



Special Thanks to Richard Carver for investing considerable time in writing and assembling the focus topic for this issue, "Computer Software for Geochemists."

Computer software is essential to allow geochemists to do their jobs. Software applications are important to all geoscientists, but since geochemists deal with large volumes of numerical data, it is especially critical for us to be proficient with a range of computer software. In fact, geochemists often end up managing data for other fields as well as their own. There is a broad spectrum of available software:

- Field Data Collection
- Data Management
- Data Manipulation
- Plotting - Gridding - Contouring - Imaging
- Interpretation/information sharing [GIS]
- Graphing
 - Basic* - profiles, scatterplots, histograms, etc.;
 - Specialized* - Box Plots, Ternary Plots, Probability Plots
- Statistics
 - Basic univariate* - means, standard deviations, percentiles, etc.;
 - Multivariate* - correlations, regression, factor analysis, discriminant analysis
- Reporting/Web page design

The objectives of this issue of EXPLORE are to provide a summary of many of the products available, to review some of the packages that cater more specifically for the needs of geochemists, to share the experiences of a number of geochemists from different backgrounds on the software they use to do their jobs, and finally, to provide short technical articles demonstrating the innovative use of software. The software packages listed in the table provide examples for each application to match the price range and capabilities required.

While this issue concentrates on selected software used by the authors, it is not intended to be comprehensive, and we hope that AEG members will submit reviews or articles for their favorite software for future issues of the EXPLORE newsletter.

Integrated Data Management

by Tracey Minton and Tim Millis, Geosoft, Inc.

Introduction

Comprehensive and easy-to-use software is essential for the management of ever increasing amounts of high volume geochemical and geological exploration data, thereby supporting the need for exploration companies to make informed, fast and practical decisions.

Here we introduce Metech's acquire data management system; the relational data model provides a central storage facility for all the technical drillhole and surface geochemical and geological data generated in an exploration or mining project. acquire validates, manages and reports on all imported data to ensure a high level of quality control. Linking directly to Geosoft's integrated Data Processing and Analysis (DPA) environment, Oasis montaj, facilitates processing, analysis and integration of surface and drill hole data to create meaningful maps for decision making.

Data Collection

A typical workflow begins with the collection of data in the field. Metech's hand held logging device, Pocket acquire provides a digital field data collection solution. Geologic lookups and validation rules are



already transferred from the company database, enabling the field geologist to collect digital validated data in the field.

Data Imported to Relational Database

The validated data can then be uploaded directly to the company's database, by synchronizing between the data logger and the acquire database, minimizing data collection errors.

With acquire data validation resides within the database. This means that any data entered into the database, through Pocket acquire or other means will be validated prior to the data being loaded. Company standards are always maintained.

acquire enables the user to customize the database to include site-specific information, such as the creation of new fields that are not found in the default acquire Data Model. In addition, the user can define new views and the order in which fields are to be displayed.



Transfer Data to DPA system

Seamless data access and transfer is essential between core software systems. Oasis montaj users can directly access their data from acquire databases within the Oasis montaj environment.



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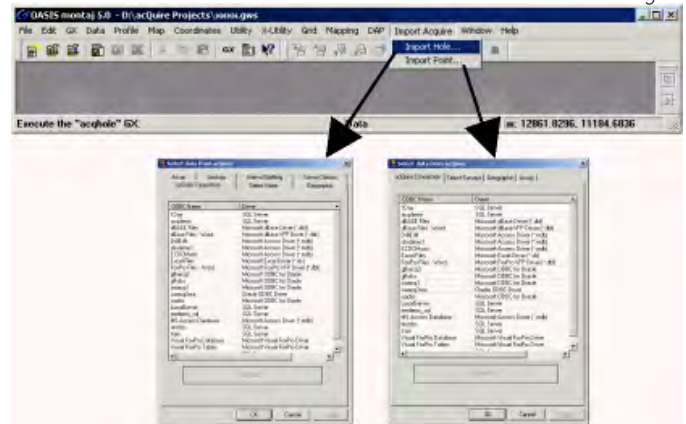
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Integrated Data Management...

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The *acquire* import menu enables the user to import drillhole (*Import Hole*) or geochemical (*Import Point*) data. These menu options access the same interface as the *Drillhole* and *Point Export* tools of *acquireDirect*.

verify data using stats

Statistical Analysis of Data

From Oasis montaj, users have access to the quality control, analysis, plotting, integration and reporting/presentation features available through the *Chimera* and *Target* applications.

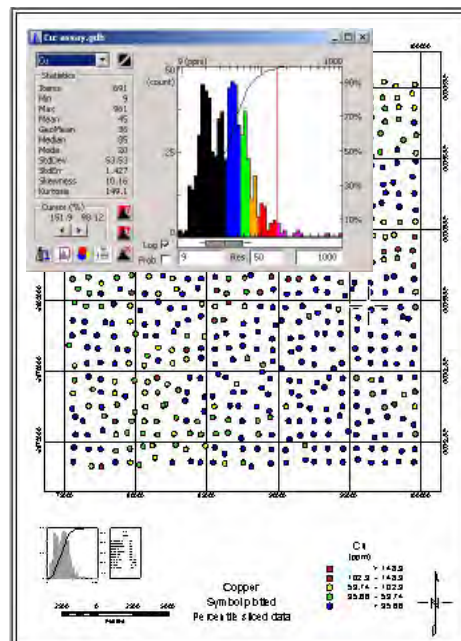


The *Chimera* and *Target* databases have the look and ease-of-use of an Excel spreadsheet, providing similar tools for calculating statistics, sorting data, creating new columns, and writing mathematical equations. Some examples of the statistical tools available for processing geochemical data are shown below.

Histogram Tool

The Histogram tool provides a visual representation of the data distribution, enabling the user to switch between a logarithmic and linear distribution, and specify the thresholds for plotting geochemical data.


In this example, we have used typical percentile breaks (50,75,87,95,98%), which were determined interactively using the histogram tool. The results were then plotted on a map.



Histogram tool displaying Cu with a logarithmic distribution. Colour zoned symbol plot map including histogram, statistics, legend, title, scale and north arrow.

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Computer Software for Geochemists... A Consultant's View

In a career of 31 years, 30 of which were with WMC, I have been involved with computer software relating to geochemistry. First there were corporate-written systems on Cyber and the VAX computers, which stored data, provided some statistics and produced plots (posted data) and reports via batch processing with no on-screen interaction. In the 1980s with the arrival of the PC, I initially became involved with word processing and spreadsheet packages. Now there was real time interaction with the data in the spreadsheet although the applications were limited. In 1988 I was introduced to the Paradox data base and have used it ever since. The database is a robust place to store data. The application language has been used to automate data processing tasks and as a tool to solve a variety of geochemical data processing problems. The key has always been to integrate the database to plotting and other specialized software applications. For my last 6 years with WMC, I was a roving geochemist running programs away from Australia, and therefore poorly connected to the corporate systems. This required an adjustment to our software/data processing regime.

Today, the specific corporate standards are gone, replaced with a mandate for flexibility and the requirement to use and provide data in a variety of different formats dependant on the consulting clients' requirements. The primary software packages which I now use are Paradox (database), Surfer (mapping), and Arcview (GIS). These are supplemented by Starpal (infield data capture), Didger (image registration and warping), Excel / Harvard Chart 3 (graphing), Pgraph (probability plotting and population subdivision), Grfac (factor analysis), Dreamweaver (web page design), and Adobe Acrobat (reporting).

Data Management and Processing

In 1988, I was introduced to the Paradox database and was struck by the advantages of databases over spreadsheets for data management and processing.

- In a database, table data are stored in columns and records that you cannot "block" cut and paste leading to far greater data integrity.
- The fields or columns have a constant variable type, which again controls the contents and thus the data integrity.
- Integrated programming language similar to Basic allows for development of tightly controlled generic processes (scripts) that can be used, at the push of a button, to accomplish frequently used tasks, for example calculation of percentile statistics. The programming code and the data are separate, unlike a spreadsheet where the code is with the data and needs to be continuously replicated.
- Queries allow for rapid sub-setting of the data and for calculation of new variables.

The database provides the tight data structure and integrity. The queries allow rapid sub setting and manipulation of the data. The scripts automate common processes, especially integration with other data and software packages. I tend to use about 50 scripts that have been developed over the years. Most start out life as specialized code to solve a problem at hand. Often they are "cloned" from an existing process. As time goes by they become more automated and generic. I use Paradox but the same can be accomplished with other data base packages (Dbase, FoxPro, Access). Dbase and FoxPro have a similar integration between the applications and the data, while with Access the processing is via Visual Basic and more remote from the data. Access is more suitable for large static databases with data display and fixed reports. Fancy hard copy reports and forms to display the data are features that are heavily promoted with most databases but which are rarely used for geochemical work.

When using databases there is always the question of whether to use flat tables or normalized tables. Most of my work is done with flat tables, although I have processes to normalize and de-normalize tables as required. Normalized tables are most suitable for large amounts of data where they allow for the storage of analytical method, mesh size, and thus, are better for long term data integrity. Some statistical processes and procedures involving duplicates and standards are often easier done with normalized tables.

The Work Process

Field data are collected by Star Pal software (see separate review, this issue) in conjunction with a Windows CE personal digital assistant (PDA), which capture the locations of samples, roads and tracks, and recorded field observations. This software outputs *.SHP or *.MIF files, imported directly into a GIS package. The *.DBF component of the output can be directly used in Paradox, where the location and assay information are merged. When working with tabular hard copy data, I have a system which handles keypunching and verification of the data, which is critical for analytical data.

Analytical Laboratory data are received from the laboratory in a number of ASCII formats. A Paradox application reads these files and creates a *.DBF table in which the variables

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A Consultant's View...

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are encoded with the units, mesh size and the analytical method. Embedding this information in the 8-9 character variable name greatly adds to the integrity of the data because the vital information always remain an integral part of the data file. During this process the laboratory quality control data, duplicate pairs and standards, are extracted from the data file.

Data Merging from the field and laboratory databases is done via a query in Paradox based on a unique sample number. This is a robust process as long as you are rigorous in how you number your samples. I also have automated processes to append records to an existing table which may have a different field structure and to insert missing data (e.g., later assay batches) into blank positions in existing tables.

If sufficient field or laboratory duplicates have been generated, they are examined by running a process that calculates a number of variables including MAPD (mean average pair difference). We can then prepare scatter plots of MAPD vs. element (programmed graph). For large suites of duplicates, cumulative frequency plots of MAPD are produced for a more robust interpretation of the variation between the duplicates. Standards are checked visually in small datasets. For larger data sets we use programs to create time series and other plots.

