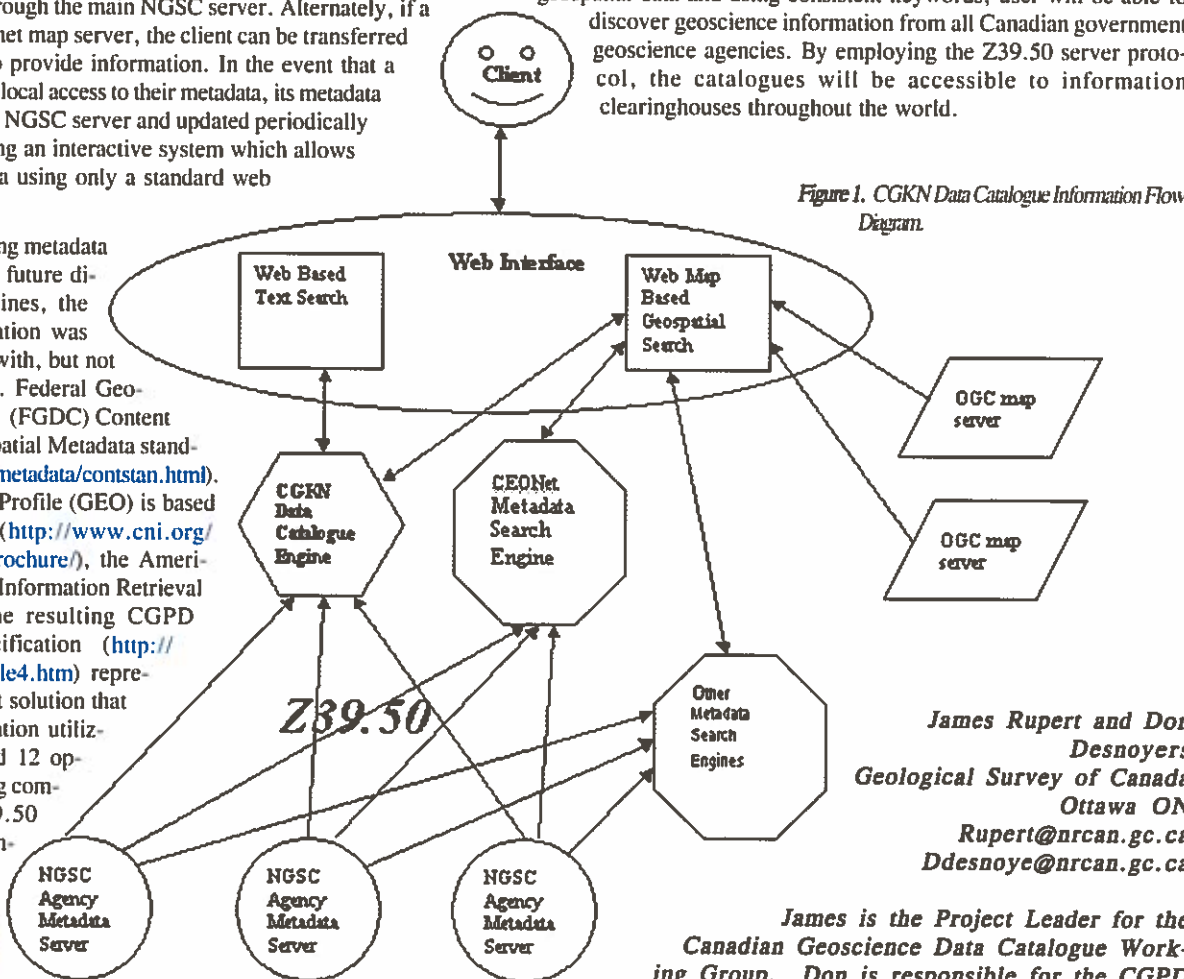
The design of CGPD allows for distributed access and maintenance. While the main server and web site are located on an NGSC server located in Ottawa, the software used to implement the directory allows varying degrees of distribution of metadata access, authoring, report generation and metadata maintenance to participating provincial and territorial agencies. The degree of distribution of the metadata depends on the capabilities and resources of the particular agency. With one option, provincial metadata can be placed on a remote server and accessed directly for generation of detail reports requested through the main NGSC server. Alternately, if a province has its own Internet map server, the client can be transferred to the provincial server to provide information. In the event that a agency is unable to provide local access to their metadata, its metadata can be located on the main NGSC server and updated periodically by file replacement or using an interactive system which allows remote editing of metadata using only a standard web browser.

To ensure that the resulting metadata would be compatible with future directories and search engines, the CGPD metadata specification was designed to be compliant with, but not as exhaustive as, the U.S. Federal Geographic Data Committee's (FGDC) Content Standard for Digital Geospatial Metadata standard (<http://www.fgdc.gov/metadata/constan.html>). This Geospatial Metadata Profile (GEO) is based on ANSI/NISO Z39.50 (<http://www.cni.org/pub/NISO/docs/Z39.50-brochure/>), the American National Standard for Information Retrieval Application Service. The resulting CGPD geoscience metadata specification (<http://ntserv.gis.nrcan.gc.ca/table4.htm>) represents an easy to implement solution that provides essential information utilizing 10 required fields and 12 optional fields while still being compatible with FGDC/Z39.50 standards. This is demonstrated by the inclusion of the CGPD in the CEONet program (<http://ceonet.ccrs.nrcan.gc.ca/cs/en/index.html>).

In June 2000, at a Canadian Geoscience Knowledge Network (CGKN) workshop in Calgary, participants from all government geoscience agencies expressed a requirement for comprehensive catalogue containing consistent metadata describing all government geoscience data that was searchable through the Internet. This requirement led to the creation of the CGKN Data Catalogue Project. This project will build upon the publication directory by creating an Internet searchable metadata catalogue of maps, publications and data at each government agency location. Each agency's portion of the catalogue will be connected to a Z39.50 protocol server that will allow not only the CGKN Data Catalogue but clearinghouses around the world to discover the information within the catalogue.

Each agency retains ownership of their information and will be responsible for the updating and maintenance of the catalogue. A central Internet portal will be created that will, in real time, search these catalogues. Users will have a choice of using either a text-based or a map-based user interface. Both interfaces will allow the user to select an area of interest and search for keywords and / or product types. The map-based interface will also utilize internationally recognized standards and specifications. Specifically those emerging from the OpenGIS initiative (<http://www.opengis.org/>); such as the OpenGIS® Catalog Services Specifications. These specifications provide a common architecture for online automated directories of web-based geospatial data and geoprocessing services. As Geographic Information System (GIS) and other vendors implement these open standards, clients of the CGKN Data Catalogue will be able to easily find, view, overlay, and combine different thematic maps from a variety of formats.

By creating metadata that conforms to the FGDC metadata standard for geospatial data and using consistent keywords, user will be able to discover geoscience information from all Canadian government geoscience agencies. By employing the Z39.50 server protocol, the catalogues will be accessible to information clearinghouses throughout the world.



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GEOLOG

## Mapping in the Palm of your Hand

### Gathering digital field data with the aid of a Palm handheld computer

The ability to digitally capture geological observations on the outcrop, and transfer them to a central database in a field camp, is essential for modern field-based geological studies. This is particularly important in the case of a large mapping party, where the number of daily traverses precludes manual point data entry in camp, yet the database must be kept current for data interpretation and planning of subsequent traverses. A functional digital field data capture system must be physically robust, as well as easy to learn and operate; data output must be compatible with the wide variety of geographical information systems (GIS) that are commonly used to display and interpret geological data. Recent advances in handheld computer technology have made such equipment inexpensive, reliable, easy to use, and readily adaptable to geological fieldwork.

Following an evaluation of the broad spectrum of handheld devices and software applications that are available, we developed a digital field data capture system that comprises an electronic data collection "form" running on an handheld computer (Gilbert et al., 2001). The form was constructed using Pendragon Software's *Forms 3.0* data collection / management software application; it operates on Palm Computing's Palm model *IIIe* handheld computer (Fig. 1). We have developed forms to support bedrock mapping in two geologically distinct project areas, as well as a form for gathering surficial data. The structure of the data gathered using this technique is compatible with evolving international standards for bedrock and surficial data, respectively. The present combination of hardware and software could easily be adapted for additional geological data gathering applications such as measurement of stratigraphic sections, or logging of diamond drill core.

In the present contribution, we describe the data collection system that we developed for regional bedrock mapping. We describe the structure of our digital data collection form, operation of the system on the outcrop, and data downloading and database population procedures. Data collected during each traverse are downloaded at the end of the day into a central database on a laptop computer in the basecamp, and visualized immediately using ArcView GIS.

#### Collecting data on the outcrop

In preparation for launching a new generation of regional geological mapping projects that produce digital products (maps, databases) promptly following completion of fieldwork, and that require management of daily data input from up to 12 mappers per project, we recognized the requirement for each mapper to be equipped to record their point observations digitally at each outcrop. The system we describe here is consequently designed to expedite point data entry into a database- it is not intended to capture linear information such as the surface traces of contacts



Figure 1b. Each handheld computer was "ruggedized" for field use with Rhinoskin's Palmsuit semi-rigid neoprene protective case.

or faults that are best recorded on aerial photographs. Our system requires that each mapper be equipped with a handheld GPS receiver in order that the location of each observation can be accurately and immediately known and recorded.

The following description of our bedrock mapping form serves to illustrate the functionality of our field data capture system (Gilbert et al., 2001). Our electronic data collection form (Fig. 2) consists of a main "page" and numerous linked thematic pages (Structure, Rocks and Minerals, Samples and Photos). Data are entered using a variety of modes- selections can be made from user-defined pick lists, multiple-pick lists, or by ticking check boxes; alphanumeric text can be recorded using an on-screen touch-sensitive keypad or "writing" on the character-recognition portion of the screen. Although our form is designed specifically for bedrock mapping activities in the Precambrian Shield, the content of the form can be readily changed to suit a wide variety of geological mapping needs. Additional structural elements, rock types, minerals or textural descriptors can easily be added to picklists as mapping progresses and needs evolve; inappropriate choices can be deleted.

Tombstone information, such as identity of the mapper, date and time of observation, geographic location and waypoint, is gathered in the main page, as are any general comments the mapper may wish to add as text (Fig. 2). Date and time are automatically captured from the operating system; the time is entered into a "blind" data field that is hidden from the user during completion the form. Geographic coordinates must be successfully entered before the mapper can proceed with geological data entry, ensuring that all subsequent data are



Figure 1a. Palm Computing Inc.'s model IIIe. Touch sensitive LCD screen measures 5.7 x 7.8 cm.

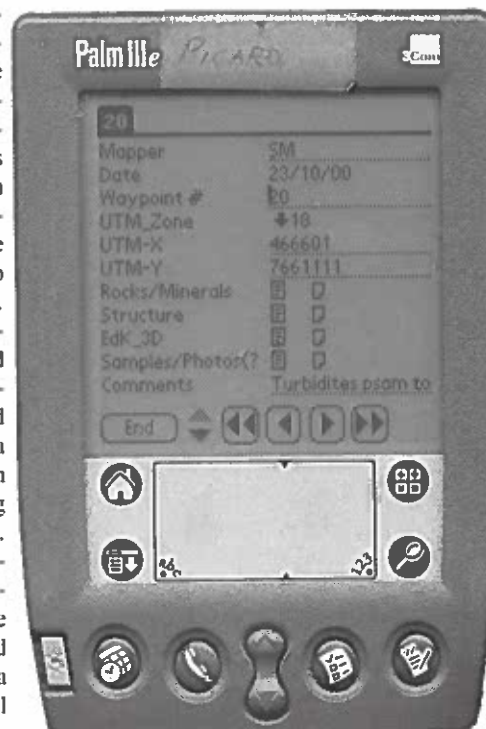
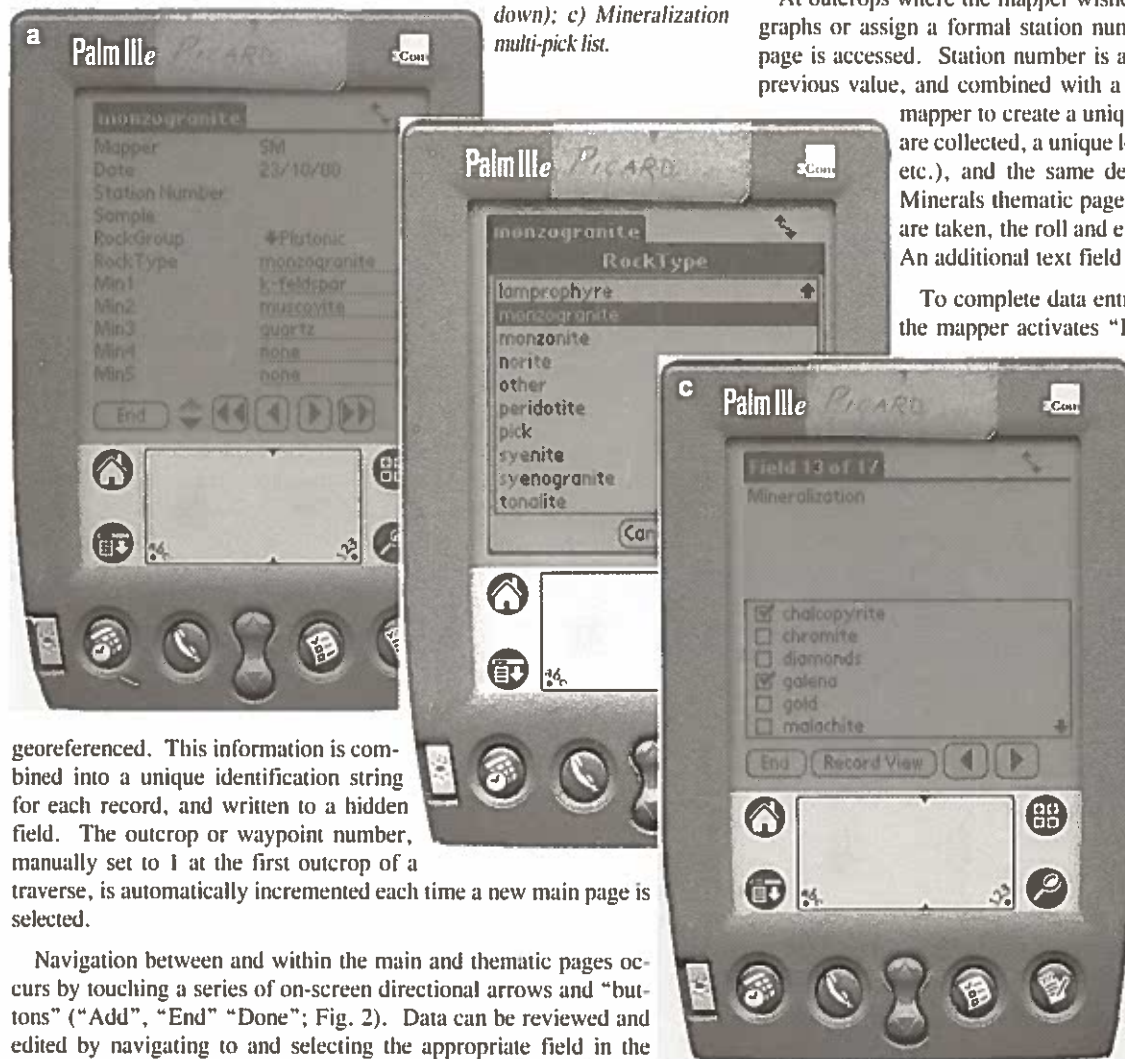


Figure 2. Main page of geological data collection form.



**Figure 3.** a) Rocks/Minerals thematic page of geological data collection form; b) Rock Type picklist showing some of the available choices (complete list available by scrolling up/down); c) Mineralization multi-pick list.



georeferenced. This information is combined into a unique identification string for each record, and written to a hidden field. The outcrop or waypoint number, manually set to 1 at the first outcrop of a traverse, is automatically incremented each time a new main page is selected.

Navigation between and within the main and thematic pages occurs by touching a series of on-screen directional arrows and "buttons" ("Add", "End", "Done"; Fig. 2). Data can be reviewed and edited by navigating to and selecting the appropriate field in the form, and are saved to memory each time the user advances to a new field.

### Rocks and Minerals

Access to the thematic pages is obtained by selecting the name of theme from the main page. The initial mandatory selection on the Rocks and Minerals page of our form is from one of three broad classes of rocks: "Plutonic", "Sedimentary" or "Volcanic" (Fig. 3a). A detailed picklist of individual rock types is linked to each of these three broad class selections (Fig. 3b). Once the mapper has selected a rock type (e.g. "monzogranite"), accessory minerals are then selected from a picklist that is linked to the selected rock type. Mode of occurrence (e.g. "minor", "dyke") is selected from a picklist; minerals of possible economic interest ("chalcopyrite", "galena") are selected from a multi-picklist (Fig. 3c). Numerous textural adjectives can be selected from a multi-picklist ("gneissic", "megacrystic") to describe each individual rock type at the outcrop. Finally, there is a text field for any general comments that the mapper may wish to add about each of the rocks and minerals observed.

### Structure

This thematic page is organized into "Planar" and "Linear" fabric elements. Each fabric element that the mapper wishes to record is selected from a picklist that is linked to the initial selection; "Planar" prompts choices such as "bedding" or "schistosity"; whereas "Linear" offers "Z-fold hinge" and "mineral lineation" among others. Numerical values for strike or trend (following the right-hand rule, 0 to 359°) and dip or plunge (0 and 89°) of the feature are entered using the on-screen touch-sensitive keypad or on-screen character recognition.

### Samples and Photos

At outcrops where the mapper wishes to collect specimens, take photographs or assign a formal station number, the Samples/Photos thematic page is accessed. Station number is automatically incremented from the previous value, and combined with a predefined code that identifies the mapper to create a unique name for the station. If samples are collected, a unique letter is assigned to each ("A", "B", etc.), and the same descriptive fields as per the Rocks/Minerals thematic page can be completed. If photographs are taken, the roll and exposures numbers can be recorded. An additional text field is available for any comments.

To complete data entry on the main and thematic pages, the mapper activates "Finished Stop?" checkbox, and selects the "End" button. The process is repeated at the next outcrop by selecting "New" from the project menu.

### Populating the Database

Each Palm handheld computer ships with a "cradle" that connects the handheld unit to a PC via its serial port. The connection or "conduit" between the two devices can be configured such that traverse data are removed from the handheld device and appended to the database resident on the PC at the touch of single button. Once in the PC, the data can be exported as either ASCII text files (.txt) or Microsoft Excel files (.xls), allowing for a wide range of flexibility in working with GIS software packages (e.g. ArcInfo, ArcView, MapInfo, GRASS, etc.).

A visual verification of the database can be conducted using a

GIS to compare the visualized database with the hand-plotted data recorded on air photographs during the traverse. If discrepancies are detected, complete information about the errant point(s) can be displayed immediately using the GIS, and corrections to the database can be made immediately.

### Discussion

The digital field data capture system described here accelerates point data input, permits daily geological interpretation and traverse planning, and expedites production of digital maps and databases. New users of this system, most with little or no previous knowledge of handheld devices or data-gathering software, were able to master the system in a matter of a few hours. For our mapping projects, in which up to 12 mappers were contributing data daily, this combination of hardware and software was found to be reliable, efficient, and affordable. We would be pleased to provide additional documentation and a copy of our data capture project to interested readers.