Basic statistics are produced by a Paradox process which produces a table of percentile and summary statistics for all variables in the table. This forms the basis of legends used to display the data in either Arcview or Surfer. Where a more detailed examination of the element distribution is required, Pgraph, an interactive probability plot program, is used to subdivide populations. When principal component analysis is called for, Al Miesch's program, Grfac, is a good choice. The input data is provided as a *.txt file from Paradox and the output factor scores are imported back into Paradox format for integration with the raw analytical and field data.

Data integration and interpretation are accomplished in a GIS software package, the ideal medium to examine, interpret and share the data with others. For stream sediment data, I prefer to display the data as "worms" which require digitizing the streams and linking the vectors to the assay values. This has two advantages: the full extents of the stream catchments

are easily seen, and the drainage data can be integrated with soil data as classed posts or contours (these are exported from Surfer as *.SHP files). Frequent use is also made of Didger, a digitizing package which can be used to register and warp images which need to be integrated with other data. This is particularly useful for plans and diagrams out of old exploration reports or the literature. For recon-naissance data, anomaly polygons are digitized for key elements and then integrated to create a final set of anomalies that can be documented and rated. Occasionally, final plots are made from Arcview, but the control over plotting provided by Surfer is preferred. The anomaly shapes generated in Arcview can be used in Surfer and if an image backdrop is required it is cut from the Arcview screen using Paint Shop Pro.

Surfer is the preferred **gridding, contouring and plotting** tool, although some plots may be generated from Arcview. The source data are *.TXT data dumped from Paradox, Shape files obtained from Arcview, and images which are often captured from the screen in Arcview. The default Kriging algorithm in Surfer is generally satisfactory for gridding, requiring only that the cell size be adjusted. Once the various components are assembled Surfer allows great flexibility in assembling them to make the key geochemical interpretations. You have the freedom of multiple plots on a single "plan" allowing you to "explode" a sub section, adding photographs and interpretation.

For **reporting**, I use Dreamweaver (in addition to Microsoft Word), where more Web-based presentation is required. It is very useful for linking directly from the text to a variety of small plans and diagrams. It is also excellent for a table index of supplementary plans and information.

The tabular data are in either *.DB Paradox or *.DBF format and are usually distributed in generic database or Access format. Adobe Acrobat is also indispensable. Word documents can be printed to Adobe format, which is more compact for email distribution. In addition, a series of Web pages can be combined into a single Adobe document. Finally, since I do not run any printers larger than A4 format, larger plots and plans can be written as a *.PDF file, which can be printed by anyone. The Acrobat format allows the end user to create plots without the need for specific software, such as Surfer or Arcview.

Conclusion

I have chosen to use a limited number of key software packages. Paradox is my choice for general data management and processing. It can automate repetitive tasks and solve specific processing problems. These key packages are supplemented with other software to do specialized tasks. While always looking for new software products to make my job easier, most are dropped from consideration after a quick evaluation. One thing is certain, the software we use will continue to evolve and become more powerful. We could not do our jobs without it, but software only helps assemble the evidence. The geochemist still needs to filter the evidence and make the correct judgements, as the software is not yet capable of that!

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Shea Clark Smith

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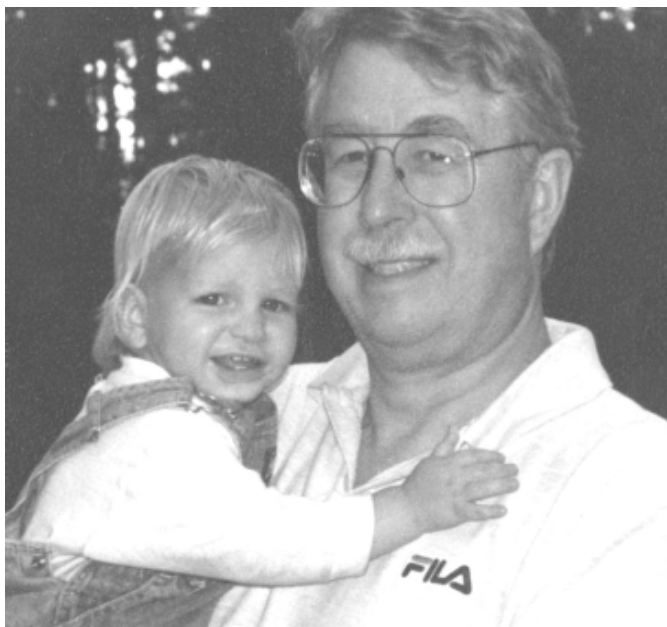
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In Memory of an Esteemed Colleague John Steven Cone 1941 - 2002

The exploration community lost a great chemist, trusted adviser, gifted educator, and close friend to many in the industry, to cardiac arrest in July. Many of you may have known Steve from Cone Geochemical, one of the leading assaying and geochemical laboratories in North America that he founded and managed for over 25 years.

Steve began his career at Bear Creek Mining (which later became Kennecott Copper Corporation) in 1964 as a part-time employee, working weekends and vacations while completing his political science degree at the University of Utah in Salt Lake City. He joined Kennecott full time in 1966 in the Geochemical Laboratories Division of Kennecott's Exploration Services unit. Steve focused on becoming expert in all technical aspects of geochemical exploration and research, from sample preparation, sample digestion, to analytical techniques, such as wet chemistry and the newly emerging technologies of atomic adsorption and inductively coupled plasma emission spectroscopy.



Steve's involvement in research included mineral separations of limonite, which were studied in an attempt to provide a more quantitative understanding of limonite composition for leached caps in porphyry copper deposits. His service at Kennecott was key to the success of the Geologic Research Division.

Steve and his wife Danielle moved to the Denver, Colorado area in 1976 and together started what became one of the mining industries' leading assaying and geochemical laboratories, Cone Geochemical Inc. At Cone Geochemical, Steve developed a culture based on integrity, honesty and accuracy that led to a loyal clientele who relied on his services for years. Cone Geochemical was well respected due to Steve's constant involvement and communication with other geoscientists. He was always available to help geologists learn about the "analysis" along with every other aspect of the lab. He was respected for his integrity and commitment to quality in our industry. Steve and his lab were always available and open for research and orientation projects; his lab was used for, in addition to routine analyses, quality check assays, the development and improvement of geochemical methods, and custom preparation procedures for orientation surveys.

Steve was committed to enhancing the contribution of analytical services to mineral exploration success through the sharing of his expertise. The fortunate result of geographic proximity and Steve's interest and hospitality enabled students taking geochemical exploration courses at the Colorado School of Mines to visit Cone Geochemical and experience this passion first hand. In addition to the obvious opportunity to translate the classroom book learning into tangible realities, they had the chance to observe a competent, dedicated professional using his talents to the benefit of all. Steve always concluded a tour with the invitation to one and all to contact him if they had questions that he might be able to help them with. He provided a personal and professional role model we all might aspire to.

A Fellow of the Association of Exploration Geochemists, Steve was a councilor of the association from 1995 to 1999, supported the **EXPLORE** Newsletter, and served on the Awards and Medals Committee for many years.

Steve's involvement was always welcomed and added greatly to the understanding of the analytical problems at hand. Throughout his career, Steve was generous with his time and was always there to provide help and advise when asked. His expert council, honesty and integrity were characteristic of his professional dealings with colleagues. For those of us who had the opportunity to work with him, he was the geochemist's chemist and will be sorely missed.

Steve is survived by his wife and partner, Danielle Clawson. All three of his children, Dominique, John, and Nathan, came to form an understanding of people, science, life, and family under Steve and Danielle's tutelage and employment. The emptiness in the hearts of those who knew him will never be filled.

A scholarship fund has been established at the Colorado School of Mines for the study of geochemistry. Donations may be sent to:

John Steven Cone Memorial Scholarship Fund, c/o Wells Fargo Bank, 1301 Jackson Ave., Golden, CO USA 80401.

Readers' Forum



Dear Editor,

In the July 2001 issue of *Explore* you kindly published a letter from me (dated 29 April 2001) suggesting that if the AEG must be renamed (and I agreed that it should), then my preferred new title would be *The Association of Applied Geochemists*. In that letter I raised what I now believe to be a red herring in mentioning the possible conflict with the Journal of Applied Geochemistry. I do not believe that the existence of this journal is an issue.

The alternative title that is being considered, *Association of Exploration and Environmental Geochemists*, I find cumbersome and restrictive. I believe that my earlier proposal has the advantage of simplicity, and will provide the Association with the flexibility to admit all genuine applied geochemists and not just those with affiliations to mineral exploration and the environment.

I do urge the voting membership to consider most carefully the immediate marketing advantages and the longer term advantage of renaming our Association *The Association of Applied Geochemists*.

Yours faithfully,

GJS Govett

(Emeritus Professor)

penycoed@acenet.com.au

Reply to Ian Devereux's letter in Reader's Forum (Explore 116, p5):

In **EXPLORE** 115, p 10-11 I argued that there is a dangerous and unfortunate tendency to assume that all reference materials are homogeneous. In order to prove my point I quoted results for ten replicate analyses of each of two reference materials, one of which was distinctly more inhomogeneous than the other. Ian Devereux (**EXPLORE** 116, p5) takes me to task for failing to identify this relatively inhomogeneous international reference material. He makes a number of valid points, but I hope you will allow me to clarify my reasons for maintaining the cloak of anonymity. This work was funded by a client who was evaluating a number of reference materials at the time. The data remained the client's property, and while I was authorised to use the results, I was not authorised to identify this particular sample. That is still the position today. The work was completed over ten years ago, and the reference material in question has long since ceased to be available for purchase, so it is extremely unlikely that it is still being used as part of a long term program.

While I agree with Ian that we need to set the highest professional standards, we will only achieve that if we are aware of all the potential pitfalls and that was the central point I was trying to make. I note that the theme for **EXPLORE** 119 is 'Geochemical Standards' and I look forward to further debate on this important topic in that issue.

David Garnett

Becquerel Laboratories, Australia

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GSA DENVER 2002 October 27-30, 2002 TECHNICAL SESSION 14

*Integrated Studies of the
Effects of Abandoned Mines on the Environment*

This session will bring together professionals from academia, government, and private industry to highlight integrated studies of the environmental effects of abandoned mines. There will be an oral session on Monday, October 28, 2002 from 8:00 a.m. until noon. A poster session follows on Monday, October 28, 2002 from 1:30 p.m. until 5:30 p.m. Together the oral and poster sessions contain 27 presentations.

Consult http://gsa.confex.com/gsa/2002AM/finalprogram/session_2973.htm for the schedule and meeting place of the oral session and http://gsa.confex.com/gsa/2002AM/finalprogram/session_3367.htm for the schedule and meeting place of the poster session.