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Celine, Kathryn and David are from the Canada-Nunavut Geoscience Office proving that technology can develop in remote regions. Visit their website at <http://www.nunanet.com/~cngo>

## The Bedrock Geology Layer for CGKN

To deliver geoscience information via the Internet, information that currently exists largely on paper, it is necessary not only to convert it to digital form, but also to reorganize it in such a way that it can be sampled, linked to other digital sources of information and synthesized to create fresh answers to new problems. The geological map has been the pre-eminent way of expressing our knowledge of the nature, structure and history of rocks at and near the earth's surface, and provides the conceptual framework we use to interpret many related aspects of geoscience. It has also been the main link to other types of map-based data. It is hardly surprising that geological map information has been identified as the most important geoscience "layer" for CGKN. The creation of a digital geological map for Canada that is scalable, extensible and easily updated is a high priority.

The design of the digital bedrock geology layer raises several fundamental questions. Should the process start with broad regional syntheses, and then move towards comprehensive digital capture of "working-level" maps at 1:50 000 or more detailed scales, or vice-versa? How much explicit and implicit information should be captured from each map, and how should the different types of information be prioritized for capture? How can authorship of the source information be preserved, how can differences in the way information is organized on adjacent maps (i.e. legends) be reconciled so that the maps form a coherent whole, and how much "editing" of original information should be carried out? How is new geological information to be incorporated in the overall geological map database?

### Top down or bottom up?

There is of course a digital geological map of Canada (Wheeler et al., 1997) at a nominal scale of 1:5 000 000, and many provinces and territories have maps of their jurisdictions at scales of 1:500 000 or 1:1 000 000 that are available digitally. Although these are valuable syntheses, and provide useful frameworks for synthesizing many other types of geoscience data, they are useful only at regional scales, and are difficult to update as new information becomes available. The same constraints apply to most regional, thematic compilations.

The task of digitizing and reconciling the content of the most detailed and up-to-date systematic maps available for the whole country is a daunting one at first sight. It is, however, the only way to create a geological map coverage that retains the full resolution of the original mapping, a level of detail that is critical to some of the most important commercial users of geological maps. Furthermore, if the information is properly organized (using a suitable data model), incorporating information from new mapping or other laboratory studies (e.g. paleontology or radiometric dating) requires only changes to small parts of the database. These changes then propagate throughout the database tables automatically.

Scalability can be achieved by linking detailed to regional map legends to create a comprehensive, hierarchical classification scheme. At the detailed level the hierarchy is based on the North American Stratigraphic Code (Anon, 1983) for lithostratigraphic and lithodemic units. At the regional level, tectonic domain (zone) and geological province can be used. The basic geological unit classifiers remain those used at the detailed level. Classifying map units by tectonic domain or geological province automatically yields a generalized regional map from a set of detailed maps. Thus we envisage using both detailed map information as the input for the spatial information (unit boundaries, faults, folds, etc.) and detailed levels of the unit classification scheme, with the regional map legends providing the upper levels.

### Selection and organization of the captured map information

The most detailed and up-to-date systematic maps published for particular area will typically vary in level of detail and type of information shown. The distribution at surface or sub-crop of the map units is the common denominator, however, usually together with fault traces and fold axes. These features are portrayed with as much spatial accuracy as possible. In

contrast individual observations at outcrops are not always included, and where they are it is commonly only a representative set. Moreover their locations may be modified on the printed map for clarity of presentation, so for these rather pragmatic reasons it is suggested that point features be assigned a lower priority for capture. In addition to the spatial features, the map legend describes the nature of, and relationships between, the map units. This information must be captured.

### Managing geological map information

Several issues are important here: authorship, reconciliation between maps, and integrity of information. In building a large database from potentially thousands of maps, it is important that each map feature is tagged with its source. This allows authorship to be credited at the feature level rather than merely in an overall bibliography as is typically done in map compilations. Feature-level attribution has implications for how much data are changed as they are added to the database. The two most significant types of change to be considered are changes to spatial elements, such as removing mismatches of features across map boundaries (map element changes), and changing the descriptions of, or relationships between, map elements (map legend changes). The former should be avoided, because without additional information (usually requiring further field work), these are cosmetic changes only. If spatial features are changed, the modified line segments should be clearly identified as such (see for example Gordey and Makepeace, 1999), and the result is strictly speaking a compilation.

Legends between maps must be reconciled to some uniform schema if information from different maps is to be made interoperable. To do this the original legend, which is adequate for the limited scope of the individual map sheet, is recast into a broader legend schema that contains a single, "standard" entry for each unique unit in the entire database of map units. In a relational database, however, both the original legend elements attributed to the author of the source map, and the new legend attributes, attributed to their author(s), may be retained. For a region the size of Canada, there will be a set of legends corresponding to the different geological provinces and tectonic domains, based on the type of framework set out in Bally and Palmer (1989) and companion volumes of the Geology of North America Series. The principle link between the geological provinces is provided by the geological time scale (e.g. Okulitch, 1999).

### Updating the database

New information may require changes to either spatial features, their attributes or both. Changes to spatial features, such as the position of contacts between map units or the sub-division of a formation into members will usually affect one or a few maps sheets at a time. If new units are defined, they will have to be added to the overall legend, but they will only be apparent in the areas where they have been mapped. Changes to the attributes of existing features will affect only the database table containing them, and tables which reference this table. For example, if a new radiometric date results in the age of a unit being reassigned, the spatial distribution and its lithological description will be unaffected. Its relationship to others may change, however. In an appropriately designed database, such changes would propagate through the database, making regular revisions much easier than with static compilation maps. The timing of updates is a matter of judgement. Because changes to a single attribute of a single unit may propagate widely, it would be desirable that they be incorporated only following their publication and peer review. In the case of map elements, because these evolve through the mapping and publication process, the map database will likely reflect the latest, published maps rather than preliminary field maps.

### Database design - the data model

Some of the design requirements for a database for geological map information have been mentioned already. The North American Data Model project (NADM) has been addressing this issue since 1996, and has elaborated an elegant and extensible design (Johnson et al., 1999). The data model includes content, vocabulary (terminology) and syntax (relation-

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## GIS Add-On Software Developed at GSC

There is often a gap between the specific needs of geologists using GIS, and what is offered in popular systems. The problem is that commercial GIS such as ArcView or MapInfo (even with supporting programs such as Spatial Analyst and Vertical Mapper) are designed for general use, and often fail in delivering specific functionality. Back in 1997, an initiative to address this problem for geologists was started between GSC and USGS, and has resulted in three new GIS-linked programs for mineral exploration. These programs also have applications in environmental geoscience, and in a variety of other fields.

### Arc-WofE: Weights of Evidence Extension

The first of these programs is named Arc-WofE. It is an ArcView extension, written in Avenue language (a scripting language used by ArcView), for applying the weights-of-evidence method to exploration datasets. Given a set of training points (locations of mineral occurrences of a particular type), the program calculates measures of spatial correlation ("weights") between individual "themes" (such as geology, geochemical/geophysical surveys, satellite images) and the training points. For themes that show a significant spatial association, the weights are used to combine information together to produce a map showing mineral favourability. Maps of various sources of uncertainty are generated at the same time. The package includes a number of additional tools for generalization, extraction of contacts and buffering, that are useful in this type of work. The package was supported by an industry consortium and after an exclusionary period of one year was made available to the public. It can be downloaded as shareware from <http://ntserv.gis.nrcan.gc.ca/wofe/>.

### Arc-SDM: Spatial Data Modeller Extension

A second package, also in Avenue, but with subroutines in Fortran and C++, named Arc-SDM (Spatial Data Modeller), builds on Arc-WofE. It provides all the functionality of the first package, but includes other methods such as logistic regression, fuzzy logic and neural network analysis. Logistic regression is an alternative to weights-of-evidence that uses a different statistical model for the weights, and allows for inter-correlation between the themes used for mineral favourability. The fuzzy logic implementation allows the user to enter his or her own "weighting" values—the so-called "fuzzy membership" functions. This approach is more

suitable for situations where there are too few known mineral occurrences to establish a representative set of training points. The neural network approach is another method and can be either "supervised" (with training points) or "unsupervised" (no training points). Arc-SDM was released publicly as shareware on the web in January 2001, and can be downloaded from <http://ntserv.gis.nrcan.gc.ca/sdm/>.

### GeoDAS – spatial analysis of geochemical exploration datasets

A third program named GeoDAS—a system for spatial analysis of geochemical exploration datasets—is currently being developed at York University, in collaboration with GSC-USGS and an industry consortium. This package is written in Visual Basic (with specialised routines in other languages), and can be used with ArcView or MapInfo. In Phase 1, three modules provide exploratory data analysis tools, not available in other systems. In the first module, the user can link maps, tables and charts together dynamically. For example, a group of anomalous samples on a bivariate scatterplot can be selected, and displayed on other charts, on an attribute table and on a geological map. Selection can be made on any view, with automatic links to all other views, and a variety of statistical tests and plots made to evaluate the differences between selected groups. A second module permits the identification of breaks in statistical populations, based not only on frequency information (conventional approach) but also on spatial characteristics on log-log plots (taking advantage of multifractal behaviour). This approach can be applied to spectral data as well as concentration data. A third module provides some multivariate statistical methods, with more graphical interaction than in conventional statistical packages, and has new extensions to handle spatial weighting variables from GIS. GeoDAS is exclusive to participating sponsors until January 2004. See <http://www.gisworld.org/geodas/> for more information.

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## The Bedrock Layer

ships between categories of information). A more pragmatic, geologist-driven data model (GEOLEGEND) is in use at the Geological Survey of Newfoundland and Labrador (Colman-Sadd, 1997). Both are based on relational designs, perform generally the same functions, and are supported by applications that facilitate data entry, retrieval and display.

### The way forward

A project has been proposed to start developing for CGKN a working geodatabase of geological map information. Its goal is to make six or more existing digital map data sets from Newfoundland and Labrador, Nunavut, the Yukon and British Columbia interoperable by applying a common database design based on NADM. The map sets are from geological maps at scales of 1:250 000 and more detailed carried out by the respective provincial and territorial surveys, as well as the Geological Survey of Canada, and map units range in age from Archean to Quaternary. The project will involve not only implementing NADM databases in Oracle and MS Access, but also the refinement of tools for entering and editing attribute data, and the definition and consolidation of terminology for lithology, lithostratigraphy and chronostratigraphy. Tools to search, retrieve and display information from the database will be developed, and the ultimate goal is to provide a tool kit and support for other jurisdictions to join the project to complete the CGKN bedrock geology "layer".

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## The MapPlace

### An award winning Internet exploration service for B.C.

The B.C. Ministry of Energy and Mines Internet site, the MapPlace, was honoured by the B.C. and Yukon Chamber of Mines at the 2000 Cordilleran Exploration Roundup meeting in Vancouver B.C. The MapPlace, featuring interactive mineral exploration datasets, won the award for providing exceptional, efficient and free access for B.C. explorationists. The award was presented to the creator and innovator Ward Kilby of the B.C. Geological Survey. This paper briefly describes what MapPlace is, how it evolved, how it works and what kind of GIS functionality is available.

#### What is it?

The MapPlace is an Internet based system that uses the world wide web (WWW) to provide free access to British Columbia mineral exploration information in a dynamic map format. The MapPlace provides interactive map access to most of the British Columbia Ministry of Energy and Mines geospatial data holdings including bedrock geology, surficial geology, metallic and industrial mineral potential ranking, regional silt and water geochemical surveys (RGS), mineral occurrences (MINFILE); assessment reports (ARIS) and mineral title locations that are useful to explorationists and landuse planners alike. These themes can be combined with other georeferenced datasets such as administrative boundaries, topographic features and other related map based information including raster images such as digital elevation model (DEM) shaded relief, satellite (LandSat) and aeromagnetics to produce user-defined map views. These can then be printed or pasted into common graphics packages. In addition, many of the features that can be displayed on MapPlace are linked to supporting database tables thus allowing the discovery, retrieval and reporting of valuable attribute data that is linked to individual map objects. For some themes clicking on an object links to a separate Internet site such as MINFILE or Mineral Titles allowing further search and retrieval capabilities.

#### How did it evolve?

The MapPlace has been operational for over four years now. Its development is linked to the release of Autodesk's MapGuide™ software in mid 1997. This product met our requirements for a cost effective and efficient method to display, retrieve and analyze vector and polygon based map information over the Internet. The site capabilities have met all our original requirements for data dissemination and have opened up the realm of online data analysis and distributed data input and maintenance. Use of web-based tools reduced our development costs and allows us to piggy-back on evolving Internet tools and expertise.

#### How does it work?

The MapPlace website was developed around several off-the-shelf software packages. Autodesk's MapGuide™, Allaire's ColdFusion™ and Microsoft's Access™ are the packages used on the site in addition to the normal WWW server software. Databases are used to handle all the tabular information associated with the site. ColdFusion is used as a WWW database manager, report writer and sophisticated WWW toolkit. MapGuide Server, Author and Viewer software provide the map displays, GIS functionality and development environment for this style of web presentation. There are numerous different configurations of software and hardware that could be used to deliver the MapPlace. Figure 1 illustrates our current configuration. Both the MapGuide Server and ColdFusion run as services on Intel based PCs using the NT operating system.

Figure 1 illustrates the distributed nature of the system. Several of the datasets displayed on MapPlace, including the Tectonic Assemblage Map geology, reside on MapGuide servers at Natural Resources Canada. This integration of data from different sources and custodianships is one of the most powerful features of distributed systems.

The only requirement for end users of the MapPlace is that they have a

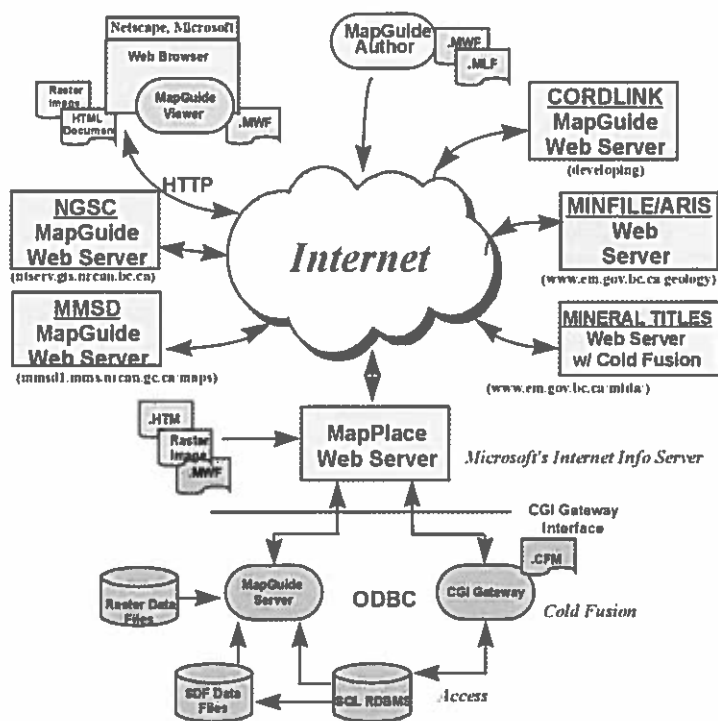


Figure 1. Diagrammatic view of the MapPlace configuration in relation to the Internet, geographic data, attribute databases, other websites and other MapGuide sites.

Web browser (e.g. Microsoft Internet Explorer or Netscape) and a free viewer plug-in that can be downloaded from Autodesk. The MapGuide Viewer enables the clients computer to perform many of the display functions independent of any one server. Using toolbar buttons and popup menus to interact with simple or complex maps, you can zoom, pan, zoom out and get custom reports. Object display is controlled by the zoom scale so that increasingly complex map objects are only displayed when the scale is appropriate. Objects on the map may be linked back to the source database on the server or across the Internet. In addition to these links, one can download files and tables. Databases accessible this way include digital geological maps, mineral potential information, mineral occurrences (MINFILE), mineral and petroleum tenure, assessment report indexes (ARIS) and regional geochemical surveys (RGS). Other links will take you to map indexes, Geological Survey of Canada databases, terrain maps and more.

#### GIS Functionality

The power of the system is that it provides some near-GIS options, such as buffering around intrusions or faults, retrieving attributes for polygons or points and displaying different sized symbols or polygon fills based on object attributes. With the Mapguide Author software, the user has nearly complete control of how data is displayed thus allowing further customization of the resultant map. Further enhancements can be achieved by embedding the MapGuide window in a web page and accessing the Viewer's API through Javascript or VBscript. The B.C. Mapper application on the MapPlace site is one such application that allows a user to input their own data on top of existing MapPlace themes by digitizing polygons, points and lines on screen. Another application is the "Exploration Assistant" which allows the user to specify what features to display in the map window. For example, the user could display all Cretaceous age sedimentary rocks within a terrane, generate a map of mineral claims that may expire (anniversary date) in the next 30 days in any area of interest, or look for prospective areas favourable for VMS type mineral deposits.

## Conclusion

The MapPlace has been operational for over four years, providing free Internet access to mineral exploration-related information to the mineral exploration industry, land use planners, government agencies and the general public. It has proven to be an efficient and effective way to disseminate map based information and its flexibility gives users a powerful tool for building their own custom maps. For more information visit the MapPlace at <http://WWW.EM.GOV.B.C.CA/MapPlace>.

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Kilby, W.E., 1999. THE MapPlace - Web-Based GIS Access to British Columbia Mineral Exploration Information, *In Proceedings of the Thirteenth International Conference Applied Geologic Remote Sensing*, Vol. 1, pages 204 - 212.



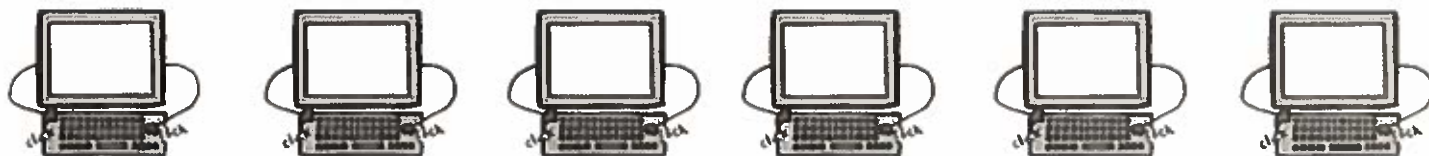
Figure 2. Screen image of a Mapguide window showing the geology and topography of the Rocky Mountains in northeast B.C. Also shown are park boundaries, mineral occurrences and towns. Layer groups (collapsed) are shown in the left hand frame. The top bar has icons for the common zoom and panning tools; the bottom bar shows the scale of the view and the height and width of the view in kilometres.

Table 1. Summary of major datasets accessible through the MapPlace.