To preregister for the GSA meeting in Denver or to obtain additional information, visit the GSA website at:

<http://www.geosociety.org>

Association of Exploration Geochemists Business 2002 Officer Reports to Membership

President's Report

Dear Colleagues;

I am taking the opportunity provided by **EXPLORE's** 4th issue in 2002 to discuss with you some of the recent features discussed by the AEG council. You will find more details in this issue in the Committees report section. As you see from the past 3 issues, the size of **EXPLORE** increased significantly and color appeared. An electronic version is planned soon. All these changes are particularly due to the introduction of the corporate sponsorship by GEOSOFT and ACTLAB. I would like to thank Mary Doherty and the editorial board who are doing a great job in editing this Newsletter and keeping it attractive and innovative. Thanks to Dave Kelley who has been a very performing business manager of the Newsletter.

This issue is focussed on software products for geochemists and provided a useful summary of many of the products available. Exploration geochemistry has always been strongly dependent on the progress of data acquisition and processing and not only on the development of new analytical devices. It is really the role of **EXPLORE** to present and discuss the recent professional applications. It is obvious to me that geochemistry, and particularly exploration geochemistry, has been strongly influenced by the new information technologies in the recent years. According to my experience of exploration geochemist working in remote areas of Africa or Amazonia, one of the tools which most increased my productivity in the field was not an analytical tool, but GPS! No doubt that some of the presented products will have some extensive applications for us in the near future. I have been recently in Amazonia and was impressed how the use of satellite internet connections is now deeply changing our professional attitudes. All these information technologies are now usable on the field, even in remote places. From data processing up to report editing can now be performed in the field, which considerably shortens the time between the field sampling and the decision process. Analytical steps are still mostly performed in laboratories, but if most of the geochemist's job may be performed now in the field, no doubt that the pressure will grow to get reliable portable devices that may analyze the trace elements. Maybe a future issue of **EXPLORE** should consider this aspect of technological evolutions.

Following my message in last issue on the debate concerning the future evolution of our association several members have sent messages. They are now displayed on our website and this keeps the debate open and lively. I am glad to see that most of these messages are in favor of a change and enlargement of the scope of AEG to the field of environment. Thanks to the efforts of Nigel Radford and Dave Garnett, there has been some consensus on the wording of changes that could be introduced in the updating process of the By-Laws. As we do not have an IGES conference this year, our Annual General Meeting is planned to be a phone conference on *November 20, 2002*. The voting process will be by mail. All Fellows of the Association should have received the text with the proposed changes on the By Laws and a proposition for the change of

name of AEG. If it is accepted it will then be necessary to modify the By-Laws in order to reflect the changes embodied in the Preamble. This will constitute an important step in the life of AEG so please be attentive these proposals, give your opinion and vote! I hope to meet you at the next AGM phone conference on November 20th.

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Secretary's Report

Since the Association's last Annual General Meeting in May 2001, Council and Executive held four regularly scheduled meetings. The May 2001 meeting was conducted immediately after the Annual General Meeting in Santiago, Chile, while the August 2001, December 2001, and June 2002 meetings were conducted by teleconference. Significant accomplishments included:

1. Deirdre Flight of the Geological Survey of Northern Ireland was nominated and agreed to accept the position of Regional Councilor for the British Isles.
2. The minutes of AEG Council meetings are now posted on the AEG web site in the Members Area.
3. AEG agreed to co-sponsor the 6th International Symposium on Environmental Geochemistry to be held in Edinburgh, Scotland, September 7-11, 2003.

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**Annual General Meeting
of the Association of Exploration Geochemists**

The 2002 Annual General Meeting (AGM) of the Association of Exploration Geochemists will be held by teleconference on **Wednesday, November 20, at 4:00 PM Mountain Standard Time** (i.e., the time and date in Denver, Colorado USA). By that time, we should have the results of voting on the proposed change to the Preamble of the By Laws and the proposed change in the name of the Association (see **EXPLORE** 116, p. 29). **All AEG members are invited and encouraged to participate in the Annual General Meeting.**

In order to connect to the phone conference, you must contact the AEG Business Manager (Betty Arseneault) no later than November 15 so she can reserve a phone line for you and provide you with exact instructions on how to get connected.
Betty Arseneault, Business Manager: Tel: (613) 828-0199
Fax: (613) 828-9288 Email: aeg@synapse.net

Officer Reports to Membership...

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4. AEG co-sponsored the Society of Economic Geologists' symposium "Global Exploration 2002: Integrated Methods of Discovery" held in Denver, Colorado in April 2002. The symposium included an AEG-supported workshop titled "Exploration Technology: Discovery through Innovation".
5. Council approved a change in the Preamble to the By Laws expanding scope of the Association. This change will be presented to AEG Fellows for vote. (See p. 29 of EXPLORE 116.)
6. Corporate sponsorship was established for **EXPLORE**.
7. Perth, Western Australia, was chosen as the site for the 22nd International Geochemical Exploration Symposium in 2005.
8. Mary Doherty agreed to become Editor for **EXPLORE**. Many thanks to Lloyd James for his excellent work while in this position.
9. Clemens Reimann completed his very successful tenure as AEG Distinguished Lecturer. Thanks, Clemens. Cliff Stanley was chosen as the next Distinguished Lecturer.
10. David Garnett took over as AEG representative on the Australian Geoscience Council. Thanks to Graham Taylor for his service as AEG's former representative.

David B. Smith, *Association Secretary*

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Treasurer's Report for the Year 2001

McCay, Duff and Co. LLP in Ottawa continues to fulfil the task of chartered accountants for the Association and a copy of their financial audit is available from the AEG business office. Below is a summary of revenue and expenditures in US dollars.

For the year 2001

Revenue

Dues	\$51,431
Symposium and workshops	6,636
Investment income	30,690
Publications book orders	6,745
Miscellaneous	1,719
Foreign exchange gain	<u>3,128</u>
	<u>100,349</u>

Expenditure

General and administration	45,334
Publications and newsletter	<u>32,866</u>
	<u>78,200</u>

Net revenue for the year **\$22,149**

HSBC also continues to act as the AEG investment manager. As of Dec 31, 2001, the total market value of **Securities** (bonds, mutual funds, treasury bills) is

\$396,910

Gwendy E.M. Hall, *Treasurer, AEG*

September 11, 2002

2002 Committee Reports to Membership

Australian Geoscience Council report

The Australian Geoscience Council (AGC) comprises nine societies and associations, including the AEG, and has a combined membership of over 7000. It represents most of the professional geoscientists in Australia. During the year the AGC developed a policy platform identifying ten top issues and actions for the geosciences. This was distributed widely to politicians, bureaucrats and other interested parties and there has already been a government response on two of the issues – on the price of geoscience information and on the matter of dual citizenship for Australians.

In March 2002 an AGC delegation met with the new Minister for Resources, Industry and Tourism to discuss the future of Australian resource industries. At present there is no national plan for Earth Science in Australia but the AGC is addressing this through participation in the Australian Academy of Science's National Committee for Earth Science. The aim is to complete the plan by June 2003. The main challenges for the year ahead will be to make an impact in two major government reviews – on Higher Education and on Research Priorities. Any AEG members based in Australia who would like to receive more information on the AGC should contact David Garnett.

David Garnett

AEG Australian Geoscience Council Representative

Email: naa@bq.com.au

Bibliography Committee Report

The bibliography committee supplied quarterly compilations for EXPLORE last year. In addition to its traditional focus on mineral exploration, the Association is moving to broaden its base and explicitly include environmental baseline and other aspects of geochemistry related to resource development. Contributions from members in all these areas are always welcome. In addition, efforts have been initiated to make the bibliography information available on our AEG web site.

Graham Closs, *Committee Chairman*

Business Managers Report

For 2001, the AEG had a total of 762 members compared to 798 members for 2000. This year 2001 total comprises 268 Fellows (voting members), 471 Members (affiliate), 9 Students, 8 Corporate, 4 Explore only and 2 Honorary memberships. This total includes 50 new memberships.

As a reminder to our members, your AEG membership for 2001 included the new journal GEEA, Volume 1 Parts 1, 2, 3 and 4 and the EXPLORE Newsletter's #110, 111, 112 and 113.

Betty Arseneault, *Business Manager*

By-Laws Report

The debate on the importance of environmental geochemistry has continued within the AEG and there would appear to be solid support for stronger links to environmental studies. If this is to be formalised then the By-Laws will require modification. Consequently the By-Laws Committee proposed

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that, as a first step, the Preamble to the By-Laws should be modified to reflect a greater interest in, and engagement with, environmental geochemistry. This modified Preamble was debated at the AGM, held during the 20th IGES in Santiago, at which time some refinements to the wording were suggested. Debate has continued – most notably led by Nigel Radford – and we have now reached a point where we have a degree of consensus on the wording. The revised Preamble will have been circulated for voting by the time this issue reaches members. If it is accepted it will then be necessary to modify the By-Laws in order to reflect the changes embodied in the Preamble. At the same time it will also be possible to include a number of other essential modifications to the By-Laws. These have been held over for several years while we have worked through the environmental debate but it is now hoped that all revisions can be incorporated for circulation and voting early next year.

David Garnett

Distinguished Lecturer Committee Report

Clemens Reimann's Distinguished Lecture series started reasonably calmly, with presentations to the Austrian Geological Survey and the University of Vienna, but then he went into overdrive. On his first visit to America he managed to give eight talks in ten days on three different topics, in the process visiting University of Las Vegas, University of Reno, Geological Society of Nevada (Elko), Geological Society of Nevada (Reno) and the Colorado School of Mines. On a subsequent shorter visit to Canada he still managed to deliver lectures to the Geological Survey of Canada and the University of British Columbia. These lectures have all been extremely well received and the AEG thanks Clemens for the enormous amount of time and effort that he has put into them. Our thanks also go to his employer, the Geological Survey of Norway, who not only gave him the time to travel, but also paid for his flight to the USA. And finally, our thanks go to a small, but dedicated squad of AEG members who coordinated his travels in North America and were extremely generous with both their time and hospitality.

David Garnett

Distinguished Lecturer Committee Chairman

EXPLORE Newsletter Report

The AEG EXPLORE newsletter continues with 4 issues per year, which have included 8 pages of color thanks to two new corporate sponsors. This allows high quality color maps and technical figures. This year we have added "Focus Topics" to each issue, which for 2002 are "Lab Updates", "Geological Survey Updates", "Software for Geochemists" and "Geochemical Process Debate". The newsletter is currently sent via hard copy to all members and select libraries, and is available on the web site for download by members only. EXPLORE is funded by advertisers, corporate sponsors, and a subsidy from the AEG.

**Mary Doherty, Editor &
David Kelley, Business Manager**

AEG Journal Report to Membership

Geochemistry: Exploration, Environment, Analysis

2001 was the inaugural year for the new AEG journal, known now as **GEEA**. It is published in partnership with the Geological Society of London (GSL) and currently comprises four issues per annum. The first issue was a special one edited by Joe Donovan and founding AEG member, Art Rose, and focussed on remediation approaches at reclaimed mine-sites. The following issue was a regular one reflecting typical subject matter of the new journal: new techniques in mineral exploration, data processing and modelling, biogeochemistry, controls on element distribution in the near surface and geoanalysis. The second half of Volume 1 of **GEEA** was edited by Charles Butt (Associate Editor of **GEEA**) and Keith Scott; the theme of these issues was gold and nickel exploration in the Yilgarn Craton of western Australia. We are indebted to these four editors for their enthusiasm, hard work and dedication in launching the first year of **GEEA** so effectively. Furthermore, sincere gratitude goes to the Associate Editors, Editorial Board and reviewers who have made the first year such a success.

The current contents of **GEEA** can be found by going to the Journal section of the aeg website (www.aeg.org) where a link to Ingenta is provided. 'Browse publications' on that page will lead you to each issue, the abstracts and the full papers for 2001 (as an introductory feature).

I want to take this opportunity to provide an explanation to the membership for the extremely late delivery of 2002 issues of **GEEA**. The publishing arm of GSL has encountered many difficulties this year, largely owing to the absence of a managing editor for half the year. **GEEA** has suffered as a result. Here is a letter from the publisher:

Dear AEG member;

*Please allow me to introduce myself. I am the new Director of Publishing at the Geological Society of London, co-owner and publisher of the journal *Geochemistry: Exploration, Environment, Analysis*. I joined the Society in April this year from a background in commercial educational publication, with a wide-ranging brief covering the effective and timely publishing of books and journals.*

*Many of you will have been frustrated and understandably annoyed at the late publication of the journal: even as I write, the first issue for 2002 is not in your hands. That poor record is unacceptable, and I offer no excuses; rather, having reviewed the causes I am putting in place new arrangements and procedures which will ensure timely publication of the 2003 volumes of **GEEA** – the journal will be our top priority until we have dealt with the backlog and each issue reaches you at the due time.*

While I cannot do anything to change past mistakes, I do wish to assure you that the Geological Society is committed to giving the journal the professional attention that it deserves, and I ask for your continued patience during the time it takes to get publication of the journal on track.

*Yours faithfully
Neal Marriott*

Gwendy E.M. Hall

*Editor, *Geochemistry: Exploration, Environment, Analysis**

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Officer Report to Membership...

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Membership Sub-Committee Report

In 2001 the AEG accepted membership applications from 50 new members. Of these 4 were admitted as Fellows, 45 as Members, and one as Student Member. These new members come from 14 countries on 5 continents. During the year, 8 Members were promoted to Fellow status. Two Fellows, Alan Coope and Eion Cameron, were advanced to Honorary Membership.

Respectfully submitted,

Nigel W Radford, *Committee Chair*

Short Course Committee Report

The AEG short course 'committee' comprises Vlad Sopuck (Cameco Corp., Saskatoon) and Colin Dunn. Periodically we discuss 'needs' and attempt to fill gaps. Commonly, it has been difficult to find people to put on short courses on specific topics of particular interest.

A number of short courses were presented at the IGES in Santiago, May 2001. Since then, Cliff Stanley presented a half day course entitled 'Litho geochemistry, Pearce Element Ratio Analysis' at the University of New South Wales, that was sponsored by the local student chapter of the Association of Exploration Geochemists (August 2001).

No other courses have been funded by the AEG in the past year, although several AEG members have organized and put on courses in conjunction with conferences. These include a workshop at the co-sponsored SEG/AEG meeting in Denver (April 2002) given by Graham Closs, Mary Doherty and Ken Witherly entitled "Exploration Technology: Discovery through Innovation". At the PDAC in Toronto (March), Graham Closs, Mary Doherty and Lynda Bloom presented a course entitled "**Improving the Odds: Effective Exploration Geochemistry**", and Eric Hoffman organized a workshop on Exploration Geochemistry. Eric Hoffman organized similar workshops in conjunction with the Ontario Geological Survey's annual meeting (December) and the Cordilleran Round-up in Vancouver (January).

Courses Currently Available for Presentation include:

Litho geochemistry: Pearce Element Ratio Analysis (Cliff Stanley), **Introduction to exploration geochemistry – including basic statistics, analysis and drainage sediments** (K. Fletcher), and **Organic media in mineral exploration and environmental studies**, and variations on that theme, such as **Applied Biogeochemical Prospecting** (Colin Dunn). These courses can include detailed modules by Gwendy Hall (for the analytical component), and Rob Scagel (for the forestry/botanical component).

We are always open to suggestions and any offers to prepare short courses (complete with short course notes). Discussions are in progress to try and put on courses on **Hyperspectral Imagery Applied to Mineral Exploration** and **Introduction to Hydrogeochemistry**.

The next major event for AEG short courses will be at the 21st IGES in Dublin (August 2003). Organizers have generated a list of possible short courses and the committee has contacted the organizers.

Colin E. Dunn, *Short Course Committee Co-Chairman*

Student Paper Competition Committee Report

The Student Paper Prize is awarded every two years. The result of the 2000 prize was announced at the IGES in Chile and in EXPLORE shortly after. Solicitation for entries for the 2002 prize is underway, with our usual barrage of form letters. The membership is urged to encourage any likely students to enter the competition. See the advertisement in this edition of the EXPLORE newsletter, or obtain details from the AEG web site under 'Students'. The winning students will be announced at the IGES meeting in Dublin, September, 2003.

XRAL have continued to sponsor the prize - my thanks to them and I hope they will continue with their long-standing support. I would also like to thank my adjudication committee, namely Boudewijn de Smeth, and Owen P. Lavin, for their hard work, and especially Richard Davy, who has now stepped down after many years of service. We will endeavour to maintain a breadth of interest and an international perspective in this adjudication committee.

Ian D.M. Robertson

Student Paper Competition Committee Chairman

Symposium Committee Report

2001 International Geochemical Exploration Symposium (IGES) - Council has agreed to a suggestion that a portion of the profits from the Santiago Symposium be allocated to the sponsorship of a fulltime Chilean Ph.D student of Exploration or Environmental Geochemistry to travel to Dublin and attend the 21st IGES. The selection of the student will be made by a Chile-based committee selected by the LOC and containing the AEG Regional Councillor, and at least one Chile-based AEG Fellow. Furthermore, AEG will consider providing funds for one registration and one workshop admission at all subsequent IGES, for a suitable student studying at a university in Chile. The sponsorship will be reviewed by AEG Council the year prior to the IGES in question, terms of both the success of the sponsorship program and AEG's financial situation at that time. This review will be initiated in 2004, after the Dublin IGES and before the 2005 (Perth) IGES.

2003 IGES (Dublin, Ireland, Aug 29 - Sept 3, 2003) - On July 29th, the writer visited the proposed symposium venue on the campus of University College, Dublin and attended a meeting of the Local Organizing Committee (LOC) of the Dublin IGES, whose hospitality is appreciated! Preparations are proceeding on schedule. The LOC has engaged the services of a professional conference company, Conference Partners, who will handle Registration (including the processing of credit-card transactions) and the organizing of the Social Program, as well as administering the conference web page. A field trip to Greenland is under consideration, for which advance registrations are essential because of the limited availability of airplane seats. An announcement regarding the Dublin Symposium appears elsewhere in this issue of EXPLORE, and more information can also be found at the following website: <<http://www.conferencepartners.ie/igesandnams2003>>.

2005 IGES - Two strong bids were received to host the 2005 IGES, from Perth, Australia and Seville, Spain. After some deliberation Council voted in favour of the Perth bid; the Seville

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Officer Report to Membership...

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committee has been encouraged to resubmit a bid for the 2007 Symposium.

Steve Amor, *Symposium Committee Chairman*

Website Report

New Host - Since its inception in 1995, the AEG website has been hosted by the Geological Survey of Canada, whose generous support is greatly appreciated. However, because the GSC's intranet is firewall-protected, the site could only be updated from within the firewall, i.e. by a GSC employee. This was not a great inconvenience as long as such a person was involved in working on the AEG website. However, with the resignation of Guy Buller (whom we also thank) as Web Technician, and the unavailability of a suitable replacement from within the GSC, it has been necessary to move the site to a commercial ISP to which the Webmaster can have direct access. The ISP selected is located in Hamilton, Ontario, which happens to be the city of residence of the current Webmaster; however, access will be possible for his successors provided that they are in possession of the password. Pending re-registration of the domain, traffic is being re-routed automatically from the old site to the new, so the <www.aeg.org> address can still be used to gain access.

Discussion Page - A page was set up in July whereby Members' opinions regarding the proposed name change of the Association can be exchanged. Depending on its success, which at time of writing gives new meaning to the term "underwhelming", more pages may be set up for the airing of important issues.

New Webmaster - Two volunteers have offered to take over the position of Webmaster when Steve Amor becomes AEG President in 2003.

Bibliography - Updates to the digital bibliography, subsequent to its creation in 1995, are now being added to the website with each new edition of EXPLORE. However, the creation of an Exploration Geochemistry Bibliography that can be fully queried on line has reached something of an impasse pending the allocation of keywords to each citation. This requires that someone read at least the abstract of all 13,000 citations in the database, decide on appropriate keywords, and communicate them to the Webmaster. Volunteers to organize and co-ordinate such an effort are needed.

Steve Amor, *Webmaster*

Minutes of the 2001 Annual General Meeting of the Association of Exploration Geochemists (held in conjunction with the 20th International Geochemical Exploration Symposium, Santiago de Chile, May 9, 2001)

I. Call to Order. Establishment of Quorum.

President Nigel Radford called the meeting to order at 4:25 PM local time. Approximately 32 AEG Fellows were present.

II. November 21, 2000 AGM Minutes

President Radford asked if there were any comments or changes to the minutes. There were none. It was moved (C. Stanley) and seconded (G. Hall) that the minutes of the November 21, 2000 AGM be approved. The President asked

for a vote on the motion and it was approved without dissent.

III. Reports from AEG Executive/Council

The reports from the AEG Executive and Council were published in EXPLORE Number 111 and will not be repeated in these minutes. Additional information that was not included with the published reports included:

- a. Vice President P. Freyssinet reported that D. Flight had accepted the position of Regional Councilor for the British Isles and that we still need a Regional Councilor for the eastern European countries.
- b. G. Hall reported that the first issue of *Geochemistry: Exploration, Environment, Analysis* was out although many AEG members have not received their copy.