Layer Group or Name	Object Type	No. of Objects	Update Freq.	Linked Reports	Source of Data
Bedrock Geology	Polygon/ Line	72,000/ 180,570	ongoing	Yes	MEM/GSB; NRCan
Mineral Potential	Polygon	788	1998	Yes	MEM/GSB
MINFILE	Point	12,000	ongoing	Yes	MEM/GSB
ARIS	Point	25,600	ongoing	Yes	MEM/GSB
RGS	Point, Polygon	43,500	annually	Download	MEM/GSB
Mineral Tenure	Polygon	127,000	weekly	Yes	MEM/MTB
Topography (2M, 250k, 50k, 20k resolution)	Pts, Poly., Line	Very large	variable	No	MELP; NRCan
Geog. Locations	Point, Polygon	41,500	1998	No	MELP
Admin. areas, (First Nations, Parks, Forestry, LRMP areas)	Polygon	Multiple	variable	No	MELP, MOF
Aeromag	Raster image				NRCan
DEM shaded relief	Raster image				MELP
LandSat	Raster image				MELP

Abbr. MEM = B.C. Ministry of Energy and Mines; GSB = Geological Survey Branch; MTB = Mineral Titles Branch; MELP = B.C. Ministry of Environment, Lands and Parks; MOF = B.C. Ministry of Forests; NRCan = Natural Resources Canada

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## FieldLog: Field Data Management Software For Field Geologists

Do some of your GPS located stations plot 1km off shore? How do you change your foliation data and map symbols when you discover an "earlier" F1 at the end of your field season? Are you able to merge several seasons of field data from multiple field projects? Do you have a problem with consistency and ambiguous terminology in large field mapping parties? Can you plot a stereo net of all the F2 foliations in cordierite bearing rocks in the north east section of your map area? **FieldLog** is a software package that can assist you in resolving these common tasks.

### So what is FieldLog?

**FieldLog** is a data management program developed by Boyan Brodaric of the Geological Survey of Canada (GSC). It is a customizable geological database system that interfaces with a map and enables you to display your data both graphically and digitally. Though similar in this regard to Geographic Information Systems (GIS), **FieldLog** is much more tailored towards geological synthesis and display of information, and requires much less detailed technical knowledge for its operation than most GIS. **FieldLog** also possesses significant cartographic capabilities as it resides within AutoCAD® (version r12 to r14), which is a premier computer aided drafting (CAD) software program.

### What can FieldLog do for you?

**FieldLog** can manage multiple project databases and graphically represent data in possible multiple AutoCAD® map drawing files. It provides some basic spatial data handling functionality, such as map projection and transformation, as well as multi-format import and export capability, and robust tools to populate and search the stored data. Most of the query functionality and data entry tools in **FieldLog** are designed to support consistent field observations. For example, it supports customizable lists of scientific terminology that assist in eliminating common data entry

errors thereby improving the integrity of the data set. The database structure and contents are defined by the geologist and modifiable at any time to accommodate the changing needs of a field survey. The field data can be easily migrated into other presentation and analysis software, such as CorelDRAW®, word processing packages and high-end GIS packages. **FieldLog** can also graphically represent the data within AutoCAD® as stereonet, rose diagrams, or incorporate georeferenced raster images (Aeromagnetic images for example). In gen-



eral, it provides an integrated suite of computer-based tools to augment the field mapping process.

### How does the "FieldLog system" work?

The **FieldLog** methodology involves equipping geologists with notebook computers, digitizing tablets and small printers to digitally capture, display and output daily field observations. At the outcrop, observations are recorded into standard field notebooks, onto preset forms or into hand-held computers. Locations can be obtained from global positioning systems (GPS) and downloaded directly into the hand held device. Field observations and measurements are transferred to the laptop computer at the field camp as a text file, then imported directly into the **FieldLog** database, and plotted to the AutoCAD® map. Using completely digital "technology" radically reduces transcription errors and enables large volumes of data from large field crews to be assimilated in real-time.

### Where can you acquire FieldLog?

**FieldLog** and accompanying documentation (manual, FAQ page, and sample data) can be downloaded free of charge from <http://www.gis.nrcan.gc.ca/FieldLog/FieldLog.html>. The manual can also be purchased as Open File 3239 from the GSC bookstore.

### Where are we going from here????

**FieldLog** has been in development at the GSC for the last 10 years and has substantially evolved in that time period. We have a diverse and varied client base ranging from individual contractors, to provincial, national and international surveys, academia, and mining and mineral exploration companies. We are currently compiling a client survey in order to better determine future needs and to direct future development. If you are a **FieldLog** user and would like to access the survey, or if you have any questions or comments concerning **FieldLog**, please contact us at [FieldLog@gis.nrcan.gc.ca](mailto:FieldLog@gis.nrcan.gc.ca).

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Boyan is currently at Pennsylvania State University.

GSC Open File 3239

### Fieldlog v. 3.0: user's guide and reference

B. Brodaric, R. Harrap, D. Lemkow, 176 p.

The Users Guide and Reference accompanies the "share ware" software **Fieldlog** v. 3.0 developed at the Geological Survey of Canada. Open File 3239 is available as a PDF file for download from <http://www.gis.nrcan.gc.ca/fieldlog/Fieldlog.html> or may be purchased as a paper booklet from the Geological Survey of Canada Bookstore in Ottawa.

**Price:** \$27.95 (Canada), \$36.35 (outside Canada)

## Geochemistry and the Internet: a Blueprint

### Data Silos and an Empty Lot

With the advent of instant access to information through the Internet, it has become obvious that the vast data holdings of federal, territorial and provincial geological surveys were not easily accessible or properly structured to permit these data holdings to be discovered, evaluated and made available for use. This is true of geochemical data that have been collected over many years, analysed and documented in detail and in some cases, structured in simple, though consistent spreadsheet formats suitable for publication. Several individuals at the Geological Survey of Canada (GSC) responsible for maintaining diverse geochemistry holdings had developed prototype models that met the minimum requirements for their specific needs. However, without a coordinated approach to managing these data, the database designs differed significantly and from the client's perspective, access was no easier.

### Laying a Foundation and Framing a Structure

In 1998, the GSC funding initiative Resources GSC was implemented with a goal to "...provide Internet access to interoperable, multi-dimensional geoscience information in a client-focused manner through a network of linked sources." (<http://www.gkn.nrcan.gc.ca>). Three GSC divisions decided to build a common data structure for archiving geochemical data. Initially, an Internet query and viewing tool was created to access the available data. The model was designed so that contributing partners employing the same database structure, science language (naming conventions, etc.) and codes, could share a virtually seamless database across the Internet while continuing to manage their own database servers and data. The Internet tool queried the appropriate server depending on the user's selection or search criteria. This provided the user with a single access window to the available data of three different divisions of the GSC. In practical terms, this was a huge step as it proved the feasibility of accessing a distributed network of databases through a single Internet site. In the greater scheme of things, there was still a long way to go.

With the potential of such work proven, provincial and territorial geological surveys were approached through the Canadian Geoscience Knowledge Network (CGKN) and cooperation established. The collaborating agencies returned to the blueprints, and continued work on the data model itself. In order to accommodate more and varied types of geochemical information, the data model would have to be restructured. Similarly, a science language of geochemical terms and rules would also have to be established so that users could be confident in the consistency of the information within a dataset and across jurisdictions. This requires participation at an equal level by the scientific community to decide the definition of this science language, uses of data and Quality Control. By making this information consistent across agencies and / or regions, value is added. A policy would be required to guide the users of this data model and provide a documented constitution. Through the CGKN, roles and responsibilities would be clearly spelled out and an overall Geochemical Data Model Stewardship Committee will need to be established. It will be made up of data managers and scientists from participating agencies under the auspices of CGKN to ensure the sustainability of this work.

### Adding the Windows and the Functionality

Because data input tools were not developed at the outset, this showcase project is, at this stage of the development, somewhat limited in its content. Only a small fraction of legacy data that could be archived using this common data model is displayed. Data input takes time and patience, especially when tools are not available to facilitate this work. Through GSC and CGKN funding sources, a suite of generic tools will be developed to allow new and legacy data to be entered into a database using this data model. This will enable participants to map their existing databases to the current Geochemistry Data Model, input current publication formats (spreadsheets) and even hard code analog data that the agency has deemed valuable and necessary for the archive.

A Laboratory Information Management System (LIMS) is currently being developed in the GSC to manage the compilation and analysis of samples as they arrive from the field. The LIMS allows the laboratory manager to control, monitor and efficiently administer the geologist's samples submitted for analysis. The laboratory is able to focus on sample preparation as the LIMS handles the data loading and tracking procedures. This is invaluable when preparing samples (duplicates, control samples, etc.) for analysis internally or by a contractor. Once the analysis is complete, the LIMS facilitates the importing of the information and performs integrity checks ensuring that the data conform to the data model definitions and rules. The GSC will make the software, procedures and documentation of the LIMS available to collaborators using the Geochemical Data Model.

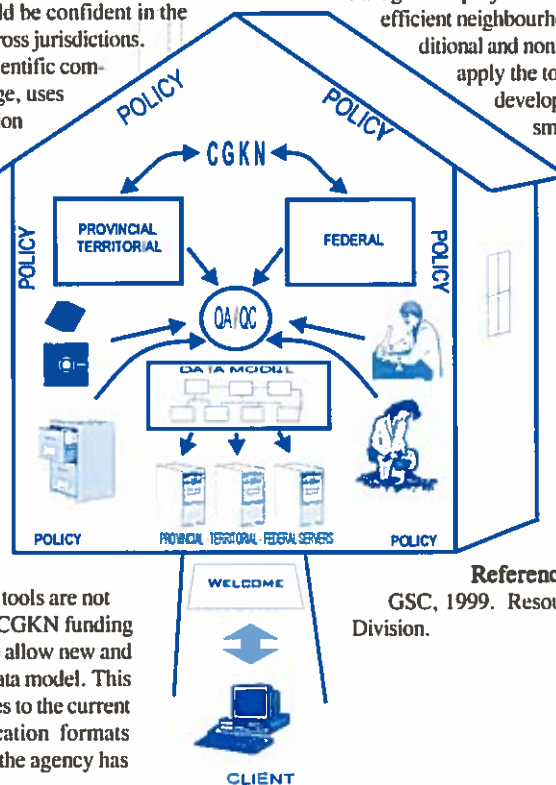
### Moving In and Building a Neighbourhood

The structuring and building of the components are near completion and new collaborators are anxious to get involved in this project. An initial CGKN sponsored policy statement for the Geochemistry Data Model Project needs to be prepared, a stewardship committee set up and stewardship procedures developed in order to properly guide this initiative and to ensure its sustainability. Though the original showcase product was an Internet query and mapping tool, its development is an ongoing task, as data dissemination must meet the needs and demands of the varied users of geochemical information. More tools have to be developed for the geologists who have collected the data, as they are best able to review the analytical results and verify the quality of the work. By including this key individual in the management of the information, the value of the data is augmented, as the user has a greater confidence in its integrity. Initial tests using the Geochemistry Data Model and QA/QC tools have shown a 10% error in previously published geochemical information and up to 20% error in data loaded after analysis.

Like building a house, the Geochemistry Data Model is made up of many components. No one component makes this 'house' useable, but rather the sum of these components. The Geochemistry Data Model project was a "grass roots" initiative started out of necessity. It has evolved to its current form and will continue to evolve through the CGKN in order to meet the needs of the geoscience community. This includes the custodians of the information and the clients who use it to make informed decisions. The policies and the stewardship committee that manages this project will ensure that the model will evolve, and that an efficient neighbourhood of distributed databases is accessible by traditional and non-traditional users. What remains to be done is to apply the tools and infrastructure already developed (or in development) to actually populate the model. This is no small task. Though the tools will soon be in place to facilitate this work, it will take a significant investment in time, money and personnel by the collaborating agencies to get new and legacy data into their database. It will also take a commitment to support the data management of local databases as well as the stewardship management of the Geochemistry Data Model.

To get a preview of the potential of this initiative, please visit: <http://sts.gsc.nrcan.gc.ca/geochemia>.

For more information and documentation on the data model please visit: <http://geochem.gsc.nrcan.gc.ca>.



### References

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Andrew Moore and Guy Buller  
Geological Survey of Canada  
Ottawa, ON

On behalf of the NGSC Geochemistry  
Online development team.

The basic blueprint for building a geochemical data infrastructure

## Ontario's Geoscience and Minerals Exploration Data On-Line

A major competitive advantage for the mining sector of Ontario is the wealth of information publicly available on geoscience, minerals exploration and tenure of mining claims. Largely, this information is a result of approximately \$5 billion worth of exploration work and government data that is made available to assist further research and exploration work. One key source of information is the exploration work files submitted by mining claim holders under the provisions of the Mining Act. Also, Resident Geologist Offices, located throughout the Province, receive and solicit submissions of data and drill cores. Finally, the Ontario Geological Survey, through its geoscience programs, has compiled and published over 10,000 geological maps and 2,500 scientific reports.

In order to make this information more easy to search for and access, the Ontario Ministry of Northern Development and Mines begun in 1993 the process of digitizing paper records and maps, as well as, building spatially referenced databases. These efforts have resulted into the Earth Resources and Land Information System (ERLIS) – comprising four stand alone electronic information libraries at key Ministry offices. Building on the legacy of ERLIS, the Earth Resources and Minerals Exploration webSites (ERMES) is an Internet facility that provides worldwide access to a wealth of data on a 24X7 basis from the convenience of the researcher's quarters.

State-of-the-art information technology, geographic information systems, database management, document management technologies and the Internet are used to bring, via user friendly interfaces, data and information from minerals exploration work, geological surveying and mapping, mineral deposit observations and references, geochemical analyses results and drill hole reports.

ERMES comprises three sites: a data management site (ERMES-DAS), a geospatial web site (ERMES-LIO) and a documents web site (ERMES-Images). Clients are linked seamlessly between the ERMES-Images site - a digital image library of over 65,000 exploration assessment files,

100,000 raster scanned maps, and over 10,000 Ontario Geological Survey (OGS) reports and maps - to the Land Information Ontario (ERMES-LIO) web site. There they have access to other ERMES databases containing spatial and tabular information on exploration assessment files, OGS reports and maps, 20,000 Mineral Deposit Inventory records, a databases of 110,00 Drill Holes and some 32,000 records of the Litho-geochemical Database. Geospatial features are displayed on seamless maps that include topographic bases of different scales, 3 thematic geological backgrounds – bedrock, surficial and tectonic assemblages - and township and administrative boundary fabrics.

Finally, the ERMES-DAS site is used by ministry employees to load, edit and maintain the various databases prior to replicating their contents to the other two sites. Also, at this site custom plots and datasets are prepared for clients who have requested them via the Internet.

Information can be browsed and some downloaded at no cost to the user. However, ERMES includes an e-commerce component through which clients can order hardcopy plots or custom data sets. For these there is a charge to recover the cost of reproducing the information on the required media.

ERMES is an integral part of the Data Warehouse of the Ontario Land Information Infrastructure. The warehouse provides access to related topics of geographically referenced information often used in the exploration for minerals, mining operations, land use planning, management of natural resources and the care of the environment.

Metadata describing in detail the attributes of each database is available through the Ministry Web site at [http://www.gov.on.ca/MNDM/MINES/ERLIS/erlis\\_db.htm](http://www.gov.on.ca/MNDM/MINES/ERLIS/erlis_db.htm). Metadata is also being provided through the Land Information Ontario, Ontario Electronic Information Directory, at <http://www.mnr.gov.on.ca/edwin>. Presently only information regarding bedrock geoscience is available through this site and it will be augmented with information on the other datasets over the next year. A third source of metadata will be the Canadian Geoscience Knowledge Network. Work is in progress to finalize the form and content of the latter.

The Ministry is contemplating future work to integrate the ERMES sites with its mining claims web site. This will provide seamless access to all of the geoscience, minerals exploration and mining claims information for the Province of Ontario.

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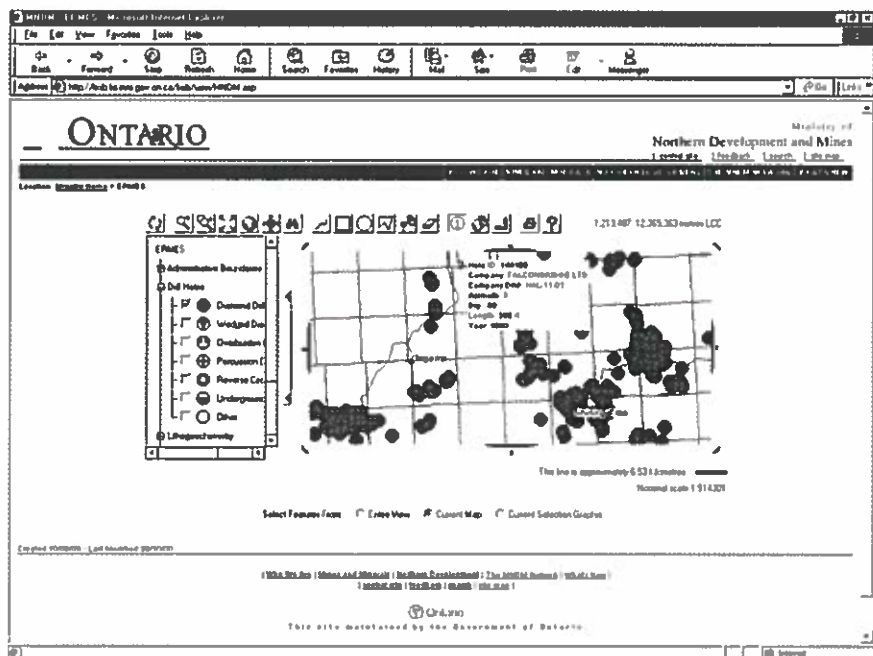


Figure 2. ERMES-LIO view showing drill hole, geology and topography layers and attribute data.



## GEOSCAN: The GSC Publication Search Engine

The Geological Survey of Canada publishes 300-400 reports, maps and open files every year. But how do you find out what they are? For over 20 years, this information has been entered into GEOSCAN, the bibliographic database for GSC publications. The Earth Sciences Information Centre of Natural Resources Canada maintains and develops this valuable resource, which is freely available for searching over the Internet at [http://www.nrcan.gc.ca/ess/esic/geoscan\\_e.html](http://www.nrcan.gc.ca/ess/esic/geoscan_e.html), serving over 40,000 clients every year.

### The records: what is in GEOSCAN?

GEOSCAN is a database of metadata for every publication released by the GSC since its first, Geological Survey of Canada, Report of Progress 1845. In addition, if a publication contains separate articles (such as Current Research), each article within the publication will have a record in the database. This allows researchers to find pertinent publications even though they may be a part of a compilation volume.

In 1986, GEOSCAN began including records for contributions by GSC staff to outside publications. These GSC Contributions to Outside Publications supplement the internal GSC publications to provide a more complete view of the published scientific output of the Geological Survey.

### The data elements: what is in each record?

There are three basic types of data recorded in GEOSCAN: bibliographic, geographic, and subject analysis. In addition to the typical bibliographic data elements like titles, authors, and source, GEOSCAN also captures abstracts, meeting information, related references, media, associated programs (MDA and NATMAP), document availability and price, digital data formats, and any software required to view them.

The geographic component includes country, province, NTS map sheet numbers and latitude/longitude bounding coordinates, but also records the names of lakes, rivers, mountains, cities, towns, etc., to help describe the area covered by the document. The subject analysis component of the document is carried out by a geoscientist who applies general and specific keywords to describe the scientific concepts presented. In addition to this thematic approach, the nomenclature associated with geologic features (well names; formations/groups; fossils; tectonic and structural elements) are all recorded.

### Discovery: how do I search the database?

There are three ways to search the GEOSCAN database: a) ask an Earth Sciences Information Centre (ESIC) librarian; b) use Z39.50 connectivity; or, c) carry out an interactive Web-based search. But even with all of today's technology, you can still telephone and speak with an actual person who will perform a GEOSCAN search.

For those of you taking advantage of Z39.50 distributed searching (your search request is sent to many databases at the same time), GEOSCAN is Z39.50 compliant. The pertinent profile information is on the GEOSCAN web page.