IV. Other Business

AEG Membership Debate - At this point in the meeting, President Radford initiated a discussion centered on "The AEG Membership Debate" as published in EXPLORE Number 111, pages 9-11. The discussion focused on whether AEG should expand its scope through a change in the Preamble to the By Laws. The proposed change discussed involved **replacing "exploration geochemistry" with "geochemistry of natural resources"**. Virtually no negative reaction concerning this proposed change was articulated by any of the participants. The lively discussion touched on many issues. Comments and observations made by the participants included:


- a. AEG has historically had strong representation from national geological surveys. However, most of these organizations no longer conduct research in exploration geochemistry and have replaced this with studies in environmental geochemistry. Will expanding the scope of the Association and widening the membership requirements attract new members from these organizations?
- b. There is no professional society that currently focuses on geochemistry of mine sites. AEG could possibly fill this niche.
- c. AEG has established student chapters at the University of Nevada (USA), James Cook University (Australia) and the University of New South Wales (Australia). Current AEG membership requirements as stated in the By Laws exclude students seeking degrees in environmental science.

V. 2003 IGES

The 2003 IGES will be held 29th August to 3rd September, 2003 in Dublin, Ireland.

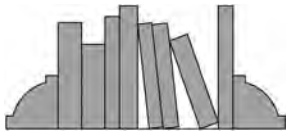
VI. Adjournment

It was moved (D. Smith) and seconded (C. Stanley) that the 2001 AEG AGM stand adjourned. President Radford asked for a vote on the motion and it carried unanimously.

President Radford thanked all the attendees for their participation and adjourned the meeting at 5:40 PM local time. 

Member News

Robert Jackson has left Newmont Mining Corporation. He is now an independent consultant to the mineral exploration industry specializing in 3D geochemical zonation vectoring for the discovery of blind ore deposits. He can be reached at 1-775-777-1619 or rgjackson@ctnis.com.



RECENT PAPERS

This list comprises titles that have appeared in major publications since the compilation in **EXPLORE** Number 116. Journals routinely covered and abbreviations used are as follows: Economic Geology (EG); Geochimica et Cosmochimica Acta (GCA); the USGS Circular (USGS Cir); and Open File Report (USGS OFR); Geological Survey of Canada papers (GSC paper) and Open File Report (GSC OFR); Bulletin of the Canadian Institute of Mining and Metallurgy (CIM Bull.); Transactions of Institute of Mining and Metallurgy, Section B: Applied Earth Sciences (Trans. IMM). Publications less frequently cited are identified in full.

- Andre-Mayer, A.S. et al., 2002. Boiling and vertical mineralization zoning: a case study from the Apacheta low-sulfidation epithermal gold-silver deposit, southern Peru. *Min. Deposita*. 37(5): 452-464. (Erratum: pg 530).
- Arima, M., Kozai, Y., and Akaishi, M., 2002. Diamond nucleation and growth by reduction of carbonate melts under high-pressure and high-temperature conditions. *Geology*. *Geol. Soc. Am.* 30(8): 691-694.
- Baba, A. and Gungov, T., 2002. Influence of gold mine groundwater quality (Efemcukuru, Izmic, Turkey). *Environmental Geol.* 41(6).
- Bashkin, V.H. and Wongyai, K., 2002. Environmental fluxes of arsenic from lignite mining and power generation in northern Thailand. *Environ. Geol.* 41(8): 883-
- Bechtel, A., Gratzer, R., Puttmann, W. and Oszczepalski, S., 2002. Geochemical characteristics across the oxic/anoxic interface (Rote Faule front) within the Kupferschiefer of the Lubin-Sieroszowice mining district (SW Poland). *Chem. Geol.* 185(1/2): 9-
- Bierwirth, P., Huston, D., and Blawett, R., 2002. Hyperspectral Mapping of Mineral Assemblages Associated with Gold Mineralization in the Central Pilbara, Western Australia. *EG* 97(4): 819-826.
- Bilali, L. El., Rasmussen, P.E., Hall, G.E.M., and Fortin, D., 2002. Role of sediment composition in trace metal distribution in lake sediments. *Applied Geochem.* 17(9): 1171-1181.
- Borrego, J., Morales, J.A., de la Torres, M.L., and Grande, J.A., 2002. Geochemical characteristics of heavy metal pollution in surface sediments of the Tinto and Odiel river estuary (southwestern Spain). *Environ. Geol.* 41(7).
- Buckle, J., 2002. The Wawa diamond enigma. *CIM Bull.* 95(1061): 85-87.
- Carranza, E.J.M. and Hale, M., 2002. Where are porphyry copper deposits spatially located? A case study in Benguet Province, Philippines. *Natural Resources Research* 11(1): 45-60.
- Chappell, D.A. and Craw, D., 2002. Geological analogue for circumneutral pH mine tailings: implication for long-term storage, Macraes Mine, Otago, New Zealand. *Applied Geochem.* 17(8): 1105-1114.
- Corsi, A.C. and Landim, P.M.B., 2002. Fluvial transport of lead, zinc, and copper contents in polluted mining regions. *Environ. Geol.* 41(7): 833.
- de Araujo, C.C. and Macedo, A.B., 2002. Multi-criteria geologic data analysis for mineral favorability mapping: Application to a metal sulphide mineralized area, Ribeira Valley metallogenic province, Brazil. *Natural Resources Research* 11(1): 29-44.
- Dequincey, O. et al., 2002. Chemical mobilizations in laterites: evidence from trace elements and ²³⁸U- ²³⁴U-²³⁰Th disequilibrium. *GCA* 66(7).
- Dinelli, E. and Tatco, F., 2002. Different types of fine-grained sediments associated with acid mine drainage in the Libiola Fe-Cu mine area (Ligurian Apennines, Italy). *Applied Geochem.* 17(8): 1081-1092.
- Drake, M.J. and Richter, K., 2002. Determining the composition of the Earth. *Nature* 416.
- Drew, L.J., Langer, W.H., and Sachs, J.S., 2002. Environmentalism and natural aggregate mining. *Natural Resources Research* 11(1): 19-28.
- Folling, P.G. and Frimmel, H.E., 2002. Chemostratigraphic correlation of carbonate successions in the Gariep and Saldanna belts, Namibia and South Africa. *Basin Research* 14(1).
- Fuge, R. (ed.), 2002. *Environmental Geochemistry: Selected papers from the 5th International Symposium, Cape Town, South Africa, 24-29 April, 2002.* *Applied Geochem.* 17(8): 595-1170.
- Giblin, A., 2001. *Groundwaters: Geochemical Pathfinders to Concealed Ore Deposits (Handbook).* CSIRO Exploration and Mining. 70 p.
- Gingerich, J.C., Peshko, M., and Matthews, L.W., 2002. The development of new exploration technologies at Noranda: Seeing more with hyperspectral and deeper with 3-D seismic. *Bull. CIM* 95(1058): 56-61.
- Grabazhev, A.I., Moloshag, V.P., and Purtov, V.K., 2002. Behavior of Al and Ti during acid metamorphism at massive sulfide deposits of the Ural. *Geochem. Intern.* 40(2): 141-154.
- Gray, J.E., Crock, J.G., and Fey, D.L., 2002. Environmental geochemistry of abandoned mercury mines in West-Central Nevada, USA. *Applied Geochem.* 17(8): 1069-1079.
- Greffie, C., Bailly, L., and Milesi, J.P., 2002. Supergene Alteration of Primary Ore Assemblages from Low Sulfidation Au-Ag Epithermal Deposits at Pongkor, Indonesia, and Nazareno, Peru. *EG* 97(3): 561-571.
- Gros, M., Lorand, J.P., and Luguët, A., 2002. Analysis of platinum group elements and gold in geological material using NiS fire assay and Te coprecipitation: The NiS dissolution step revisited. *Chem. Geol.* 185(3/4): 179-190.
- Hannah, J.L. and Stein, H.J., 2002. Re-Os Model for the Origin of Sulfide Deposits in Anorthosite – Associated Intrusive Complexes. *EG* 97(2): 371-383. *continued on Page 13*



RECENT PAPERS

continued from Page 12

- Hellmann, R. and Wood, S.A. (eds.), 2002. Water-Rock Interactions, Ore Deposits, and Environmental Geochemistry: A Tribute to David A. Crerar. *Geochem. Soc.* 462 p.
- Hoatson, D.M. and Sun, S.S., 2002. Archean Layered Mafic-Ultramafic Intrusions in the West Pilbara Craton, Western Australia: A Synthesis of Some of the Oldest Orthomagmatic Mineralizing Systems in the World. *EG* 97(4): 847-872.
- Hodson, M.E., 2002. Experimental evidence for mobility of Zr and other trace elements in soils. *GCA* 66(5): 819-828.
- Horn, R., 2002. Metals exploration in a changing industry. *Bull. CIM* 95(1058): 35-48.
- Inan, E.E. and Einaudi, M.T., 2002. Nukundamite ($\text{Cu}_{3.38}\text{Fe}_{0.63}\text{S}_4$)-Bearing Copper Ore in the Bingham Porphyry Deposit, Utah: Result of Upflow through Quartzite. *EG* 97(3): 499-515.
- Jago, B.C., Davis, D., and Derbuch, H., 2002. Diamonds on the Brodeur Peninsula – A new kimberlite province in Nunavut, Canada. *CIM Bull.* 95(1061): 72-78.
- Jebrak, M., Higuera, P.L., Marcoux, E., and Lorenzo, S., 2002. Geology and geochemistry of high-grade, volcanic rock-hosted, mercury mineralization in the Nuevo Entredicho deposit, Almaden district, Spain. *Min. Deposita.* 37(5): 421-532.
- Johnson, C.A., Leinz, R.W., Grimes, D.J., and Rye, R.O., 2002. Photochemical changes in cyanide speciation in drainage from a precious metal ore heap. *Environ. Sci. and Tech.* 36(5): 840-842.
- Kimball, B.A., Runkel, R.L., Walton-Day, K., and Bencala, K.E., 2002. Assessment of metal loads in watersheds affected by acid mine drainage by using tracer injection and synoptic sampling, Cement Creek, Colorado, USA. *Applied Geochem.* 17(9): 1183-1207.
- Klein, E.L., Koppe, J.C., and Moura, C.A.V., 2002. Geology and geochemistry of the Caxias gold deposit, and geochronology of the gold-hosting Caxias Microturolite, Sao Luis craton, northern Brazil. *J. South Am. Earth Sci.* 14(8): 837-851.
- Kravtsova, R.G. and Korkina, O.I., 2002. Alkaline elements in tin and silver mineralization of different stages at the Pestrinskoe ore field, Northeastern Russia. *Geochem. Intern.* 40(4).
- Kyser, K. (ed.), 2001. Fluids and Basin Evolution. *Min. Assoc. Canada Short Course V.* 28. 262 p.
- Lawrence, M.J., 2002. The VALMIN Code – The Australian experience. *Bull. CIM* 95(1058): 76-81.
- MacKenzie, A.B. and Pulford, I.D., 2000. Investigation of contaminant metal dispersion from a disused mine site at Tyndrum, Scotland, using concentration gradients and stable Pb isotope ratios. *Applied Geochem.* 17(8): 1093-1103.
- Maltman, A., 1998. Geological Maps – an introduction. 2nd Ed. Wiley. 260 p.
- Manske, S.L. and Paul, A.H., 2002. Geology of a Major New Porphyry Copper Center in the Superior (Pioneer) District, Arizona. *EG* 97(2): 197-220.
- Matveeva, S.S. et al., 2002. Geochemical model of the formation of the Spokoininsk tungsten deposit (Eastern Sagan, Russia). *Geol. Ore Deposits* 44(2): 111-131.
- McBirney, A.R., 2002. The Skaergaard Layered Series. Part VI. Excluded trace elements. *J. Petrol.* 43(3): 535.
- McClenaghan, M.B., 2002. Indicator mineral and till geochemical methods for kimberlite exploration in glaciated terrain. *CIM Bull.* 95(1061): 79-84.
- Olea, R.A., 1999. Geostatistics for Engineers and Earth Scientists. Kluwer Acad. Pub. 303 p.
- Pawlowsky-Glahn, V. and Buccianti, A., 2002. Visualization and modeling of subpopulations of compositional data: Statistical methods illustrated by means of geochemical data from fumarolic fluids. *Intern. J. Earth Sci. (Geologische Rundschau).* 91(2): 357.
- Pezzotta, F., 2001. Madagascar: A Mineral and Gemstone Paradise. *Lapis International.* 97 p.
- Piestrzynski, A., Pieczonka, J., and Gluzek, A., 2002. Redbed-type gold mineralization, Kupferschiefer, south-west Poland. *Min. Deposita.* 37(5): 512-528.
- Pike, G., Cas, R., and Smithies, R.H., 2002. Geologic Constraints on Base Metal Mineralization of the Whim Creek Greenstone Belt, Pilbara Craton, Western Australia. *EG* 97(4): 827-845.
- Preinfalk, C., Kostitsyn, Y., and Morteani, G., 2002. The pegmatites of the Nova Era-Itabira-Ferros pegmatite district and the emerald mineralization of Capoeirana and Belmont (Minas Gerais, Brazil): geochemistry and Pb-Sr dating. *J. South Am. Earth Sci.* 14(8): 867-889.
- Ramezani, J., Dunning, G.R., and Wilson, M.R., 2002. Geologic setting, geochemistry of alteration, and U-Pb age of hydrothermal zircon from the Silurian Stog'er Tight gold prospect, Newfoundland Appalachians, Canada. *Explor. and Mining Geol.* 9(3/4): 157-170.
- Ran, Y., Fu, J., Rote, A.W., and Gilkes, R.J., 2002. Adsorption of Au (I, III) complexes on Fe, Mn oxides and humic acid. *Chem. Geol.* 185(1/2): 33.
- Reimann, C., Filzmoser, P., and Garrett, R.G., 2002. Factor analysis applied to regional geochemical data: problems and possibilities. *Applied Geochem.* 17: 185-206.
- Ropchan, J.R. et al., 2002. Host-Rock and Structural Controls on the Nature and Timing of Gold Mineralization at the Holloway Mine, Abitibi Subprovince, Ontario. *EG* 97(2): 291-309.
- Rui-Zhong, H., Wen-Chao, S., Xian-Wu, B., Guany-Zhi, T., and Hofstra, A.H., 2002. Geology and geochemistry of Carlin-type gold deposits. *Min. Deposita.* 37(3/4): 378-392.

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RECENT PAPERS

continued from Page 13

- Schandl, E.S. and Gorton, M.P., 2002. Application of High Field Strength Elements To Discriminate Tectonic Settings in VMS Environments. *EG* 97(3): 639-642.
- Schmitt, A.K., Trumbull, R.B., Dalski, P., and Emmermann, R., 2002. Zn-Nb-REE Mineralization in Peralkaline Granites from the Amis Complex, Brandberg (Namibia): Evidence for Magmatic Pre-enrichment from Melt Inclusions. *EG* 97(2): 399-413.
- Schwarz-Schampers, U. and Herzig, P.M., 2002. *Indian Geology, Mineralogy, and Economics*. Springer. 257p.
- Seigel, H.O., Gingerich, J.C., and Kostlin, E.O., 2002. Explore or acquire? The Dilemma. *Bull. CIM* 95(1058): 62.
- Sharpe, R. and Gemmill, J.B., 2002. The Archean Cu-Zn Magnetite-Rich Gossan Hill Volcanic-Hosted Massive Sulfide Deposit, Western Australia: Genesis of a Multistage Hydrothermal System. *EG* 97(3): 517-539.
- So, C.S., Yun, S.T., Shelton, K.L., and Zhang, D.Q., 2002. Geochemistry of the Youngbogari deposit, Republic of Korea: An unusual mesothermal gold-silver deposit of the Youngdong area. *Geochem. J.* 36(2): 155.
- Steven, N.M., 2002 (2002). A Shaba-type Cu-Co (-Ni) deposit at Luamata, west of the Kabompo dome, northwestern Zambia. *Explor. and Mining Geol.* 9(3/4): 277.
- Strunz, H. and Nickel, E.H. (eds.), 2001. *Strunz Mineralogical Tables*. 9th Ed. E. Schweizerbartsche Verlagsbuchhandlung. 870 p.
- Sweetapple, M.T. and Collins, P.L., 2002. Genetic Framework for the Classification and Distribution of Archean Rare Metal Pegmatites in the North Pilbara Craton, Western Australia. *EG* 97(4): 873-895.
- Szava-Kovats, R.C., 2002. Outlier-resistant errors-in-variable regression: anomaly recognition and grain-size correction in stream sediments. *Applied Geochem.* 17(8): 1149.
- Thomas, D. and Gleeson, C.F., 2000 (2002). Use of till geochemistry and mineralogy to outline areas underlain by diamondiferous spessartite dikes near Wawa, Ontario. *Explor. and Mining Geol.* 9(3/4): 215-232.
- Thompson, I.S., 2002. A critique of valuation methods for exploration properties and undeveloped mineral resources. *CIM Bull.* 95(1061): 57-62.
- Valley, J.W. and Cole, D.R. (eds.), 2001. *Stable Isotope Geochemistry*. *Rev. Min. and Geochem.* V. 43. Min. Soc. Am.
- Voicu, G. and Bardoux, M., 2002. Geochemical behavior under tropical weathering of the Barama-Mazaruni greenstone belt at Omai gold mine, Guiana Shield. *Applied Geochem.* 17: 321-336.
- Wang, P., 2001. Geology and geochemistry of geothermal fields and hot-spring type gold deposits in Sanjiang orogen, southwestern China. *Bull. Geol. Surv. Japan* 52(8): 327.
- Wang, Y., Qin, K., Tan, Y., and Hou, Z., 2000 (2002). The Derni Cu-Co massive sulfide deposit, Qinghai province, China: Ultramafic volcanic-hosted submarine-exhalative mineralization. *Explor. and Mining Geol.* 9(3/4): 253-264.
- Woolley, A.R., 2001. *Alkaline Rocks and Carbonatites of the World*. Part 3: Africa. Geol. Soc. Pub. House. 372 p.
- Yang, X.J. and Pin, C., 2002. Determination of niobium, tantalum, zirconium, and hafnium in geological materials by extraction chromatography and inductively coupled plasma mass spectrometry. *Analytica Chimica Acta.* 458(2): 375.
- Yee, N. and Fein, J.B., 2002. Does metal adsorption onto bacterial surfaces inhibit or enhance aqueous metal transport: Column and batch reactor experiments on Cd-bacillus subtilis-quartz systems. *Chem. Geol.* 185(3/4): 303-320.
- Youngson, J.H. et al., 2002. Au-Ag-Hg and Au-Ag alloys in Nokomai and Nevis valley placers, northern Southland and central Otago, New Zealand and their implications for placer-source relationships. *New Zealand J. Geol. And Geophys.* 45(1): 53-70.
- Yui, T.F. and Kwon, S.T., 2002. Origin of a Dolomite-Related Jade Deposit at Chuncheon, Korea. *EG* 97(3): 593-601.
- Zegers, T.E., Barley, M.E., Groves, D.I., McNaughton, N.J., and White, S.H., 2002. Oldest Gold: Deformation and Hydrothermal Alteration in the Early Archean Shear Zone-Hosted Bamboo Creek Deposit, Pilbara, Western Australia. *EG* 97(4): 757-773.
- Zhilong, H. et al., 2002. The geochemistry of lamprophyres in the Laowangzhai gold deposits, Yunnan Province, China: Implications for its characteristics of source region. *Geochem. J.* 36(2): 91-118.
- Zhou, T., Goldfarb, R.J., and Phillips, G.N., 2002. Tectonics and distribution of gold deposits in China – an overview. *Min. Deposita.* 37(3/4): 249-282.

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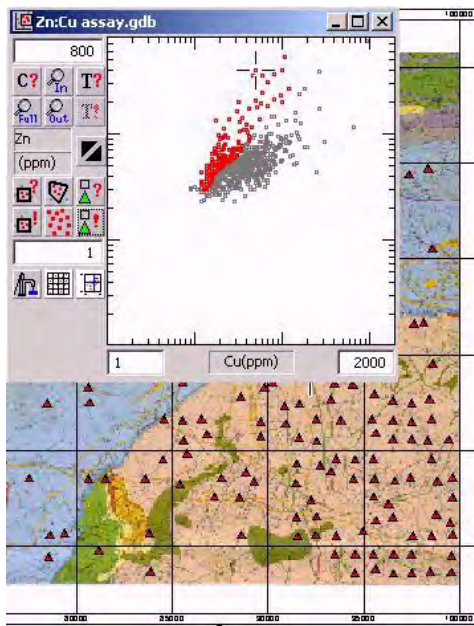


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Scatter Plot Tool

The Scatter Plot tool enables users to plot one ASSAY channel against another ASSAY channel. The scatter tool is dynamically linked to the database and map enabling easy identification of outliers. The scatter tool also enables the selection of discrete populations (as shown on the figure below) and the plotting of these selected sample locations on a map.