Most likely, you are interested in searching GEOSCAN using its Web interface

([http://www.nrcan.gc.ca/ess/esic/geoscan\\_e.html](http://www.nrcan.gc.ca/ess/esic/geoscan_e.html)), which has been developed to provide the flexibility you need to find the documents you want. The big advantage of this Web search screen is that you can refine your search to your heart's content. The searching is free and there is plenty of online help. The NTS Help page even includes GIF images of the NTS map sheet grids of Canada to assist you with finding NTS values.

For ease of searching, there is a "Basic" search window that searches a number of indexes at once. If you are not sure of what field to search in, then put your search terms in "Basic". And if you are searching for the number of the Bulletin or Open File, enter the value in "Basic".

Searchers who are looking for certain themes or topics will want to use the ability to search using Titles, Subjects, Geographic areas, or NTS map sheets, in conjunction with map scales, publication dates or language requirements. If you are

not sure what terms to search on, the "Browse" function shows you terms that are in use in the database.

### The results: options for displaying the data

Now that you have found the records you are interested in, you have a variety of options with which to display. The default display is a citation listing sorted by publication date beginning with the most recent. This listing can be sorted by province, NTS, series or author. If you choose to view the "Short" or "Long" formats you will see additional data elements, such as abstracts, media, digital file formats, and document availability (how much it costs, and where you can buy or view it). As the Geological Survey of Canada moves to e-commerce to sell its products, look for GEOSCAN to offer an online ordering option.

GEOSCAN records contain links to other Web resources related to the publications. If a publication is affiliated with a particular MDA or NATMAP project,

it will be referenced and if a Web site exists, a link to that site will be displayed. If a scanned image or JPEG of a retrieved map exists on the Web, a link to that image, or the image itself, will occur within the GEOSCAN display.

An export display format is available to facilitate capturing GEOSCAN data. Standard two character tags are employed to yield a Tag-Data format for these publications.

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GSC Contribution number 2000287

*Bruce is an Information Geologist working with ESIC's databases.*

The screenshot shows the GEOSCAN search interface. At the top, there are buttons for 'Search', 'Search & Display Results', 'Clear Search', and 'Exit'. Below this, it shows 'Search Results: 0' and a 'Max Records to Display' dropdown set to 50. The main search area is divided into 'Basic' and 'Advanced Search' sections. The 'Basic' section has a single search input field with a 'Help' button. The 'Advanced Search' section includes fields for 'Titles', 'Authors', 'Subjects', 'Area', and 'NTS', each with a 'Browse' and 'Help' button. There are also dropdown menus for 'Province' (listing All, Canada, British Columbia, Alberta) and 'Document Type' (listing All, Outside Contributions, All maps, GSC Publications). Other filters include 'Media' (All), 'From Publication Year', 'To Publication Year', 'Scale: From', 'Scale: To', and 'Language of text' (Any). At the bottom, there are buttons for 'Search', 'Search & Display Results', 'Clear Search', and 'Exit', along with an 'Email' button.

## Digital Information Services in Nova Scotia

The Digital Information Services group is responsible for developing and maintaining the Minerals and Energy Branch Geographic Information System and associated databases, the NovaScan bibliographic geoscience database, for supplying digital data and services to clients and staff, and for developing the Minerals and Energy Branch Internet web site. Permanent Digital Information Services staff consist of geologists/geographic information system specialists Brian Fisher and Jeff Poole, and word processor operator Susan Saunders. John MacNeil, a geologist/geographic information system specialist and geologist Miranda Huskins were hired to work on the south-central Cape Breton Island Targeted Geoscience Initiative project.

### Digital Geoscience Data Products

A collection of digital geology maps, databases and images on Nova Scotia has been developed and is now on sale through the Department of Natural Resources library and available for free download from the Minerals and Energy Branch web site at <http://www.gov.ns.ca/natr/meb/pub3.htm>. The complete list of digital data products available can be obtained from the Department of Natural Resources Library or viewed on the Minerals and Energy Branch web site at <http://www.gov.ns.ca/natr/meb/pubshome.htm>. A licence agreement is issued with all digital data sets. This agreement allows unrestricted use of the data with the understanding the Department of Natural Resources remains the owner of the data and is not transferring copyright to the owner. Since March 1999, when the data was first made downloadable from the Minerals and Energy Branch web site, there have been over 10,000 downloads.

### Public Access GIS

A Public Access GIS has been developed for use by clients in the Halifax library. This is a user-friendly query and display system that uses a customized version of ArcView to access a variety of geographically referenced digital geoscience data. It can display and query data sets, overlay various themes of geoscience, topographic and land-use information, and output the resulting maps as colored plots.

### GIS Development

Digital Information Services staff have been working cooperatively with Minerals and Energy Branch staff on several projects. The new 1:500 000 Geology Map of Nova Scotia was released as Published Map ME 2000-1 and digital product D00-01 in January 2000. In conjunction with the Land use staff, they have converted the Mineral Resources Land Use Maps for Nova Scotia into digital form. These are currently being checked and will be released as Open File Map (OFM) ME 2000-3. The Land Designation and Ownership Map was released as OFM ME 2000-1.

Work on integrating the Registry of Mineral and Petroleum Titles database into the Geographic Information System and automating the production of the Mineral Claims Disposition Map has been completed. This was released as OFM ME 2000-6, Mineral Rights Disposition Map. Two other open files maps were also released as a part of this project in the last year, namely: OFM ME 2000-7, Designated Underground Gas Storage Exploration Areas; and OFM ME 2000-8, Geothermal Resource Areas. An OFM of Crown Limestone Areas will be released in 2001. All three maps will be released as a digital product on our web site in 2001 and the databases will be available in version 3 of the Public Access Geographic Information System.

Work is continuing on converting the NovaScan database into Arc/Info format. When completed, the database will be made available in the Public

Access Geographic Information System and on the Internet in 2001. Thirty of the detailed Faribault Gold District maps were converted into Arc/Info format and georeferenced. These will be released as digital products on our web site in 2001 and included with version 3 of the Public Access Geographic Information System.

### Internet Map Projects

Several prototype Internet Map Server (IMS) applications, currently running in-house, have been created that will allow our clients to view, query, plot and download our digital maps and databases over the Internet. Over the next year an Internet application, using ArcIMS technology, will be developed that will provide the general public with Internet access to our Public Access Geographic Information System layers. It is planned that the initial deployment of this application will be in 2001.

### South Central Cape Breton Island Project

In the summer of 2000 the Geological Survey of Canada Atlantic Division and the Minerals and Energy Branch were awarded funding under the Geological Survey of Canada Targeted Geoscience Initiative for a geological mapping project to aid in mineral development in south central Cape Breton Island. As part of this project we are responsible for producing a digital compilation of geological data for this area. John MacNeil and Miranda Huskins were hired in November to work exclusively on this project to build databases, digitize maps and develop the digital products that will be produced as a result of this project. Approximately 90 layers have been identified that may potentially be included as part of the final products for this project.

### NovaScan

NovaScan is the bibliographic geoscience database on Nova Scotia and its offshore regions. As of December 31, 2000, the database contained 14,881 Department of Natural Resources records, consisting of 6517 mineral exploration assessment reports, 3535 publications, 2691 open files, 1200 journal literature references, 756 theses, 165 contribution series, 12 digital publications, and 5 outside publications.

In order to provide better service to our staff and clients by allowing Internet access to and searching of the NovaScan database, two independent projects were carried out in 2000. The first project involved downloading the database into the Minerals and Energy Branch Geographic Information System and creating geographic boundaries for all NovaScan records. When complete, the NovaScan database will be searchable through Minerals and Energy Branch's Public Access Geographic Information System, and also searchable on the Internet. Completion of this project should take place in 2001.

The second project involved downloading and converting the NovaScan records into standard library MARC format, so that they could be loaded into the Provincial Library's Internet-accessible *Ncompass* catalogue database. This catalogue can be accessed at the following address: <http://ncompass.library.ns.ca>. As of December 31, 2000, all open NovaScan records were entered into the *Ncompass* database. Newly opened assessment reports are added to the *Ncompass* catalogue on a monthly basis.

*Brian Fisher, Jeff Poole, John MacNeil and Susan Saunders  
Nova Scotia Department of Natural Resources  
Halifax, NS*

*The authors work for the Geoscience Information Services Section  
in the Minerals and Energy Branch.*

## You can't tell the players without a program

### A Glossary of Geoscience Information Management, who is where, and how to get there

A host of new initiatives and services, each with its own acronym, have developed over the last few years. This glossary is an attempt to identify some of them, sort out their relationships, and find sources for additional information. Unfortunately, due to space limitations, this glossary provides only a sample of the many initiatives and services.

#### CAD

An abbreviation for Computer Aided Drafting

#### Canadian Geospatial Data Infrastructure (CDGI) (<http://cgdi.ca/>)

The Canadian Geospatial Data Infrastructure, which is being developed by GeoConnections, will coordinate Canada's numerous databases of geographic information, make them accessible through a common window on the Internet, and enable partnerships between federal, provincial and territorial governments, the private sector and the academic community.

#### Canadian Geoscience Knowledge Network (CGKN) (<http://cgkn.net>)

The Canadian Geoscience Knowledge Network is an initiative of the National Geological Surveys Committee to provide Internet access to consistent Canadian government geoscience data. The CGKN will become the geoscience node of the CGDI.

#### Canadian Geoscience Publications Directory (CGPD) (<http://cgpd.cgkn.net>)

The Canadian Geoscience Publications Directory. A CGKN service providing on-line searches for publications of Canadian government geoscience agencies.

#### CEONet (<http://ceonet.ccrs.nrcan.gc.ca/>)

CEONet is the search engine of the CGDI to support access to geospatial information and services.

#### CORDLink (<http://132.156.108.208/Cordlink1/>)

CORDLink is a digital geoscience library prototype for the Canadian Cordillera.

#### EXAMINE (<http://examine.mrn.gouv.qc.ca/dex/plsql/app.debut>)

Examine is the on-line database of products available from the Ministère des Ressources Naturelles in Québec.

#### eXploration and Mining Markup Language (XMML) (<http://www.ned.dem.csiro.au/research/visualisation/XMML/>)

A CSIRO (Australia) initiative to develop an XML dialect for mining geoscience data.

#### Extensible Markup Language (XML; <http://www.w3.org/XML/1999/XML-in-10-points>)

Extensible Markup Language is a simple ASCII language based on the use of <tags> for transfer of data on the Internet. GeoXML and XMML are geoscience versions of XML used for Internet transfer of geoscience data.

#### Federal Geographic Data Committee (FGDC) (<http://www.fgdc.gov/>)

The Federal Geographic Data Committee coordinates the development of the United States "National Spatial Data Infrastructure" (NSDI). The NSDI encompasses policies, standards, and procedures for organizations to cooperatively produce and share geographic data.

#### GEIXS (<http://geixs.brgm.fr/>)

A Eurogeosurveys (European union of National Geological Surveys) project that provides and on-line European Geological Data Catalogue. It allows you to search for European geoscience data sets. (The EU equivalent of the Canadian Geoscience Publications Directory).

#### GeoConnections (<http://www.geoconnections.org/>)

GeoConnections is a national initiative to develop the Canadian Geospatial Information Infrastructure (CGDI).

#### GeoGRATIS (<http://geogratias.cgdi.gc.ca/>)

GeoGRATIS is a GeoConnections service that provides free access to a wide variety of Canadian geospatial data. The objective of GeoGRATIS is to expand the use of geospatial by providing free access to high quality Canadian data sets.

#### GeoInnovations (<http://www.geoconnections.org/english/geoinnovations/>)

GeoInnovations is a GeoConnections program that provides funding for innovative geospatial infrastructure projects developed by Canadian companies.

#### GeoMatter

A software tool for population of geological databases based on the North American Data Model. (Contact Eric Boisvert, GSC-Québec).

#### GeoXML

A variant of XML for geoscience data exchange on the Internet.

#### GIS

Abbreviation for Geographic Information System.

#### Intergovernmental Geoscience Accord (IGA)

The Intergovernmental Geoscience Accord is an agreement that establishes a framework for federal, territorial, and provincial geoscience collaboration, planning, and clarification of federal and provincial mandates.

#### IM

Abbreviation for information management

#### International Standards Organization (ISO)

The International Standards Organization defines international standards in many areas including metadata and geospatial data standards.

#### Interoperability

A term to describe the state where data can be exchanged without loss of content or understanding.

#### IT

Abbreviation for information technology

#### The Map Place (<http://www.em.gov.bc.ca/mining/Geosurv/MapPlace/default.htm>)

A British Columbia Department of Energy and Mines web site providing a range of services aimed at the mineral exploration community.

#### MIRAGE (<http://www.rgsc.nrcan.gc.ca/mirage/>)

A ResSources GSC supported project that delivers images of GSC geological maps at variable resolution on the Internet.

#### National Atlas of Canada (<http://atlas.gc.ca/>)

The National Atlas of Canada is responsible for the development and maintenance of an authoritative synthesis of information on the geography of Canada. It is being developed in partnership with organizations that hold scientific data and knowledge.

#### National Geological Surveys Committee (NGSC)

The National Geological Surveys Committee coordinates the activities of the 12 federal provincial and territorial geoscience agencies in Canada. The NGSC is the endorses development of the Canadian Geoscience Knowledge Network.

#### North American Data Model (NADM) (<http://geology.usgs.gov/dm/>)

The North American Data Model is an initiative of the USGS, the GSC, American state and Canadian provincial geoscience agencies to establish a standard model for geological map, and ultimately all geoscience data.

#### OpenGIS Consortium (OGC) (<http://www.opengis.org/>)

The OpenGIS Consortium is developing open software independent standards and protocols for GIS data and software.

#### ResSources GSC (<http://rgsc.nrcan.gc.ca/>)

ResSources GSC is a Geological Survey of Canada initiative to put geoscience data on the Internet. A number of projects demonstrating Internet delivery of a range of geoscience data can be accessed through the ResSources GSC home page.

#### Targeted Geoscience Initiative (TGI) ([http://www.nrcan.gc.ca/gsc/tgi\\_e.html](http://www.nrcan.gc.ca/gsc/tgi_e.html))

The Targeted Geoscience Initiative is a federal program designed to stimulate new investment in the mining sector by improving the quality of information relevant to new mining opportunities.

#### Z39.50

A computer-to-computer communications protocol designed to support searching and retrieval of information – full-text documents, bibliographic data, images, multimedia – in a distributed network environment. Based on client/server architecture and operating over the Internet, the Z39.50 protocol is supporting an increasing number of applications. See: <http://www.cni.org/pub/NISO/docs/Z39.50-brochure/>



# Letters to GEOLOG

## Isotopes, Religion and Public Policy

Well, we've got our Vision, and our Mission and our Business Plan. We have given the vexatious problem of country-wide licensing of Professional Geologists to another group to worry about. We have had some good meetings and made some money. We've published books and oh so many papers. We have wondered whether what we do is properly labeled. We've struck some good committees. We've reinvented ourselves. We are ready for the next century!

And we have FAILED in our societal responsibility.

We have a leader of Her Royal Highness' Opposition who is said to be a creationist. A man that wants to be the Prime Minister of the country. Who would shape our Canadian Science Policy.

We have a populace which, according to a COMPASS Poll taken Nov. 23, 2000, indicates that 38% believe in a biblical interpretation of creation. Furthermore it indicates that "...Ontario (43%) and Prairie (46%) voters are the most likely believers in the Stockwell Day version of creationism." (Vancouver Sun November 25, A4).

How can a person that uses the electricity derived from a nuclear reactor, state that the rocks of the Acasta Gneiss are not 4,000,000,000 years old. The science behind them both is the same! They both rely on the orderly breakdown of unstable isotopes.

When I raised the above point on a CBC chat line I was told, from coast to coast, by many people, that I was an Religiously Intolerant Person. And many other not so nice things as well.

The breakdown of unstable isotopes is not a matter of belief or choice of religion. It happens, whether I, or you, want it or not.

The poll results point to a severe disconnect in people. We, as geologists, have not done our jobs, the GAC has not done its job, in explaining geology to our fellow citizens.

Geographers managed to educate our public into accepting the near spherical shape of the earth. Surely we can help people find out for themselves that the earth is old.

What to do? Let the GAC take on this meaningful challenge.

*Mikkel Schau  
F1826  
mikschau@home.com*

## Beyond Logan

I was very supportive of the GAC initiative to reverse the Prime Minister's decision to re-name Mt. Logan, and am pleased that it seems to have succeeded. As a number of the comments you quoted said, it is most unlikely that either M. Trudeau, or his family, would have been happy with a memorial achieved in such a manner.

However, I was dismayed that you would publish such a heavily biased commentary as that offered by C. Gordon Winder of the University of Western Ontario concerning the respective contributions to Canada of Logan and Trudeau. Logan is all good, and Trudeau is all bad. Winder asks "Who made the greater contribution to Canada?", then proceeds to answer his own question by a totally irrelevant bashing of Trudeau. His comments on the War Measures Act are a case in point. Since a murder and kidnapping had already taken place, terrorism was not an idle threat during the October crisis of 1970. While even a few days loss of personal freedom for some innocent bystanders is indeed scary, I should point out that I have not seen Dr. Winder's name in the Globe and Mail protesting the strip searches the Toronto police have no hesitation in carrying out without any similar justification.

Geolog should not be used for spreading "the big lie"; it will not endear our profession to Canadians generally.

I would agree that a far more important issue for the earth scientists of this country to deal with, in concert with all other Canadian scientists, the presence among us of a sizable minority of citizens who can support a political leader whose personal philosophy is a complete negation of modern science. The absurdity is that they wouldn't want to give up modern health care, a direct outcome of that same "science". Such total irrationality does not bode well for the future of Canada. Can we hope for any leadership on this from the GAC?

*Gwen Milton  
PhD, Earth Science  
Deep River ON*

***Stones in your shoes?***

**Write a letter to GEOLOG**

**geolog@gov.yk.ca**



# Association News

## Public Outreach at GeoCanada 2000: Building on a GAC Tradition

Common ground to the earth science societies that came together at GeoCanada 2000 is that of an interest in public awareness and outreach. Earth science tends to take a back seat to many of the other sciences in the collective mind of society and politicians. There is an ever increasing awareness within the earth science community that it must reach out to the public, in particular the youth, to help them appreciate the role and relevance of geoscience and the earth to their everyday lives.

The GAC's public outreach activities are many. GAC members participate in numerous grass-roots programs in their own communities. A 1998 preliminary survey by the Canadian Geoscience Education Network (CGEN of the Canadian Geoscience Council) identified well over a hundred such activities. In support of these activities the GAC features an Education Series in Geoscience Canada, financially supports the EdGEO and Earthnet programs, the Student Internship Program, National Youth Science Fair awards, and encourages the inclusion of public awareness of earth science (PAES) events as an integral part of its annual conferences. This article is a brief summary of the PAES events that occurred at GeoCanada 2000 in keeping with, but also expanding upon, GAC tradition. While the GAC membership was occupied attending technical sessions and networking there was a parallel dynamic public program. This article is intended to give the membership a flavour of the program and hopefully encourage future organizing committees to build upon this and previous PAES events.

The GeoCanada 2000 Outreach Program consisted of three components each aimed at a different part of the community; the general public, high school students, and educators.

### General Public

On the Wednesday evening of GeoCanada 2000, some 725 people attended a public lecture by Dr. Roberta Bondar, Canada's first woman astronaut to orbit the earth and photographer/author of the recently published book "Passionate Vision, discovering Canada's national parks" (Bondar, 2000). A crowd filled with youngsters was treated to an entertaining and informative presentation on how the human body reacts as an integrated system to imposed changes such as weightlessness, similar to how the earth functions as a system.