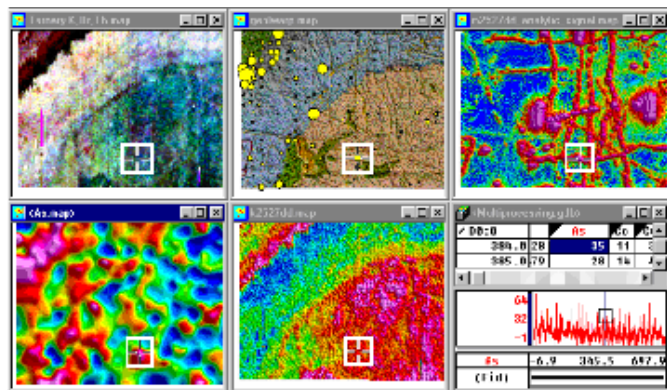
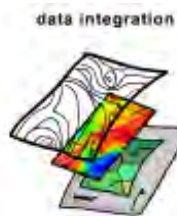


Scatter plot tool displaying Cu and Zn as elements of interest, and a scanned geological map of the region displaying the selected sample locations.

Data Integration

A fundamental process in geochemical exploration is the integration of other available data. This assists in the identification of potential areas of interest, so that calculated and informative decisions can be made.

Dynamic linking between maps, databases and plots enables the user to accurately identify similar areas of interest and reference it back to the original data

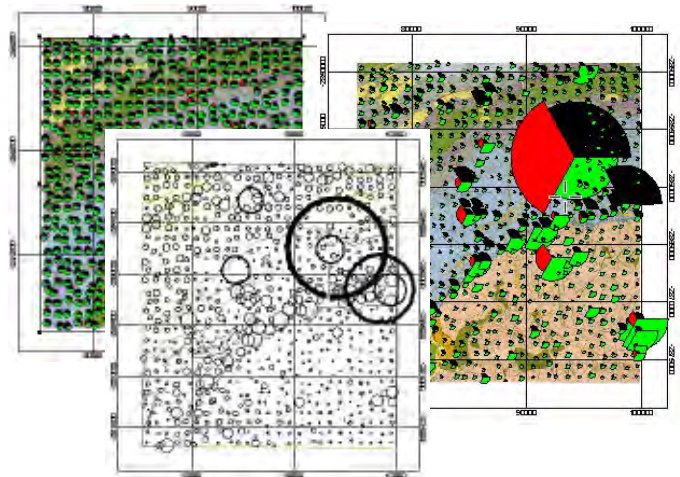


Integrated presentation showing ternary K/U/Th image, shaded geology map with proportional As symbols, processed magnetic data (analytic signal), As grid, Potassium grid and original As geochemical data with graphical view.

Meaningful Map Production

The ability to quickly and easily produce meaningful maps is an important requirement of any exploration software solution. It is vital that any graphical representation of geochemical data is accurate and professional. Along with the ability to grid data, Chimera provides a variety of methods for symbol plotting single and multi-element data.

The traditional way to display geochemical data is as symbol plots, overlaying other data types such as geophysics and geology. The Chimera system enables users to create colour symbol plots using statistical breaks, proportional size symbols, symbols based on two variables (e.g. Cu for size and Zn for colour), rose, pie and bar plots for up to 8 elements at individual location points.



A variety of symbol plotting techniques available for displaying geochemical data.


Drill Target Areas

Having identified potential targets, you will want to follow these up by drilling. The drillhole component of Target (Wholeplot) enables geologists to set-up drill projects, manage results dynamically, produce presentation-quality section and plan maps, and interpret results for follow-up drilling and decision-making.

An import wizard that enables direct import from Excel™ files, ASCII files, and databases. There is also a 'hot link' directly from acQuire.

Assay data typically contain standards and duplicates that need to be extracted before the data can be processed. This can be done as described previously.

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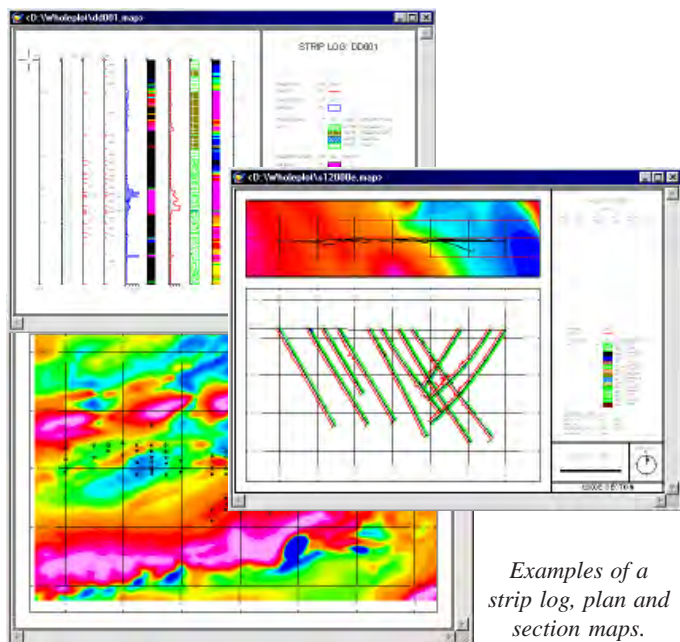
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Making your first plan or section should be a simple procedure. Target has a user-friendly interface, with intelligent defaults, enabling the quick creation of plans and sections. Geo-physical, geochemical and lithological data can be displayed as bar charts, profiles, lithology logs, text or grids. The map-making tools allow for integration of all available data to enable quick and calculated decisions. Printing of maps is a one-button operation. Some examples of plans and sections created using Target are shown below.



Examples of a strip log, plan and section maps.

Conclusion

We have illustrated how an integrated and complete software solution can be used to increase the value and ensure the integrity of geological, geochemical and geophysical data through better management, quality control, analysis, integration and reporting/presentation. This gives explorationists a solution that is cost effective (licensing, support, training) without compromising data specific functionality and performance.

acquire's data management systems, along with your Oasis montaj DPA and GIS solutions can provide you with an integrated, powerful and cost-effective exploration toolkit.

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Surfer: A Versatile Plotting and Contouring Package

Surfer has been around for 17 years and has evolved with advances in MS-DOS and Windows operating systems and plotting devices over that time. I have used Surfer for about 10 years, particularly since it moved to the Windows platform. It is a robust, versatile, general purpose plotting package very suitable for geochemical work. At U.S. \$599 it is not expensive for a scientific mapping package. It is upgraded about every two years to keep pace with advancing technology.

Software with a long heritage usually becomes very feature rich and Surfer is no exception. I would frequently use only 33 % of the functions available and have probably used another third infrequently. And the rest! They look great and I know they are there but I have never had the time and/or the particular data set to try them out.

In the space available here I will review some of the basic plots of most use to a geochemist, touch on a couple of applications which might not be obvious from the manuals, and refer to other uses by drawing on examples from Golden Software.

Common Inputs

- Data - Spreadsheets, Text (CSV, DAT, TXT) The input data are of the simplest form making it easy to get your data into Surfer. All data base products have an option to dump the data into a comma separated text file and that is the format that I use.
- Vectors - DXF, SHP, MIF, E00, GSI, BLN, LGO, BNA, GSB, DLG, LGS, USGS, SDTS. While the files above get your geochemical data into Surfer for plotting and gridding, it is useful to integrate that information with vector information such as streams, exploration leases etc.
- Raster - TIF, JPG, GIF, WMF, PCX, BMP, CLP, TGA, PNG, DCX, WPG. Raster data can be used in your work in two forms.
 - Base maps - for these an image of topography, Landsat or Aeromag is loaded and the calibrated by indicating the real world coordinates of the bottom left and top right corners of the image. This process allows the image to act as a backdrop to vector and point data from the above two data sources. I often collect the image data from capturing a rectangular section of the screen using Paint Shop Pro from Arcview which has been defined by a coordinated polygon on the screen.
 - Raster Images - These may be photographs, diagrams or images which are being combined with map data on the plot. These can be re-scaled as required but do not need to go through the registration process. These are very useful for producing posters

Basic Map Types

In Surfer, a plot is best described as a blank space that is populated by objects which include post maps, contour maps, image base maps, pictures, text etc. The plot can consist of many maps which in turn may be made up of multiple layers. For all objects on a plot the user has complete independent control of: scale, fonts, line thicknesses, axes, and polygon fill. In multi-layer plots, individual layers may be moved to any position in the "stack" at any time and turned off and on as required. This

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feature allows you for example to have quite a complex base plot made up from an image and numerous vectors. This can then be overlaid by multiple post plots for say 10 elements with one turned on and the other nine off and you just need to toggle the layers on and off for viewing and printing.

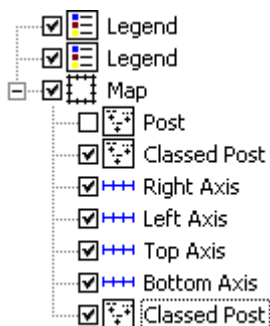


Figure 1: Navigation Pane - controlling the position and status of all plot objects.

There are two types of **post plots** which are the most common basic plot type used by geochemists. These are very simple to create and you can have one displayed within 30 seconds of opening the data file.

Basic Post Plot essentially consists of post symbol which may have text placed next to it. The size of the symbol may be scaled according to the values of a numeric variable on a linear or square root basis. This option allows for the shape of the symbol and its angle to be defined on the basis of variables in the data file. This feature is useful for assigning different symbols to different sample types where the soils may be shown as say circles and the rock chips as triangles.

Alternatively, a plot may be produced with arrows showing the slope direction. The arrow size can be varied according to the steepness of the slope. These data can be generated by Surfer from the gridding menu.



Figure 2: Topographic Wire Frame with Slope Vectors

The basic plot can be used for geochemical data but the classed post plots are more useful for that purpose. This style of post plot is great for sample number /location plots or for plotting locations of point topographic features such as towns or villages.

Classed Post Plots provide full versatility for plotting of geochemical variables where variations in the chemistry can be displayed by varying the colour size and shape of the post

symbol. Surfer will automatically assign legend increments (equal numbers or equal bin sizes), or the user can define any legend that they would like. Figure 3 shows an example of some legends and class posting of 2 variables at the one sample site. In the example, the upper of the two is a perspective view where the symbols are offset and the lower is the normal orthogonal view. It is possible to post 4 values at the one point but two values are probably the maximum number of symbols that should be displayed.