Dr. Bondar was an excellent choice for this event. Her presentation was full of humorous anecdotes and information. She fielded questions from the audience for close to half an hour and then spent about an hour in the lobby meeting families, autographing books, being photographed and chatting with everyone (especially Dr. Bondar's fellow Girl Guides, Figure 1) until all of the people were gone!

### High School Students

In partnership with the Calgary Science Network's Science Hotline, GeoCanada 2000 hosted 20 students from 7 high schools and accompanying educators, in an event entitled "At the Conference for a Day". The students spent a busy day attending selected talks at the "Earth Science and Society" Summit Session, touring the Exhibits Tradeshow and Posters, attending a luncheon presentation by Roberta Bondar and visiting the GeoTreasures Exhibition. The students were treated to a half-hour private question and answer session with Roberta Bondar following her luncheon talk.

The students commented on their surprise at the breadth of topics

being discussed at the conference and the multitude of high-tech jobs and careers represented at the Exhibits Tradeshow.

### Teachers' Program

GeoCanada 2000 hosted 37 teachers from Saskatchewan, Alberta and British Columbia at a two-day program. The Canadian Geoscience Education Network and EdGEO invited teachers from across Canada to attend a program consisting of three components: delegate for a day attending a technical session, an evening workshop and a choice of one of two field trips. This general plan was developed by the Outreach Committee who benefited from many discussions with Fran Haidl (Saskatchewan Energy and Mines) of EdGEO and CGEN.

The Teachers' Program took advantage of events already scheduled at GeoCanada 2000. The technical session entitled "Communicating Critical Geoscience Issues to Canadian Communities" was identified as being potentially relevant to teachers and the conveners of this session, John Clague (Simon Fraser University) and Bob Turner (Geological Survey of Canada, Vancouver) enthusiastically agreed to open this session to educators. Talks were punctuated with discussion periods on specific topics relevant to educators and using geoscience resources in the classroom. This session was intentionally scheduled to include Friday in order to accommodate teachers, as they must arrange for substitute teachers if they are to be away. This would also allow for continuity in the program by having the field trips the following day, a Saturday. It was imperative to minimize teachers' time away from the classroom.

Following the morning's technical session, the teachers attended a talk by Steve Kellas, a teacher from Richmond B.C. Mr. Kellas described the Mining Association of B.C. sponsored program which develops resource materials for use in the classroom by partnering professional earth scientists with educators. This program has been extremely successful and has been a model for programs elsewhere such as the Mining Matters of PDAC.

In the afternoon, the teachers toured the GeoTreasures Exhibition.



Figure 1. Dr. Roberta Bondar visiting with some fellow Girl Guides after her evening public presentation, a highlight of the GeoCanada 2000 Public Outreach Program.

photo by Jim Baker, Calgary

The teachers reconvened for a 3-hour evening workshop. This was designed to give the teachers a networking opportunity and to prepare them with background knowledge for their field trips the following day. A local consultant, W.G. Ayrton, (Ayrton Exploration Consulting Ltd.) kindly provided a lecture on Geology of Western Canada for teachers, highlighting the geology of the areas they were to visit the following day. This was followed by an entertaining team quiz including over 20 geoscience-related questions accompanied by display items.

The following day there were two field trips. Dave Eberth of the Royal Tyrrell Museum of Palaeontology (RTMP) lead a trip to "The World's Richest Dinosaur Graveyard" in Dinosaur Provincial Park. Len Hills of the University of Calgary lead a trip to the Front Ranges entitled "Mountain Mysteries and Riches" highlighting the relationship between humans and the Earth's resources (Figure 2).

#### GeoTreasures Exhibition

Though not developed by the Public Outreach Committee, the GeoTreasures Exhibition was used as a component of public outreach. The exhibition featured geological samples from some of the country's best collections and was housed at the University of Calgary Nickle Arts Museum. It was open to the public during, and for 3 weeks following, the conference. During this time attendance records were set for the museum. A visit to GeoTreasures was included in the Outreach Student and Teachers Programs and was also included in general media material developed for the Outreach Program.

#### Earth Science and Society Summit Session

This technical session was convened by Godfrey Nowlan (GSC Calgary), Pat Rasmussen (Health Canada), and Paul Johnston (RTMP) featuring talks on topics of direct interest and relevance to the public. Though not part of the Outreach Program, attendance at some talks from this session was included as a component of the Students Outreach Program. The General Public was invited to attend these talks for a modest fee of \$10 per day, which also provided admission to GeoTreasures. Few people, if any, took advantage of this opportunity, but it was an experiment perhaps worth repeating at future conferences with more pre-conference publicity.

#### Financial

With the approval of the Steering Committee, which agreed that a prime conference objective was to increase the profile of earth science in the community, the Outreach Program was budgeted to incur a loss. Outreach delegates had conference registration waived. Registration for the Teachers' Program was kept to a minimum at \$10 for the day and \$60 for the package including a field trip. The high school students' program was offered without fee and tickets to the public lecture by Roberta Bondar were set at the reasonable price of \$10 for adults and \$5 for children. Some costs were minimized by taking advantage of conference events already budgeted. Roberta Bondar, for example, had been booked for a conference luncheon and was available at a reduced fee for the additional public address.

The cost of the outreach events far exceeded revenues generated from ticket sales and registration fees. However, the costs of the program were more than offset by sponsorship funds that were attracted by the Outreach Program. Numerous sponsors requested that part, or all of their contributions, be devoted to the outreach costs. In some instances sponsors may not have otherwise participated. It appears that outreach is a priority for corporations as well as the earth science societies.



**Figure 2.** Teachers on one of two field trips offered in the GeoCanada 2000 Teacher Program. This group, lead by Dr. Len Hills, discusses humans' relationship to the earth and its resources within view of a cement plant in the Front Ranges of the Rockies. (photo by Jon Dudley)

#### Media Profile

An in-kind sponsor attracted by the Outreach Program was CBC Radio Calgary. Free radio announcements regarding the public lecture by Roberta Bondar were instrumental in attracting attendees and provided exposure for the GeoCanada 2000 conference. The GeoTreasures Exhibition also attracted electronic media attention. These initial contacts with the media also helped in drawing attention to other aspects of the conference, such as the talks in the "Earth Science and Society" session. These events contributed to GeoCanada 2000's unprecedented media attention.

#### Keys to Success

In addition to an extremely hard working Outreach Committee, the following factors contributed to the success of the GeoCanada 2000 Outreach Program.

- Integrating the Outreach Program with other conference events: this controls costs and gives public participants exposure to the conference
- Engagement of grass-roots networks in soliciting educators to participate (e.g. local Science Networks, EdGEO and CGEN networks, the Mining Association of B.C. and the Yoho Burgess Shale Foundation)
- Attracting sponsorship by profiling Outreach activities in conference fund-raising literature
- Attracting media interest through in-kind sponsorship of appropriate outreach events

In summary, Public Outreach events are a prime opportunity to share with the public the excitement and wonder of our science and our planet. This increased awareness is the beginning of appreciation of earth science and its relevance to everyone's daily lives. This is critical to the future of our science and quality of our lives. It is ultimately more effective to focus our efforts on building an informed electorate than to attempt to convince politicians and policy makers of the significance of geoscience. The electorate ultimately influences the politicians. Pursuing outreach as an ongoing component of the GAC's activities, including at its annual conference, is an opportunity we cannot afford to miss. Hopefully this article on the GeoCanada 2000 experience (as well as the details in the conference final report) will be helpful to future organizers of Outreach events.

#### Reference

Bondar, R.L. 2000. *Passionate Vision*. Douglas & McIntyre Ltd., Vancouver, 175 p.

*Jon Dudley*  
Coordinator GeoCanada 2000  
Chair Public Outreach Program  
Calgary, AB

## The media: a note on lessons from GeoCanada 2000.

The last issue of *Geolog* (v. 29, pt. 4) featured numerous articles on Logan and the controversy over the renaming Mount Logan. I read with great interest the Presidential Preamble by Scott Swinden entitled "Engaging the Canadian Public in Geoscience - Lessons from Mount Logan". As conference coordinator and co-chair of the GeoCanada 2000 Marketing Committee, I was involved in attempting to get media attention for the conference. GeoCanada 2000 enjoyed perhaps unprecedented media coverage and I think there are some lessons to be learned from this success similar to those from the Mount Logan controversy.

GeoCanada 2000 received extensive press coverage for a Canadian geoscience conference. Twelve on-site television interviews were conducted, 12 radio interviews with organizers and speakers, and 4 printed articles appeared during the conference.

This coverage involved a great deal of advance effort. A press list of over 40 contacts was assembled and used to distribute a number of items; press packages in March 2000, media advisories two weeks before the conference, and press releases during the conference.

The March 2000 press package attempted to interest the media in the uniqueness of the conference, some of the socially relevant topics to be discussed, and the public outreach program including Roberta Bondar as a feature speaker. There was very little response to this mail out.

**Lesson 1: the media looks for current news and plans ahead on a very short time frame.** There was much more response to media advisories sent out two weeks before the conference which were also followed up by telephone. A two-page media advisory gave only the highlights for the conference week. Each technical talk or event was described by a one line "hook", not the title of the paper or event which would not grab any attention. Also, enclosed were one-page backgrounders for each highlighted event which were essentially abstracts rewritten for a lay reader. The media were given contact names for the days preceding the conference and directions, with a map, to report to the Information Centre to obtain a press pass and updated information package at the conference.

**Lesson 2: make the material palatable, facilitate access for the media, and be persistent.** A celebrity in the form of Dr. Roberta Bondar, Canada's first woman astronaut to orbit the earth, and her public presentation was a big attraction for the media. Dr. Bondar conducted three television interviews at the conference and four radio interviews. Days before her arrival at the conference there were more requests for interviews

than could be accommodated (recall Lesson 1). Dr. Bondar's profile got the media out to the conference and helped draw subsequent attention to the conference.

**Lesson 3: Celebrity and public programmes can help attract the media and lead to further coverage.** Breaking news stories attracted the media to GeoCanada 2000 for 8 interviews. These stories were: 1) the security concerns for the World Petroleum Congress, to be held two weeks later, following the unrest at the previous World Trade Organization meetings in Seattle; 2) the Walkerton water supply contamination. The security story was pursued by the media itself looking for comments on any GeoCanada 2000 security concerns and precautions. The Walkerton lead, however, was the subject of media releases from the conference. The Walkerton story broke the Friday before the conference and continued during the conference. Though there were some water-related talks described in media advisories distributed earlier, press releases were written and faxed to the media during the conference highlighting all of the water-related talks coming up at the conference. As it happened, most of these talks were being presented in the Earth Science and Society Summit Session. The media were attracted to this session by the topic of water but this also led to coverage of some other topics.

**Lesson 4: Be quickly proactive in responding to any news items related to earth science.** This latter lesson is the most similar to that learned from the Mount Logan story. As Scott Swinden stated in his article in the last *Geolog*, "Perhaps the most important lesson is the importance of reaction time." Closely related, is the importance of reacting to and capitalizing on any earth science related issue that is already newsworthy. It should be abundantly clear by now that our science, our conferences, and we, the scientists, are NOT newsworthy. It is largely futile to attempt getting media attention by talking ABOUT the importance and relevance of our science. It is much more effective and successful to DEMONSTRATE the relevance of earth science by providing a timely voice to related news items that have already grabbed the media's attention. The occurrence of a conference such as GeoCanada 2000 offers a vehicle and mechanism through its organizers to provide such a voice. Many individuals and societies such as the GAC heeded the call in the Mount Logan instance. It would serve us well to ensure that our science has the mechanisms and vehicles in place to be able to capitalize on earth related news on an ongoing basis.

*Jon Dudley  
Calgary AB*



A small ceremony was held recently at GSC-Calgary to recognize the contributions of two GAC members to last year's GeoCanada 2000 event. Grant Mossop and Godfrey Nowlan played key roles in the success of the meeting.

Grant was GAC representative on the Steering Committee, and Godfrey was Chairman of the Keynote Speakers & Plenary Sessions Committee and GAC's representative on the Technical Program Committee. As well, Godfrey stepped in for Grant during Grant's illness. Sandy McCracken (GAC Publications Chair) presented the two with gifts on the Association's behalf. The gifts were soapstone carvings, with accompanying engravings, done by the Newfoundland artist, Nathaniel Thomas Noel. The soapstone is primarily pyrophyllite and is mined from near Manuels, in Conception Bay South, Newfoundland. Headquarters staff chose the soapstone subjects specifically for the two - Grant received a puffin, to remind him of his (former) days of "puffin" on a pipe, and Godfrey received a "wise old owl".

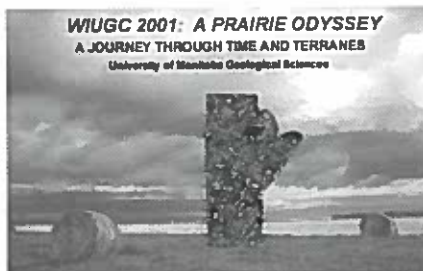


# Student News

## “WIUGC 2001: A Prairie Odyssey”

From January 11<sup>th</sup> – 13<sup>th</sup>, 2001: delegates of “WIUGC 2001: A Prairie Odyssey” took part in events hosted by the University of Manitoba, Department of Geological Sciences. This year marked the 37<sup>th</sup> Annual Western Inter-University Geological Conference (WIUGC) that has been hosted on a rotational basis by Western Canadian universities. WIUGC is an academic conference that has traditional technical and social events. Technical sessions include “soft rock” and “hard rock” talks presented by students based on individual geoscience research, as well as a career fair. For those who register for the “social” aspect of the conference WIUGC provides: a Beer ‘n’ Bull icebreaker, an outing to a local bar, and the wrap-up banquet. This is a conference that every geoscience student should attend at least once. WIUGC is a great experience because it involves exposure to geological research and industry / academia. In addition, while attendees are meeting student delegates from across this beautiful country, they may also grab the opportunity to present a talk. I have been to a handful of WIUGC’s myself and each time has been a lot of fun highlighted by various memorable events.

In the aftermath of organizing WIUGC 2001, after having collected comments on conference events, there are a few highlights that stand out. This was the inaugural year for posters to enter as a main event along with talks in the technical program. We had a great response from students because it is a step on the way to giving a formal oral presentation. Another accomplishment was a technical program that was free of instrumentation problems, and remained on schedule! A unanimous highlight, on behalf of the WIUGC 2001 Organizing Committee, was having our Manitoba Minister of Industry, Trade and Mines open up the invited industry and academic talks that we scheduled on the Saturday of events. Also, we were delighted to have Dr. Chris P.M. Heath give the keynote address at the wrap-up banquet. His talk on the skills needed by the oil industry for students brought all of



us up to speed on the importance of particular technical and non-technical skills.

For those who remember (or lack memory), social event highlights definitely included karaoke participants singing Tom Jones songs. I also think most would agree that the University of Regina winning the “boat races” a second year in a row, does compare to the excitement that arose when a certain University of Calgary Rundle Group executive decided to provide a “cheeky” indiscretion for everyone to enjoy! Of course, the ultimate annual WIUGC tradition and highlight is the bun fight concluding supper at the wrap-up banquet. However, not only was this a tradition breaking year for the U of M organizing committee in regards to the technical session, but also for the bun fight! Much to the dismay of hotel banquet personnel, we had buns, as well as perogies flying by the chandeliers!

In review of this year’s WIUGC conference it is certain that all delegates enjoyed what the University of Manitoba had to offer, as well as the great student research presented by all participating universities. Every member on the 2001 organizing committee is elated that WIUGC was a success and are thankful now that we can put up our feet and pass the torch to the University of Alberta for 2002.

**Karen Greengrass**  
 Chairperson, WIUGC 2001 Organizing Committee  
 University of Manitoba  
 Winnipeg, MB

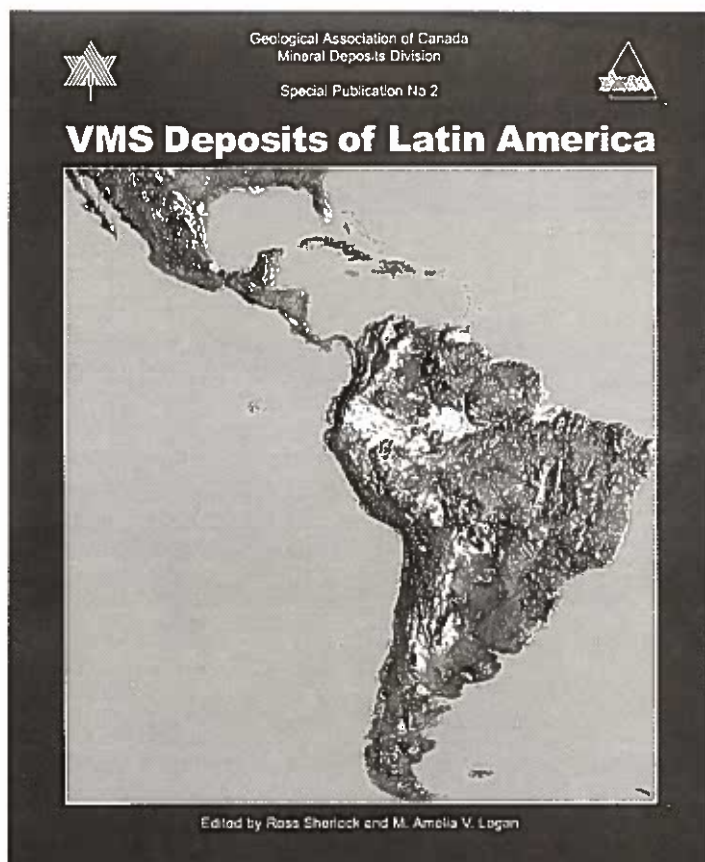
*Top: The wrap-up banquet event held in the Winnipeg Ballroom at The Fairmont Winnipeg. Bottom: WIUGC 2001 poster session that included Graham Young of the Museum of Man and Nature and Bob Elias of the U of M (not present) showing a cast of the world’s largest trilobite which was found in northern Manitoba. Right: WIUGC 2001 Organizing Committee Chair Karen Greengrass (left) and Vice-Chair Kristin Salzsauler (right) at the Beer ‘n’ Bull conference event. Left: U of A students enjoying the icebreaker at WIUGC 2001 hosted by the U of M.*







# Publications Corner




The Mineral Deposits Division of the GAC has just published a new book. The title of the book is "VMS Deposits of Latin America". This 650-page book contains 37 papers on volcanogenic massive sulfide deposits in the Caribbean, Mexico, Central and South America. The papers range from descriptions and research on individual deposits to district wide compilations and synthesis. It represents the current state of knowledge on VMS deposits, in Latin America with all significant deposits and districts well represented. Many of the papers are authored by industry geologists with the information presented being previously inaccessible to the public. It is produced in an inexpensive format and is mandatory reading for anyone working in Latin America or on VMS deposits in general.

	Member	Nonmember	Student
Canadian orders	\$78.00 Cdn	\$78.00 Cdn	\$56.00 Cdn
US orders	\$60.00 US	\$60.00 US	\$44.00 US
International orders	\$66.00 US	\$66.00 US	\$50.00 US

Order Details are available from the GAC website at [www.gac.ca](http://www.gac.ca).

### Current Research 2001 FREE On-Line

In light of widespread criticism of the GSC's decision to make its flagship Current Research 2000 publications available only as pay-on-demand web-downloads, changes were made and CR 2001 papers are now free to download as pdf files. However, they contain low resolution graphics, higher quality papers are available at \$2.50/each or by purchasing a CD volume of all papers for \$120. Due to the restructuring of e-commerce activities within the Department, the sale of individual Current Research 2000 papers online has been suspended.



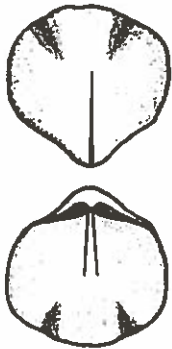

## PALAEONTOGRAPHICA CANADIANA

### No. 18


Late Ordovician and Early Silurian  
pentamerid brachiopods  
from Anticosti Island,  
Québec, Canada

Jisuo Jin  
and  
Paul Copper

2000

CANADIAN SOCIETY OF PETROLEUM GEOLOGISTS  
GEOLOGICAL ASSOCIATION OF CANADA



Available soon from Palaeontographica Canadiana  
No. 19: Upper Devonian (Famennian) conodonts of the Palliser Formation and Wabamun Group, Alberta and British Columbia, Canada. David Johnston and Brian Chatterton. 154 p., 35 pls., 19 tables, 13 figs. (in press).

No. 20: Upper Wenlock (Silurian) graptolites from Arctic Canada: pre-extinction *lundgreni* biozone fauna. A.C. Lenz and Anna Kozłowska-Dawidziuk. 55 ms pp., 5 figs., 19 pls. (being typeset).

### CJES On-line

The Depository Services Program is pleased to announce that the government of Canada is providing free access for Canadians to the 14 journals published by NRC Research Press, a service offering of the Canada Institute for Scientific and Technical Information (CISTI). Access has already been granted to all domain names in the \*.ca range and to all IP numbers registered to Canadians and companies primarily dealing with Canadians. Access the Canadian Journal of Earth Sciences from the following web site: [http://www.nrc.ca/cgi-bin/cisti/journals/rp/rp2\\_desc\\_e?cjes](http://www.nrc.ca/cgi-bin/cisti/journals/rp/rp2_desc_e?cjes).

The GAC Mineral Deposit Division newsletter, *The Gangue* is now available in ".pdf" format from the GAC website:

<http://www.gac.ca/SECTIONS/secdiv.html>



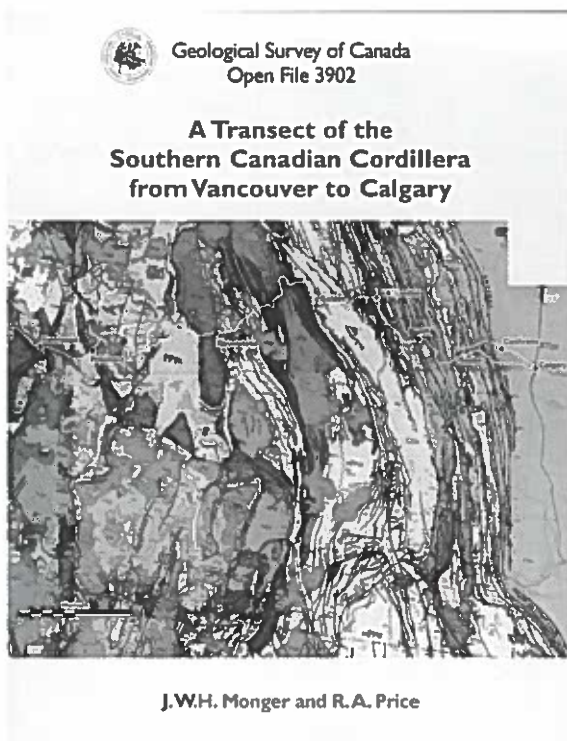
# Book Reviews

## A transect of the southern Canadian Cordillera from Vancouver to Calgary

By J.W.H. Monger and R.A. Price, 2000, Geological Survey of Canada Open File 3902, 170 p. Price: \$35.00 CDN. Also published as "A Transect of the Southern Canadian Cordillera from Vancouver to Calgary", by R.A. Price and J.W.H. Monger, by the Cordilleran Section of the Geological Association of Canada for the Geological Society of America, Cordilleran Section Meeting.

I highly recommend the field guide to the southern Canadian Cordillera by Jim Monger and Ray Price (2000). This is not merely a guide to the roadside geology between Vancouver and Calgary; it also provides an overview of the Cordillera and its tectonic evolution, and discusses current controversies and outstanding problems. The book will be useful as a stand-alone field guide for geologists travelling the TransCanada for the first time as well as Cordilleran aficionados. I also recommend it to anyone who is interested in tectonics and the evolution of mountain belts.

The introduction contains a comprehensive review of the Canadian Cordillera. It describes the physiography and active tectonics of the orogen, morphogeologic belts of the Cordillera and their formation, terranes and their amalgamation, geophysical characteristics of the lithosphere and geophysical and geological cross sections of the transect. It concludes with an analysis of the Cordilleran orogenic collage and the significance of long-lived subduction, exotic terranes, arcs, terrane accretion and oblique subduction. Subsequent sections are devoted to the Coast Belt, Intermontane Belt, Omineca Belt and Foreland Belt, each containing an introduction to the regional geology and topical problems of interest followed by a detailed road log.



For those of you who have had the privilege of attending a Monger and Price field trip it will be no surprise to hear that the book is concise, well illustrated, well organized, and informative. It contains citations to a comprehensive reference list that includes citations to everything from early mappers to recent geophysical and geological studies. The road log describes navigation landmarks, roadside outcrops and formal field trip stops; it includes historical vignettes as well as geological information. The guide is full of useful figures, maps, cross sections and sketches.

This volume is published by the Geological Survey of Canada as an Open File, can be viewed at any of the GSC sales office or libraries, and is available for \$35.00 from the Vancouver (Pacific) GSC Maps and Publications Sales office. The address is 101-605 Robson Street, Vancouver, B.C. V6B 5J3. For ordering information on the web go to <http://www.nrcan.gc.ca/gsc/bookstore>.

**Sharon Carr**  
Carleton University  
Ottawa, ON

*Sharon is a professor at Carleton University where her research focuses on unravelling the tectonic evolution of orogenic belts with geochronology.*





# Conference Reports

## Moncton AGS 2001 Colloquium

The Atlantic Geoscience Society's 19<sup>th</sup> annual Colloquium and Annual General Meeting was held at the Delta Beausejour Hotel in Moncton, New Brunswick over two days (February 9-10). It attracted 158 geoscientists from the Atlantic Provinces, Alberta and New England.

The conference featured two special sessions. The first, on Friday evening entitled "Geological Correlations between New Brunswick and Maine" attracted papers from Northeastern US as well as the rest of the eastern Canada. The Saturday special session "Onshore and Offshore Oil and Natural Gas Exploration and Related Research" also attracted talks and posters on the Scotian Shelf, Onshore Nova Scotia and New Brunswick. The General Session on Current Research in the Atlantic Provinces was, as usual, well subscribed and attended. In all, 60 abstracts were submitted, the high quality and diversity of the papers reflects the broad range and vitality of research in the Atlantic Provinces. One of the very important traditions of the AGS are the student oral and poster presentations. For many students, the AGS is their first formal technical presentation outside of the university and this year 26 student abstracts were presented. The student presentations of the past number of years have been of exceedingly high quality and this year was no exception. It reflects very well on the dedication of the students and the quality of their education at our local universities.

The AGS would like to thank the session Chairs: Sandra Barr, Kirsten McLaughlin, Marcos Zentilli, Joyia Chakungal, Clint St. Peter, Graham Price, Mike Cherry, Martin Ethier, David Lentz, Jeff Carroll, Steve

McCutcheon, Janet Lee Bannister, Ralph Stea and Ian MacDonald.

The Conference came to a close on Saturday evening with the Annual Banquet and Social. The Banquet Speaker, Dr. Scott Swinden, President of the Geological Association of Canada, gave an excellent talk entitled "Geoscience in a dot.com world - living in a time of change". Dr. Swinden spoke of the challenges and opportunities that face our geological surveys in the new age of data computerisation and the shrinking budgets of governments. The AGS Banquet is also a time to recognise the various achievements of the AGS members over the past year via the AGS award program (see summary below). Another great AGS tradition and that is the "traditional" music played at the apres banquet social. This involves many guitars and assorted instruments such as the banjo, tin whistle, and a mandolin or two and is one of the highlights of the AGS season.

On behalf of the AGS I would like to thank Mike Parkhill for organising the Abstract Volume and program, Sue Johnson for the local logistics, Ian Spooner for providing the AV equipment, Les Fyffe for bringing down the poster boards, Peter Wallace for co-ordinating the registration desk and selling publications, Ken Howells for looking after the financial end of things, and Howard Donahoe for photography. Thanks also to the student judges Linda Ham and Howard Donahoe (oral presentations), Murray Ginghras and Alan Ruffman (posters displays) and to Chris White for publicity and everything else that fell through the cracks. Thanks and appreciation to our corporate sponsors: Corridor Resources Inc., Northstar Resources and Potash Corporation of Saskatchewan.

## AGS Awards

### Student Awards

Student awards are given annually to the best oral presentation (Rupert MacNeill Award) and the best poster presentation (Graham Williams Award) at the annual Atlantic Geoscience Society Colloquium. Assigned judges rank the student presentations based on scientific content, organisation and presentation of data and (for the posters) overall display aesthetics. The awards include an annual Plaque with the name and university of the recipient, and \$100 cheque for the purchase of geological reference material. In addition, Noranda Mining and Exploration Incorporated (Bathurst Office), has established an award for the student presenting the best paper or poster in economic geology (or related field). This award consists of a field pack containing a Silva compass, hammer, magnet, etc. and a contract summer position with Noranda, in Atlantic Canada. The awards are handed out to students that are registered in a BSc, MSc, or PhD program.

### Rupert MacNeill Award - Best Student Paper

The Rupert MacNeill Award was presented to Michelle DeWolfe of St. Mary's University for her talk entitled "Petrological evidence for extensive liquid immiscibility in the Jurassic North Mountain Basalt, Nova Scotia".

### Graham Williams Award - Best Student Poster

The Graham Williams Award was presented to Martin Ethier of Acadia University for his poster entitled "Re-interpretation of the geology of the Cape Breton Highlands using remote sensing and geological databases".

### Noranda Award - Best Economic Student Presentation

The Noranda Award was presented to Lawrence Mireku of Acadia Uni-

versity for his talk entitled "Geology, geochemistry and hydrothermal alteration of the Lower AB Zone, Halfmile Lake North volcanic hosted massive sulphide deposit, Bathurst, New Brunswick".

### Other Awards

The AGS also presents two prestigious awards (Distinguished Scientist Award - Gesner Medal and Distinguished Service Award) to more "established" geoscientists in the geological community.

### Distinguished Scientist Award (Gesner Medal)

The AGS awards the Distinguished Scientist Award (Gesner Medal) to a person who through his or her own efforts (maps, publications, memoirs, etc.) has developed and promoted the advancement of an aspect of geoscience in the Atlantic Region. This year's award has been presented to Dr. Brendan Murphy of St. Francis Xavier University.

Brendan was awarded the Gesner Medal based on his strong contributions to the advancement of geoscience in the Atlantic region, his achievements as a researcher in geoscience, his work in developing the "infrastructure of geoscience" and his abilities to communicate geoscience information.

He joined the faculty at SFX in 1982 and has progressed to full professor and has served as chair of the department. All through his time at SFX, he has provided considered opinions, support for programs, innovations in teaching and research and the excitement of discovery for students and colleagues.



**AGS Highlights:** 1) Martin Ethier (right) of Acadia University receives the Graham Williams award for best student poster from Alan Ruffinan. 2) Lawrence Mireku (right) of Acadia University receives the Noranda Award for best economic paper from Greg Woods of Noranda. 3) Alan Anderson (right) accepts the AGS Distinguished Scientist (Gesner) Award for Brendan Murphy from Howard Donahoe. 4) Michelle DeWolfe (right) of St. Mary's University receives the Rupert MacNeill Award for best oral presentation from Linda Ham. 5) Jason O'Connell (left) talks to Rick Horne at the AGS Poster Session. 6) Reg Wilson (left) accepts the AGS Distinguished Service Award for Mike Parkhill from AGS President Mike MacDonald.

Brendan Murphy exemplifies many of the best attributes in a scientist. He has worked hard to communicate the importance and excitement of geoscience to students, the public, university administrators and government. He has continued a lengthy field-based geological research program in Nova Scotia and elsewhere that explores the basics of orogenesis and plate boundaries and movements. Yet his scientific curiosity is such that he will also question and examine other topics and areas. At the same time Brendan has always involved himself with students: teaching, supervising, and advising. Brendan has contributed time, energy and leadership to geoscience societies both in Atlantic Canada and Canada as a whole. He has continued to communicate the results of his research through published papers, maps, abstracts and memoirs.

He has worked hard for the geoscience community, for the connection between science and society, for scientific excellence and for the students who will become the science's future leaders.

#### Distinguished Service Award

This year, the Distinguished Service Award of the Atlantic Geoscience Society was presented to Mike Parkhill of New Brunswick Department of Natural Resources. This award is given in recognition of exceptional and altruistic contributions to the Society over a long period of time.

Mike has served as a councillor from New Brunswick, Vice President and President of the Society. He organised the Bathurst, NB annual meeting which was one of the few meetings outside the normal orbit of annual meeting locations in Nova Scotia and New Brunswick. For many years he has taken on the task of accepting abstracts for annual meetings and organising them into a publication. One can always count on Mike for organising some part of the annual meeting.

During his tenure as President, Mike introduced new measures to more formally review proposals for financial assistance from the Society.

Through this and other means he has been a good steward of the society's funds and its financial well being.

As a member of the Executive Council of the Society he has been involved in guiding the affairs of the Society. He has encouraged the work of the Video and the Education Committees as a means of fulfilling one of the Society's mandates to communicate geoscience to the public.

Mike has long been an advocate of strengthening communications with teachers, students, and the public. He has presented many talks and workshops to teachers, students and the public. As a frequent contributor to the newsletter, he communicates with members of the Society about events and features of interest.

Mike Parkhill received the Distinguished Service Award for his outstanding and altruistic contributions to the Society for many years.

#### ATLANTIC GEOLOGY

Atlantic Geology, the Journal of the Society, publishes papers of regional, national and international interest, including thematic issues. Persons or organisations interested in having their research or proceeding published in an issue of Atlantic Geology should contact Dr. Sandra Barr at Department of Geology, Acadia University, Wolfville, NS, B0P 1X0. Phone 902 585-1340; Fax 902 585-1816; E-mail [sandra.barr@acadiu.ca](mailto:sandra.barr@acadiu.ca).

#### AGS INFORMATION

Web site at: <http://is.dal.ca/~walla/ags/ags.htm>

Tom Martel  
AGS President  
[tmartel@corridor.ns.ca](mailto:tmartel@corridor.ns.ca)

## CORDILLERAN ROUNDUP A ROARING SUCCESS

The early word on the street surrounding the British Columbia & Yukon Chamber of Mines' Cordilleran Exploration Roundup from January 23 to 26 ranks it as an overwhelming success. People with complaints are either non-existent, or they just aren't talking. Attendance increased slightly to over 2100 people; a pleasant surprise given the continuing malaise in the mineral exploration industry. Delegates seemed generally more upbeat this year, as the exhibitors area seemed to have a consistent positive buzz in the air.

The Roundup has always been a sum of many parts, and all components this year were excellent. From Exhibitors to Socials, everyone really helped put on a quality show.

BC Geological Survey Branch and Geological Survey of Canada Talks and Poster Displays were the primary focus of the first ever Roundup,

and now, 18 years later, they continue to be a major draw. The Nechako NATMAP Project of Central BC, the GSC-Andean project, Yukon geology mapping, the BC extension of the Yukon-Tanana Terrane, and the newly minted Canada-Nunavut Geoscience Office were some of the major contributors. Student poster awards and their cash prizes were won by Travis Frebey (UVIC), Renee Hetherington (UVIC), Cari Deyell (UBC-MDRU), and Keith Patterson (UBC).

Base-metals and Platinum Group metals dominated the remainder of the week through both their own dedicated sessions and those focused on Emerging Trends and Exploration in Peru.

DIAND Minister Tony Nault addressed the Annual BCYCM Awards Luncheon which saw the presentation of: the Murray Pezim Award, for success in financing mineral exploration, to

Peter Brown of Cannacord Capital Inc.; the E.A. Scholz Award for excellence in Mine Development to Lawrence "Joe" Adie, former VP Exploration for Placer Dome, and the H.H. "Spud" Huestis Award for excellence in prospecting and mineral exploration to three recipients: John McDonald, founding director of the Mineral Deposit Research Unit at UBC and former VP of Winspear Resources Ltd, and Arthur John and Robert Etzel, prospectors from Ross River, YT, who discovered many mineral showings in that area.

Sincere thanks are offered to all contributors and the organising committee for their efforts, and we look forward another great Roundup in 2002.

Comments, complaints, and suggestions for next year are always welcome. Drop us a line at [chamber@chamberofmines.bc.ca](mailto:chamber@chamberofmines.bc.ca).

### Mineralogical Association of Canada Short Course

## Principles & Applications of Laser Ablation-ICP-Mass Spectrometry in Earth Sciences

St. John's, NF 26-27 May 2001

Laser ablation-ICPMS is arguably the most exciting new analytical development in geochemistry in the last decade, opening up approaches to pure and applied geologic problems that were only dreamed of before. The goal of this course is to teach graduate students and post-graduate researchers how laser ablation-ICPMS works, what is being done in the earth sciences with the method now, and what could be done in the future. It will appeal to all those earth scientists who are interested in solving geologic problems with chemical data. Material will be presented at the level of understanding of most graduate students in the earth sciences and will be assembled in a short-course volume.

Technical topics discussed include: Nd-YAG and excimer laser instrumentation; laser beam delivery systems; ablation cell design; quadrupole, magnetic sector and time-of-flight ICPMS instrumentation; collision cell technologies; sample preparation; data acquisition, calibration and quantification strategies; laser ablation phenomena and element fractionation.

Examples of earth sciences applications: whole rock geochemistry using fusion disk analyses; lithophile element studies of silicate and oxide minerals in the mantle and crust; noble metal element studies of sulphides, oxides and metals in ores and rocks; experimental mineral-melt partitioning; melt inclusions and magmatic processes; fluid inclusions and ore genesis; metamorphic minerals and diffusion-rate processes; trace-element geothermometry/geobarometry; environmental pollution tracing and monitoring; radiogenic isotope systematics of minerals; U-Pb accessory mineral geochronology.

Registration costs: CD\$250 for professionals and CD\$150 for students (includes short-course volume and two cold lunches). To register and for other information, visit the St. John's 2001 GAC/MAC website at [www.geosurv.gov.nf.ca/stjohns2001](http://www.geosurv.gov.nf.ca/stjohns2001) or contact Paul Sylvester at [pauls@sparky2.esd.mun.ca](mailto:pauls@sparky2.esd.mun.ca) for answers to specific questions. On-line registration will commence on 1 March 2001.

## HOWARD STREET ROBINSON FUND

The Robinson Fund was established in 1977 by the Geological Association of Canada, using a bequest from the estate of Howard Street Robinson. The fund is dedicated to the furtherance of scientific study of Precambrian Geology and Metal Mining by:

- 1) sponsoring an annual Distinguished Lecturer Tour whose focus alternates between Precambrian research and economic geology (lecturer alternately chosen by the GAC's Precambrian and Mineral Deposits divisions);
- 2) supporting Special Projects including publications, symposia and conferences.



Proposals for special projects on Precambrian Geology or Metal Mining should be submitted to the Robinson Fund Committee. Projects should be sponsored or organized through the GAC or one of its Divisions or Sections. Proposals that have a wide appeal or degree of

accessibility to the GAC membership are preferred.

For further information and proposal submissions, please contact:

*Benoit Dubé*  
 Chairman, Robinson Fund  
 Geological Survey of Canada  
 2535 Laurier, CP 7500  
 Ste-Foy, QC, G1V 4V7  
 418 654 2669  
[dube@gsc.nrcan.gc.ca](mailto:dube@gsc.nrcan.gc.ca)





# Reading on the Rocks

## Mammoth: Book 1: Silverhair

By Stephen Baxter (1999) Millennium, London, UK 277 pages. ISBN 1-85798-595-8. \$19.95

**M**ammoths have been much in my mind lately. What with the recent media reports of the recovery of a well-preserved mammoth carcass in Siberia, complete with *Far Side*-esque images of a large block of dirt sporting protruding tusks being heli-lifted from the tundra. And I work in a museum whose logo is a mammoth, along the hall from a colleague who at times waxes lyrical about them with eyes that become quite glittery. And a few years' ago, I had the good fortune to work on an excavation where mammoth remains were plentiful. So I long ago decided that mammoths are quite my favourite critters, although I've never seen one. The descriptions of the Wrangell Island mini-mammoths, which only became extinct around 4,000 yr BP, evoke the same wistful sense of loss that you get from arriving at a bus stop just as the bus is disappearing down the street: "Dang! I only just missed it!". But perhaps, just perhaps, they haven't all gone. Surely, even in the era of satellite imagery and GPS, there may be some remote corner of the north where a relict population may linger?

Well, yes, according to Stephen Baxter, mammoths still roam northern Siberia as they have for millennia. Our guide to their world is a mammoth called Silverhair, a young female not yet full grown, intelligent and filled with curiosity. We see her world from a mammoth's-eye point of view - rather like *Watership Down* with tusks. Living on a large island, surrounded by an ocean that is frozen for most of the year, she wanders the tundra landscape, feeding, and socializing with her clan. As we meet the mammoths, a long harsh winter is ending. Spring and summer, the seasons of relative abundance and good living, are ahead. The clan, led by the matriarch, Owlheart, Silverhair's grandmother, ranges widely, looking for good forage as plants start new growth, and seeking fresh water. Good food and lots of it is especially important for Silverhair's sister, Foxeye, who has just given birth to a new calf, Sunfire, and still has another youngster, Croptail, to care for. To ensure survival of the calves, she will need to build up her own body's resources and subcutaneous fat reserves, depleted during the past winter.

As they travel, Silverhair learns much mammoth lore from the clan elders, especially her great-grandmother, Wolfnose. Their origin myths tell how mammoths are descended from small hot-blooded underground-dwelling animals who survived a cataclysm that destroyed the Reptiles, thereto the dominant creatures. Silverhair memorizes the Kipling-like stories of how mammoths gained their

present form, separating from their tropical cousins, and becoming superbly adapted to northern cold.

Over the millennia, as the rhythm of the ice-sheets dictates, mammoths have made the bleak northern lands their own. But the mammoths' world is altering. Climate is changing. Year by year it is getting warmer. The treeline is advancing northwards. The open tundra is diminishing. And mammoths cannot live in spruce forest. As the permafrost melts, mammoth carcasses emerge, puzzling

Silverhair who cannot connect them with any of the clans she knows. Wolfnose tells her these are mammoths that lived on the island many, many lives' ago. Then Owlheart leads the clan on a search for new terrain. But with mountains blocking any route to the north, and nowhere else to go, the clan is trapped in a diminishing habitat. Even more worrying, they cannot find any other mammoths. So Croptail cannot join a bachelor herd for his teenage years. Without interaction with other herds, the clan cannot survive. Perhaps they are truly the last mammoths.

Their future becomes even more precarious when they finally do meet up with humans. Rare exotic animals are valuable if they can be trapped and sold to zoos. Some unscrupulous men trophy hunt them for ivory, or simply for the joy of killing them. Silverhair and her clan become the target for a gang, castaways after their ship founders, led by a vicious drunk who delights in inflicting pain and degradation on these animals. Such behaviour is incomprehensible

to the mammoths, who have no way of dealing with this new and powerful adversary. Isolated on their island, they have no way of evading humankind. I won't spoil the story by revealing the outcome of the conflict!

Stephen Baxter has clearly read his mammoth lore; he refers to the books by Adrian Lister and Gary Haynes. His visualization of the daily and seasonal life of the mammoth herd and their social organization is vivid and compelling. The tale is less successful when the humans become involved, and I found the last few chapters quite weak. Nevertheless, the picture of the mammoths' world is absorbing and well-realized. Although I think this tale is probably directed mainly at older children, most adults will enjoy it too. And for those of us who can't get enough of mammoths, the book is a delight to read.

Alwynne B. Beaudoin  
Edmonton, AB





# Mélange

## Canadian Geoscience Education Network (CGEN)

Canadian Geoscience Education Network (CGEN) is a loose-knit group of educators, scientists, and other professionals whose objective is to advance earth science education in Canada. Established in 1993, CGEN is the educational arm of the Canadian Geoscience Council. Its mandate and objectives are to:

- encourage public awareness of geoscience activities;
- coordinate efforts of the Canadian earth science community in matters related to geoscience education and public awareness of geoscience;
- act as a forum for discussion of geoscience education in Canada;
- initiate coordinated activities related to geoscience education; and
- liaise with similar bodies in other countries

CGEN can best advance geoscience education in Canada by capitalizing on current, high-profile success stories. To this end, CGEN is promoting four projects over the next few years as the core of a national geoscience educational program (*Geoliteracy Canada*):

• **EarthNet** (<http://agc.bio.ns.ca/EarthNet>), a virtual centre of earth science resource information and contacts for teachers, home educators and students at the elementary, junior, and senior secondary school levels

• **EdGEO** (<http://www.edgeo.org>), which supports local earth science workshops for Canadian teachers

• **Geoscape Canada** (<http://geoscape.org>), which produces posters and websites that communicate practical earth science information to communities across Canada; and

• **GeoSciEd IV** (<http://www.science.uwaterloo.ca/earth/geosciEd>), the Fourth International Conference of the International Geoscience Education Organisation (IGEO), which will be held in Calgary in August 2003.



CGEN also wishes to champion and support local and regional geoscience education programs, such as those of CGC and some of its member societies, provincial and other museums, mining associations, the Atlantic Geoscience Society, the Geological Survey of Canada, volunteer groups such as the *Calgary Science Network*, and others.

CGEN would like to draw Canadian geoscientists into these programs. It is undertaking fundraising for Geoscape projects, EarthNet and an updated brochure on careers in earth science. CGEN's vision is a greatly expanded delivery of Geoscape Canada, EarthNet, and EdGEO. Our hope is that you will get involved in one or more of these programs. If you would like additional information or wish to be placed on CGEN's e-mail distribution list, please phone me or send me an e-mail message.

**John J. Clague**  
President, CGEN  
Burnaby, BC  
[jclague@sfu.ca](mailto:jclague@sfu.ca)

*John is also Professor and Shrum Chair in Science at Simon Fraser University and Emeritus Scientist at the Geological Survey of Canada*

### Steve Blasco Awarded Order of Canada

The Geological Survey of Canada is extremely proud that the Governor General of Canada has appointed one of its scientists, Steve Blasco as a Member of the Order of Canada. The official citation reads:

"He played a pivotal role in promoting the transfer of technology from government and university researchers to the exploration industry. A renowned marine geophysicist with the federal Department of Natural Resources, he has designed innovative equipment for the harvesting of ocean resources. Relating his experience as a member of the production team for the IMAX film *Titanica*, he uses his excellent communication skills to educate Canadians and share with them his passion for science".

### GeoCanada2000 CD Hints Info On-Line

All the information that you need to efficiently access the extended abstracts and associated information that are on GeoCanada 2000 CD-ROM are on-line. Or if you'd like to order a copy of the CD, order information is available on-line as well. Take a look through the pages <http://www.gac.ca/ANNMEET/annmeet.html>, <http://www.gac.ca/PUBLICAT/pubdesc.html>.

### New CGC Members

Canadian Geoscience Council now comprises 12 member organizations representing 10,000 geoscientists. At the Vancouver meeting, the Prospectors and Developers Association of Canada (PDAC), the Canadian Society of Petroleum Geologists (CSPG), and the Canadian members of the Society of Economic Geologists joined as Associate Members. The Canadian Geoscience Council, an umbrella organization that covers a group of associations across Canada with an interest in geoscience. Current members also include the Committee of Provincial Geologists, the Geological Association of Canada, the Society of Exploration Geophysicists, the BC and Yukon Chamber of Mines.

### Paleontologists probe puke pile

*WebPosted Tue Mar 6 14:44:07 2001*

LAS HOYAS, SPAIN - Evidence of what may be the first case of a dinosaur bringing up its lunch has been uncovered by a team of Spanish scientists. The dino vomit consists of a single fossil blob containing the partial remains of four slightly digested birds.



## GEOSTAMPS

### Canada Post sticks it to the oil and gas industry again

Canada Post issued a self-adhesive stamp on September 13<sup>th</sup>, 2000, to recognize Petro-Canada's "quarter-century of success". This 46-cent die-cut (no perforations) stamp is available in booklets of 12 stamps (Canada Post catalogue no. 4134661111; \$5.52). Dominating the stamp is the recently redesigned gas station sign. At the bottom are two runners of the Olympic Flame torch relay (remember the 1988 Olympic flame glasses handed out at their gas stations?), to the lower right is the Hibernia platform, upper right - a formation of Canada geese symbolizing Petro-Canada's "commitment to environmental stewardship", and on the left are a young couple, representing the consumers, watching the pump prices fly high like the flock of geese - one person with his hands clasped in prayer. On second thought (after reading Canada Stamp Details, vol. IX/5), they more likely represent Petro-Canada's employees and their relatives who regularly volunteer in a variety of community services across the country. The illustrated 12 page bilingual booklet also tells the complete story of the company's 25-year history. The first day cover (Canada Post no. 413466131; \$0.76) also shows a gas plant with the Rocky Mountains in the background.

This is not the postal service's first involvement with Petro-Canada, or the oil and gas industry. The 1990 set of four "Majestic Forests of Canada" stamps (Scott catalogue No. 1283-86) were issued as a set-tenant block of four, but four mini-panes of four stamps (No. 1283a-86b) and a cancelled set of No. 1283-86 on a Petro-Canada souvenir card were available only through a promotion at the company's service stations. The stamps were issued to commemorate the 19<sup>th</sup> World Congress of the International Union of Forestry and Research Organizations meeting held in Montreal. The Majestic Forests and Petro-Canada connection es-



capas me, unless it was part of the company's commitment to environmental stewardship, so if any readers know, please help.

Other recent stamps were the 1998 stamp commemorating the centenary of the Canadian Institute of Mining, Metallurgy and Petroleum (No. 1721), which showed an offshore platform (see Geostamps in Geolog, 28/2:33), and two stamps (Harvie, No. 1830c; Gesner, No. 1832b) in the 2000 Millennium Collection (see Geolog, 29/1:33 for these and comments on other oil-themed stamps).

The Petro-Canada stamps are available from your local postal supplier, or from: National Philatelic Centre, 75 St. Ninian St., Antigonish NS B2G 2R8. Or call from Canada and the USA: 1 800 565-4362. From other countries: 902 863-6550. Fax: 902 863-6796.

The citation on the Canada Post web site ([www.canadapost.ca](http://www.canadapost.ca)) follows below.



Celebrating its 25th anniversary in the year 2000, Petro-Canada has risen from a Crown corporation developed in response to the mid-1970s energy crisis to a successful profit-oriented business with world-class assets. Today, this thriving company is a leader in the realms of natural gas exploration and production, offshore oil and gas developments, and the refining of petroleum products. It is also recognized for its environmental responsibility and its support to cultural, educational and community organizations across the country.

Cette année, Petro-Canada célèbre le 25<sup>e</sup> anniversaire de sa fondation. Créée au milieu des années 1970, en réponse à la crise du pétrole, la société de la Couronne devient par la suite une entreprise à but lucratif, prospère sur la scène internationale. Aujourd'hui, Petro-Canada est considérée comme un chef de file dans les domaines de la prospection et de la production de gaz naturel, de la mise en valeur du pétrole en mer, de la découverte de gaz naturel et du raffinage de produits pétroliers. Elle est aussi reconnue pour son engagement dans la protection de l'environnement et pour son appui à des organismes culturels, éducatifs et communautaires dans tout le pays.

Submitted by Sandy McCracken  
[samccrac@NRCan.gc.ca](mailto:samccrac@NRCan.gc.ca)  
 (1990, Scott Catalogue No. 1290)



### THE GEOLOGY OF MARINE HABITAT

The Marine Geosciences Division is hosting a special session of the 2001 GAC-MAC meeting, May 27-31, St. John's, NF

The session will bring together a multidisciplinary group of marine scientists with a common interest in fostering a better understanding of habitat through the study of seabed substrate and the processes that influence its character. Visit the MGSD or the GAC conference web sites ([www.pgc.nrcan.gc.ca/~mgd](http://www.pgc.nrcan.gc.ca/~mgd); [www.geosurv.gov.nf.ca/stjohns2001/](http://www.geosurv.gov.nf.ca/stjohns2001/)) or contact Brian J. Todd, GSC Atlantic, P.O. Box 1006, Dartmouth, NS, B2Y 4A2, [todd@agc.bio.ns.ca](mailto:todd@agc.bio.ns.ca).



## Canadian Mining Hall of Fame Inductee 2000

### James Merritt Harrison 1915-1990

In January 2001, former Director General of the Geological Survey of Canada, James Merritt Harrison was inducted into the Canadian Mining Hall of Fame. Other inductees included William Guy Brissenden, Marsh Alexander Cooper, Alexander Stewart Dadson, Richard Geren, and John Fairfield Thompson.

Like Sir William Logan before him, James Merritt Harrison was the right man in the right place at the right time. During his 17-year tenure with the Geological Survey of Canada (GSC), the scientific organization enjoyed one of the most successful periods of its venerable history. When he became Director in 1956, the GSC was ready for a major, post-war expansion and elevation of its mapping and research facilities. Owing to strong demand for its services, the GSC more than doubled its staff, greatly increased its budget, moved to new headquarters in 1959 and decentralized to new divisions across the country. A variety of new challenges were met, including mapping the Canadian Arctic, studying the huge continental shelves and slopes, and increasing research and applications in the newly developing fields of geochemistry and geophysics, to name but a few. These and other government programs, developed under his guidance, helped make Canada a world leader in mineral exploration and resource development.

Born in Regina, Saskatchewan, Harrison obtained his BSc degree at the University of Manitoba in 1935. After transferring to Queen's University, he earned his MA in 1941 and PhD in 1943. His early field work for the GSC produced authoritative reports on the mineral-bearing regions of the Canadian Shield and provided him with knowledge and



experience that would stand him in good stead as he rose through the ranks to become Director General. Under his extraordinary leadership and direction, the GSC grew in stature, accomplishment and recognition to become one of the finest in the world. Harrison recognized the importance of the GSC to natural resource development and successfully gained the support and trust of industry through the use of advisory committees and his extensive range of personal contacts. His top priority was service to the prospecting community. He directed, guided and encouraged the use of new technology and geological concepts that would yield benefits to prospecting. Some examples are the commissioning of airborne magnetic and radiometric surveys and ground geochemical surveys. Later, as a senior officer with the federal government department that is now Natural Resources Canada, he became a respected spokesman on mineral industry issues.

In 1973, Harrison joined the United Nations Educational, Scientific and Cultural Organization in Paris as Assistant Director for Science and Technology, in which capacity he was responsible for teaching programs, mainly in developing countries. He returned to Canada in 1976 to spend his remaining years as a general consultant — work that took him to more than 20 countries. He published 65 scientific and technical papers and was awarded many honours during his career.

Harrison joins other GSC Hall of Famers, Sir William Logan, Joseph Tyrrell, John Tuzo Wilson and Robert Boyle, as well as industry leaders Norman Keevil and William James who spent significant periods of their careers with the GSC.

*Printed with permission of the Mining Association of Canada with contributions from Christy Vodden.  
Visit the Canadian Mining Hall of Fame website at [www.halloffame.mining.ca](http://www.halloffame.mining.ca).*

## UWO Professor Glen Caldwell Awarded Order of Canada



Dr. W. Glen E. Caldwell, Professor Emeritus of the Department of Earth Sciences, The University of Western Ontario (UWO), was awarded the Order of Canada (Officer) in February, 2001. In awarding the Order, the Governor-General recognized Professor Caldwell's career achievements in scholarship and research. In congratulating Professor Caldwell, the scientific community at UWO feel excited and encouraged as the award is also a recognition of the importance of earth sciences education in our society. Professor Caldwell is an

internationally recognized scholar in paleontology, biostratigraphy, and evolution of sedimentary basins, with special emphasis on the Mesozoic Western Interior Basin of North America.

Shortly after completing his PhD degree in geology at the University of Glasgow, 1957, Glen Caldwell took up a faculty position in the Department of Geology, University of Saskatchewan. In 1971 he became head of the department and devoted 17 years to establishing and developing a first-class Geological Sciences program at the University of Saskatchewan, with comprehensive components of paleontology, stratigraphy, petrology, geophysics, geochemistry, and geological engineering. Glen Caldwell was also instrumental in establishing the Geology Library and the state-of-the-art Geological Building at Saskatchewan. In 1988, Glen Caldwell became the first Vice-President (Research) of UWO, a post he held essentially until his retirement in 1996. His commitment to excellence in all disciplines of learning paved the way to many great research achievements at UWO.

Among his numerous professional activities, Glen Caldwell has served as Chairman of the American Commission for Stratigraphic Nomenclature, Chairman of NSERC Grant Selection Committees for Earth Sciences, Chairman of NSERC Grants Committee, Member of NSERC Council and Executive Committee, Chairman of GAC Publications Committee, President of the Canadian Geological Foundation, Vice-President of the International Union of Geological Sciences, Books Editor for the Geological Society of America, Editor of the Canadian Journal of Earth Sciences, and Chairman of the National Advisory Board on Scientific and Engineering Publications. In retirement, he continues to play an important role in various national and international scientific organizations, such as the Canadian Institute for Advanced Research, the NRC Research Press, and the International Union of Geological Sciences.

Throughout his busy career, Glen Caldwell has been dedicated to research and supervised over fifty graduate students, who remain grateful for his kind supervision combined with an unrelenting insistence on the highest possible standards of science and scientific writing. Through his collaboration with colleagues (notably Erle Kauffman, Ruth North), Glen Caldwell made a remarkable contribution to the Cretaceous biostratigraphic standard of the Western Interior Basin of North America. The monumental volume on the *Evolution of the Western Interior Basin* (GAC Special Paper 39), edited by Caldwell and Kauffman, has become a reference standard for Cretaceous research and related fields of study.

*Jisuo Jin  
University of Western Ontario  
London ON*

## St. John's 2001 GAC/MAC

Mineral Deposits Division - Geological Association of Canada

**Sedimentary Geochemistry Program**

## Pre-meeting MDD-GAC Short Course

*(2 1/4-day lecture-style course)***Geochemistry of Sediments & Sedimentary Rocks:  
Secular Evolutionary Considerations to Mineral  
Deposit-Forming Environments**Date: *evening* Friday May 25 to *afternoon* Sunday May 27

S. McLennan, J. Patchett, J. Veizer, E. Van Der Flier-Keller, W. Nesbitt, J. Peter, M. Parsons, B. Fryer, G. Jenner, R. Coveney, M. Zentilli, P. Fralick, D. Fox, R. Creaser, A.C. Brown, N. Rogers, and D. Lentz

Major- and trace-element and stable- and radiogenic-isotope compositions of clastic to chemical sedimentary rocks and their component minerals are presently some of the fastest growing geoscience research fields. In the past 15 years, the breadth and depth of research has been impressive, extending from global secular analysis of crustal growth and atmospheric redox evolution, to regional and local tectonic reconstructions using various types of provenance analysis techniques including chemostratigraphy to depositional paleoenvironment studies. The accelerated research developments have been brought about by revolutions in analytical technology coupled with lower analytical costs and an increased appreciation of inorganic geochemistry in solving problems of interest. This short course will also include pragmatic applications relating to; 1) baseline abundance and anomalous threshold determinations; 2) detailed correlations; and 3) improved understanding of metal sources and syngenetic to epigenetic depositional environments for numerous types of Au, base-metal, and Ni-V-Mo deposits; 4) paleoplacers; and 5) environmental studies.

*Limited registration, register early*Course Fee: *Professional* - \$400; *Student* - \$100**MDD-GAC Special Session  
(Oral and Poster Presentations)****Geochemistry of Inorganic Sedimentary Rocks****Co-organizers:** George Jenner (*Memorial University of Newfoundland*), Brian Fryer (*University of Windsor*) and Scott McLennan (*State University of New York - Stony Brook*)

The geochemistry of sedimentary rocks is a diverse field potentially involving whole-rock geochemistry, trace-element studies, radiogenic isotopic work and detrital mineral dating. The purpose of this session is to highlight key developments in this field, their applications, and implications for understanding both tectonic and environmental conditions of deposition. A journal special issue is planned, if there is enough interest.

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**Formation of a Committee Under the Leadership of  
the CIM to Establish  
GUIDELINES FOR THE ESTIMATION OF  
MINERAL RESOURCES AND MINERAL  
RESERVES AND A REQUEST FOR  
EXPRESSIONS OF INTEREST**

A new CIM-led committee is being formed to develop best practice guidelines for estimation of mineral resources and mineral reserves.

In June 1997, the Ontario Securities Commission and the Toronto Stock Exchange established the Mining Standards Task Force (MSTF). In their final report, "Setting New Standards", dated January 1999, they recommended that the Canadian Institute of Mining, Metallurgy and Petroleum (CIM) expeditiously develop national best practice guidelines for the conduct of mineral exploration programs, development programs and mining operations. Pursuant to this recommendation the CIM is establishing an industry based committee to develop guidelines for the estimation of mineral resources and mineral reserves.

The mandate of this committee is to:

- Prepare a report of proposed guidelines for the estimation of mineral resources and mineral reserves for industry comment. May 2002 has been set as a target deadline.
- Compile, assess and incorporate, as appropriate, comments from broad industry circulation into the proposed guidelines, and
- Prepare a final report for adoption by CIM Council to be incorporated in the CIM Industry Standards.

The guidelines will cover metalliferous minerals, industrial minerals, diamonds, coal and oil sands. (The committee will initially focus on metalliferous minerals and will later expand to incorporate the other commodities.)

It is anticipated that the committee will consist of ten practitioners, including the chairperson. The "Scope of Work" as defined on page 34 of the MSTF report can be described as follows:

- Develop guidelines, in table format, that outline the best practices of responsible mining companies.
- Establish, within the guidelines, recommended key activities that should be part of a best practice program.
- Develop best practice guidelines that will foster greater standardization of reporting and provide a benchmark for both companies and Qualified Persons (QP) in discharging their responsibilities.

As clearly stated in the MSTF report, the guidelines to be developed will be "high level standards" and will not "mandate particular practices or methods" or "dictate exactly what to do and how to do it". The QP will remain responsible for the details of a program and for ensuring that the guidelines are followed or that disclosure is made if they are not.

It is our intent to have broad geographic representation on the committee as well as appropriate technical expertise. Interested persons are encouraged to contact the Chairman.

*Paul Severin, Chairman  
Mineral Resources & Mineral Reserves Committee  
Toronto, ON  
[pseverin@falconbridge.com](mailto:pseverin@falconbridge.com)*



# Geological Association of Canada

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**GEOLOGICAL ASSOCIATION OF CANADA**  
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Memorial University of Newfoundland  
St. John's, Newfoundland, Canada  
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Ville, Province, Pays Code postal

Telephone Fax  
Téléphone

E-mail address/ Courriel

Do you hold a B.Sc. in geology or related field?  Yes/Oui  No/Non Date Obtained  
Avez-vous un B.Sc. en géologie ou domaine connexe? Date d'obtention

Name of employer or university  
Nom de l'employeur ou de l'université

Present position and/or occupation  
Fonction et/ou occupation actuelle

Faculty member signature if student,  
Pour les étudiant(e)s, signature d'un(e) professeur(e)

Printed name/ Nom en lettres moulées Dues to apply to/ Cotisations applicables à

Applicant's signature / Signature du candidat Date / Date  Current year / Année en cours  
 Next year / Prochaine année

\* Voting privileges are only accorded to Fellows of the Association. A Fellow must have a B.Sc. in geology or closely related field, 1 year further experience, and recommendation of a sponsor. A Fellow application form is available on our website or from GAC Headquarters.

\* Le droit de vote est réservé aux Fellows de l'AGC. Un Fellow doit avoir un B.Sc. en Géologie ou domaine connexe, 1 an d'expérience, et la recommandation d'un parrain. Les formulaires pour candidature sont disponibles sur notre site internet et au siège social de l'Association.

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# Calendar

## 2001

May 6-10  
**The 20th International Geochemical Exploration Symposium (IGES), Santiago, Chile**  
 Acme Analytical Laboratories Chile. Fax: 56 2 748 6772; Tel: 56 2 748 6771; Email: [progr3@attglobal.net](mailto:progr3@attglobal.net); Web: [www.aeg.org](http://www.aeg.org)

May 9-12, 2001  
**47th Annual Institute on Lake Superior Geology, Madison, Wisconsin, USA**  
 Web: [www.ilsgeology.org/2001Mtg.html](http://www.ilsgeology.org/2001Mtg.html)

May 14-17, 2000  
**CGU Annual Meeting, Ottawa ON**  
 Spiros Pagiatakis (Chair), Tel: 613 995-8720, Fax: 613 992-1468; Email: [sppagiatakis@NRC.gc.ca](mailto:sppagiatakis@NRC.gc.ca)

May 17-19  
**2001: A Hydrothermal Odyssey, Townsville, Qld, Australia**  
 New Developments in Metalliferous Hydrothermal Systems Research. Tel: 61 (0)7 4781 5563; Fax: 61 (0)7 4725 1501; Email: [odyssey@jcu.edu.au](mailto:odyssey@jcu.edu.au); Web: [www.es.jcu.edu.au/dept/earth/research/conf/2001/2001all.htm](http://www.es.jcu.edu.au/dept/earth/research/conf/2001/2001all.htm)

May 20-24  
**Eleventh Goldschmidt Conference Roanoke, Virginia, USA**  
 Special session on Crustal Melting: From Grain Boundaries to Batholiths, Web: [cass.jsc.nasa.gov/meetings/gold2001/gold2001.1st.html](http://cass.jsc.nasa.gov/meetings/gold2001/gold2001.1st.html)

May 27-30  
**Geological Association of Canada/Mineralogical Association of Canada Annual Meeting/North Atlantic Minerals Symposium, St. John's, NF**  
 PO Box 8700, St. John's, NF A1B 4J6, Tel: 709 729-2301, Fax: 709 729-3493, Email: [dmp@zeppo.geosurv.gov.nf.ca](mailto:dmp@zeppo.geosurv.gov.nf.ca); Web: <http://geosurv.gov.nf.ca/stjohns2001>

June 3-6  
**AAPG Annual Convention, Denver, CO, USA**  
 AAPG Conventions Department, PO Box 979, 1444 S. Boulder Ave., Tulsa, OK 74101-0979, USA. Tel: 918 560 2679; Fax: 918 560 2684; Email: [dkeim@aapg.org](mailto:dkeim@aapg.org)

June 4-8  
**Remote Sensing in Glaciology (4th International Symposium), College Park, Maryland, USA**  
 International Glaciological Society, Lensfield Road, Cambridge CB2 1ER, U.K. Tel: 44 1223 355974; Email: [int\\_glaciol\\_soc@compuserve.com](mailto:int_glaciol_soc@compuserve.com); Web: [www.spri.cam.ac.uk/igs/home](http://www.spri.cam.ac.uk/igs/home)

June 24 - 28  
**Digital Earth 2001: Beyond Information Infrastructure Second International Symposium on Digital Earth, Fredericton, NB**  
 E-mail: [info@digitalearth.ca](mailto:info@digitalearth.ca); Tel: 866 334-4825; Web: [www.DigitalEarth.ca](http://www.DigitalEarth.ca)

June 24-28  
**Earth System Process, a global meeting, Edinburgh, Scotland**  
 Web: [www.geosociety.org/meetings/edinburgh/](http://www.geosociety.org/meetings/edinburgh/)

June 26 - July 1  
**North American Paleontological Convention, Berkeley, California**  
 Web: [www.ucmp.berkeley.edu/napc/general.html](http://www.ucmp.berkeley.edu/napc/general.html)

July 29 - August 2  
**6th Biogeochemistry of Trace Elements Conference, Guelph ON**  
 ICOBTE Secretariat, Department of Land Resource Science, University of Guelph, Guelph ON N1G 2W1. Tel: 519 824 4120 ext. 2531; Fax: 519 823 1587; Email: [icobte@lrs.uoguelph.ca](mailto:icobte@lrs.uoguelph.ca); Web: [icobte.crle.uoguelph.ca](http://icobte.crle.uoguelph.ca)

August 6 - 10  
**Fluvial Sedimentology (International Conference), Lincoln, Nebraska, USA.**  
 Mike Blum, Department of Geosciences, 214 Bessey Hall, University of Nebraska - Lincoln, Lincoln, NE 68588-0340. Tel: 402 472 7872; Fax: 402 472 4917; Email: [mblum1@unl.edu](mailto:mblum1@unl.edu); Web: <http://www.unl.edu/geology/ICFS.html>

August 19-24  
**Gordon Conference on Inorganic Geochemistry, Proctor Academy, NH, USA**  
 Jeff Hedenquist - [Gordongeochem@aol.com](mailto:Gordongeochem@aol.com)

August 27-29  
**Society for Geology Applied to Mineral Deposits Mineral Deposits, Krakow, Poland**  
 University of Mining and Metallurgy, Faculty of Geology, av. Mickiewicza 30; 30-059 Kraków, Poland. Tel: 48-12 617 2385; fax: 48-12 633 2936; Email: [wmayer@geol.agh.edu.pl](mailto:wmayer@geol.agh.edu.pl); Web: [galaxy.uci.agh.edu.pl/~sga](http://galaxy.uci.agh.edu.pl/~sga)

August 23-28  
**International Conference on Geomorphology (5th), Tokyo, Japan**  
 Dept. of Earth Sciences, Kanazawa University, Kakuma, Kanazawa 920-1192, Japan; Phone & Fax 81-76 264 5735; Email: [kashii@kenroku.kanazawa-u.ac.jp](mailto:kashii@kenroku.kanazawa-u.ac.jp); Web: [www.soc.nacsis.ac.jp/jgu/](http://www.soc.nacsis.ac.jp/jgu/)

September 1-7  
**IEC2001: 6th International Eclogite Conference, Niihama, Japan**  
 Abstract deadline: May 31, 2001  
 Email: [iec2001@ganko.eps.nagoya-u.ac.jp](mailto:iec2001@ganko.eps.nagoya-u.ac.jp)  
 Web: <http://ganko.eps.nagoya-u.ac.jp/iec2001/index.html>

September 3-5  
**21st International Association of Sedimentology, Davos, Switzerland**  
 IAS-2001, Institute of Geology, ETH-Zentrum, 8092 Zurich, Switzerland. Fax: 41 1 632 1080; Email: [info@ias-2001.ethz.ch](mailto:info@ias-2001.ethz.ch); Web: [www.ias-2001.ethz.ch](http://www.ias-2001.ethz.ch)

September 10-14  
**20th International Meeting on Organic Geochemistry (IMOG 2001), Nancy, France**  
 IMOG 2001, UMR 7566 G2R (CREGU) Université Henri Poincaré, BP 239 54506 Vandœuvre-lès-Nancy, Cedex, France  
 Fax: (33) 3 83 91 38 01; Email: [imog2001@g2r.uhp-nancy.fr](mailto:imog2001@g2r.uhp-nancy.fr); Web: <http://www:imog.uhp-nancy.fr>

September 16-19  
**2001 An Earth Odyssey, Calgary AB**  
 Combined Hydrogeology Specialty Conference & 54th Canadian Geotechnical Conference. Tel: 403 220-2793; Email: [ryan@geo.ucalgary.ca](mailto:ryan@geo.ucalgary.ca); Web: [www.geo.ucalgary.ca/iah-cnc](http://www.geo.ucalgary.ca/iah-cnc)

September 22 - 24  
**Eleventh Canadian Paleontology Conference (CPC-XI), London ON**  
 Paleontology Division of the Geological Association of Canada, University of Western Ontario. Jisuo Jin (Chair), Email: [jjin@julian.uwo.ca](mailto:jjin@julian.uwo.ca)

September 24-28  
**Archaeological Symposium (4th International), Perth, Western Australia**  
 P.O. Box 80, Bullcreek, WA 6149, Australia. Tel: 61 8 9332 7350; Email: [susanho@geol.uwa.edu.au](mailto:susanho@geol.uwa.edu.au); Web: [www.geol.uwa.edu.au/~ias/](http://www.geol.uwa.edu.au/~ias/)

November 5-8  
**GSA Annual Meeting, Boston, MS, USA**  
 GSA Meetings Dept., P.O. Box 9140, Boulder, CO 80301-9140, USA. Tel: 303 447 2020; fax: 303 447 1133; Email: [meetings@geosociety.org](mailto:meetings@geosociety.org); Web: [www.geosociety.org/meetings](http://www.geosociety.org/meetings)

## 2002

March 10-13  
**American Association of Petroleum Geologists, Houston, Texas, USA.**  
 AAPG Conventions Dept., P.O. Box 979, Tulsa, OK 74101-0979, USA; Phone: 918 560 2679; Fax: 918 560 2684; Email: [convene@aapg.org](mailto:convene@aapg.org); Website: [www.aapg.org](http://www.aapg.org).

March 27-30  
**National Earth Science Teachers Association, San Diego, CA, USA.**  
 NESTA, 2000 Florida Ave., N.W., Washington, D.C. 20009, USA; Phone: 202 462 6910; Fax: 202 328 0566; Email: [fireton@kosmos.agu.org](mailto:fireton@kosmos.agu.org)

April 15-17  
**Global Exploration - Integrated Methods for Discovery, Denver, CO**  
 Joint SEG, AEG, SGA Meeting. Web: [www.seg2002.org](http://www.seg2002.org)

May 26-29  
**Geological Association of Canada/Mineralogical Association of Canada Annual Meeting, Saskatoon, SK.**  
 Web: [www.usask.ca/geology/](http://www.usask.ca/geology/)

July 22-27  
**11th IAGOD Symposium/GeoCongress 2002, Safari Hotel, Windhoek, Namibia**  
 The Secretary, IAGOD/GEOCONGRESS 2002, P.O. Box 44283, Linden, 2104, South Africa. Web: <http://www.wits.ac.za/gssa>

September 16-20  
**Engineering Geology for Developing Countries, Durban, South Africa**  
 Technical Committee, 9th IAEG Congress, PO Box 1283, Westville 3630, South Africa.

Promote your meeting.  
[geolog@gov.yk.ca](mailto:geolog@gov.yk.ca)

LOGAN'S BIRTHDAY - APRIL 20 - CELEBRATE - GO FOR A WALK

## Report on the 199<sup>th</sup> GAC Council Meeting

The 199<sup>th</sup> meeting of GAC Council was held on February 17-18, 2001 in Saskatoon, Saskatchewan. This was a particularly an important GAC Council meeting to deal with crucial issues such as the 2001 budget and the implementation of the Publications Business Plan.

The proposed Publications Business Plan received a great deal of attention by Council at this meeting. A Due Diligence Report was presented by an ad hoc committee charged with the responsibility of reviewing three main issues: the production of publications, support from Sections and Divisions and the financial cost and risk associated with the implementation of the Publications Business Plan. After a lengthy debate on the report presented by the ad hoc committee, Council voted to continue the process of implementing the Publications Business Plan with extensive consultation with all GAC Sections and Divisions.

The Secretary/Treasurer presented a proposed budget for the 2001 fiscal year. Council reviewed the details of the budget and approved the proposed budget with revisions.

The Saskatoon LOC provided Council with an update of the planning for Saskatoon 2002 and provided a tour of the excellent facilities at the University of Saskatchewan. All agreed that this should be a successful meeting and that the planning is well in hand.

All GAC Committees provided Council with an update of their work over the fall/winter months. Some of the highlights included:

- The Program Committee Chair has prepared an in-depth review of Annual General Meetings (AGM's). This review will be an important agenda item for Council at the upcoming St. John's meeting.
- The Communications Committee is preparing a Strategic Plan for Public Awareness and K-12 Education.
- The Communications Committee also presented a Draft Business Plan for the Student Chapters Program.
- The St. John's LOC provided an update on the final planning for the AGM. It appears that St. John's is well underway to being a highly successful meeting.
- The Publications Committee provided Council with an update of new publications.

There was also a preliminary discussion on GAC Awards and it was agreed by Council to investigate options for awards and to have a full discussion at the St. John's meeting. Finally, Council reviewed and updated the 2001-02 priorities contained within GAC's core business areas.

**S.R. Morison**  
GAC Vice President  
Calgary, AB

Litho geo chemistry



## Litho geo chemistry for Exploration and Research

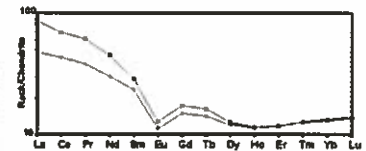
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## North American Minerals Symposium at the GAC/MAC St. John's meeting



The Symposium consists of plenary and general sessions, and features a mixture of invited and submitted presentations in oral and poster formats. Oral sessions will be held in the Music School; posters are integrated with the overall conference poster sessions in the Thomson Student Centre. The Symposium will be published as a volume of extended abstracts, which will be made available to all NAMS and St. John's 2001 registrants. The Technical Program is being sponsored by the Mineral Deposits Division of the Geological

Association of Canada and the Irish Association for Economic Geology. A final, detailed program will be posted on [www.gov.nf.ca/nams/](http://www.gov.nf.ca/nams/) and [www.esd.mun.ca/stjohns2001/](http://www.esd.mun.ca/stjohns2001/).

# ST. JOHN'S 2001

Geological Association of Canada/Mineralogical Association of Canada Joint Annual Meeting  
l'Association géologique du Canada/l'Association minéralogique du Canada réunion annuelle conjointe

Memorial University, St. John's, Newfoundland



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technical programme/programme technique  
field trips/excursions • short courses/cours intensifs

## May 27-30 Mai

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