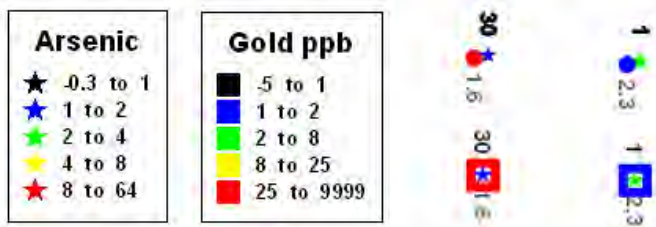


Figure 3: Legends and classed post examples.

Contour and Related Maps

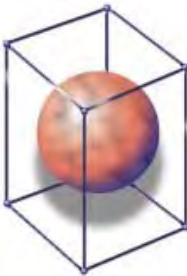
The production of grid based maps is a three stage process.

- 1. Gridding.** The gridding process can be as simple or complex as you would like. Twelve different methods are provided, each with many parameters which can be set. I usually just use the default kriging option and just set the cell size parameters.
- 2. Blanking.** Surfer does not automatically limit the grid to established data points. Thus, if you have a non rectangular data set you will need to create a "blanking file" using the Digitise option on the map menu. This file will be used to remove nodes which project beyond the actual data area.

3. Map Production

Contour maps are the most applicable to geochemical data. The user has complete control over the process (e.g. lines, fill, legends, labelling). **Image Map & Shaded Relief Maps** are more applicable to topographic or geophysical data. **Vector maps** are generated from the grid and can be used as a map layer on a 2D map, or on a wire frame map as depicted in Figure 2. **Wire Frame maps** are most applicable for introducing 3D topographic aspect into the geochemical plot. Figure 4 illustrates this type of plot.

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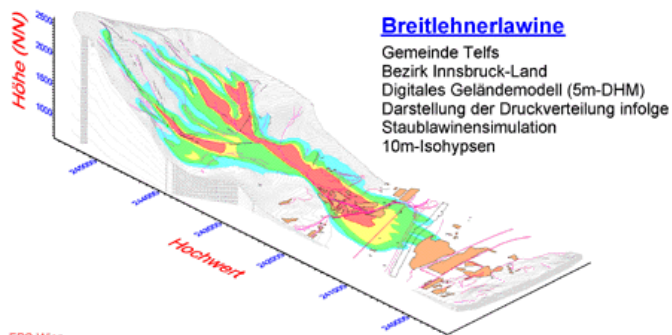


Figure 4: Wireframe map with draped contours.

Other Surfer Applications

While the most common applications used are map production, Surfer can be readily adapted to other uses.

Surfer is ideal for the production of posters because of its flexibility in handling a wide variety of images and data types. The poster can be built on a large format (A0) sized plot using material sourced from Surfer or imported from other software packages.

Cross sections can be easily produced if you have the 3D coordinates. Plotting of cross sections is assisted by the fact that the two plot axes can be individually scaled allowing you to vertically exaggerate the plot which is essential for displaying closed spaced data in drill holes. Post plots or symbol plots (using the filled square) are the simplest, although more sophisticated plots are possible with data preparation outside Surfer. Figure 5 illustrates an example of drill intercepts which have been converted into short line vectors written to a DXF file and imported as a map into Surfer. The same processing can be used to produce stream "worm" maps.

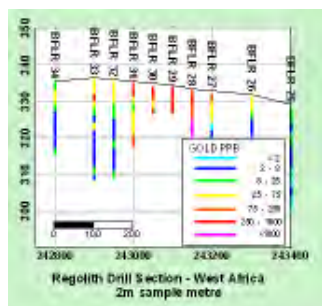


Figure 5: Geochemical Drill Section

Surfer is not specialised for plotting graphs but it is excellent for producing any non-log XY or Ternary diagrams. The ternary base shown in Figure 6 is an image; you could use any type of vector format as well. You need a mechanism for calculating the XY coordinates for the Ternary System (e.g. Excel). The advantage of Surfer for this type of plotting is that you have full control over the posting variable. A fourth variable may be gridded and contoured in this coordinate space and as an overlay to the diagram. Additionally the drawing tools can be used to enhance the plot.

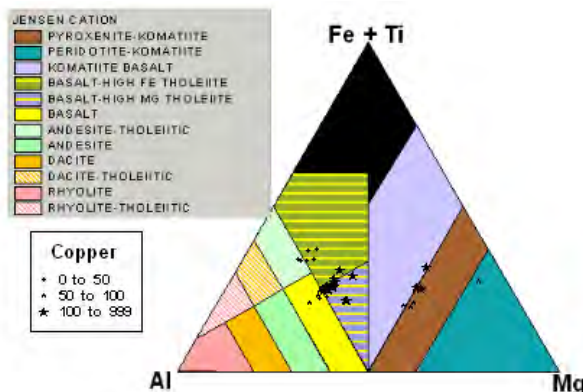


Figure 6: Jensen Cation Ternary Diagram with Classed Post Overlay.

Hardcopy plots may be made to any Windows-supported plotting device. Vector and Raster Export can be made to most of the above formats available for input.

Summary

Surfer is a software package suitable for everyday plotting and presentation of geochemical data but is also adaptable to the limits of the user's imagination for wide variety of other applications. This review has highlighted briefly some of the aspects of Surfer that are of most use to a geochemist. Some of the illustrations have been borrowed from the Golden Software site (www.goldensoftware.com) which has additional information about Surfer and some spectacular examples of plots which have been produced by users.

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Rock Works and Exploration Office. Two affordable geologic software options

If you ever had any doubts about using a computer for fieldwork, the affordable RockWorks 2002 and Exploration Office software will change your mind. These two programs provide a convenient and fast means to collect data in digital form, draw log plots, base maps, cross sections, and create solid and stratigraphic models. A geologist can identify surface and subsurface geology while still in the field and can make informed decisions about whether more data is needed and where to collect it. When the fieldwork is done, the programs continue to be just as useful in the office as in the field.

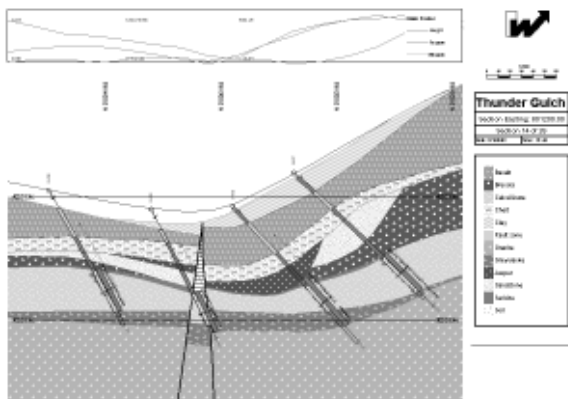
Besides affordability, field geologists and engineers also want software they can learn in an afternoon, functions that are easy to set up and execute, and results that are representative and make sense. RockWorks and Exploration Office supply a full set of geological tools that run well on laptop computers. *RockWorks* software offers drill hole data analysis, 2D and 3D mapping, geologic modeling, log plots, cross sections, statistics, geochemical and geophysical analysis, and a wide variety of geological tools. *Exploration Office* consists of three parts: Downhole Explorer for drill hole data handling, log plots and sections; Terrain for surface modeling and viewing in 2D and 3D; and Viewpoint for displaying models and data in 3D.

These programs supply field and office geologists and engineers with these tools:

Ability to build and access a database containing log information, quality analysis and any other data.

Both programs provide data handling with basic editing capabilities and user-defined fields.

- RockWorks software provides a spreadsheet format for entering any field data. Text data can be readily imported from ASCII files, spreadsheets (such as Excel), and most major databases (such as MS Access).
- Downhole Explorer imports text data, directly interfaces with ODBC databases (such as MSAccess) and imports formats from specialized software such as Datamine, Vulcan, Gemcom, DataSched, ESRI, GDM, Medsystem, Micromine, Surpac, CAD formats, and several others.



Cross-section with inclined drillholes created in the Downhole Explorer component of Exploration Office

Plot base maps, logs, sections, plot contour maps.

Both programs use database information to deliver quality graphical displays and plots. Both packages can handle deviated drill holes.

- RockWorks offers flexibility and a complete set of options for producing 2D and 3D log plots, cross sections, fence diagrams, drillhole location maps, and contour maps generated from a variety of gridding and triangulation methods.
- EO has excellent cross section plot and display capabilities. With ease, it will display sections in different directions and automatically page through successive sections. Contour maps are produced in Terrain from gridded or triangulated data.

Build models and display as plans, sections, 3D views.

3D viewing in both programs lets you turn on/off various parts of a model, rotate in 3D, render, and use other graphic effects to help show and evaluate interpretations.

- 2D and 3D models can be built and displayed with RockWorks.
- Models can be imported and displayed in Exploration Office.

The greatest challenges to producing accurate models with computer software are:

- Getting data entered quickly, efficiently, and accurately
- Correctly interpreting geology and other significant units
- Adjusting a model until it is "correct".

Data. The biggest hurdle and most time-consuming task is building a project database, whether you start with DrillHole No. 1 or already have existing digital data. RockWorks2002 and Downhole Explorer both provide a flexible spreadsheet-style interface for creating and importing/exporting data. Downhole Explorer provides details about import file formats and also connects 'live' to ODBC databases. When data is changed in an ODBC database, the program automatically updates all plots in the project - a great time-saver.

Interpretation. Log plots, cross sections and plan maps help build a picture of subsurface geology or other conditions such as a contamination plume or water occurrences. RockWorks and Exploration Office include geological interpretation tools to plot drill holes in plan and section, and identify strata or other characteristics. With RockWorks, the user picks stratigraphic tops with a mouse, then the program auto-correlates the stratigraphy in cross section. If a stratum does not exist in a log, the section shows a 'pinch'. In Downhole Explorer, the user draws all correlations and geological interpretations, then can easily page through successive sections.

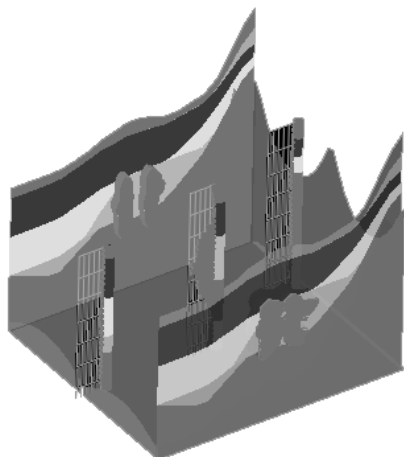
Model. RockWorks has 2D and 3D model building capabilities and works best with stratigraphic models and disseminated deposits. Exploration Office accepts models created with other software. Tools available in these programs include the ability to show or hide data to emphasize or de-emphasize characteristics and reveal features that would be missed otherwise.

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*RockWorks2002
OpenGL 3D viewer
showing a model of
MVT Pb mineralization
in a brecciated
dolomite layer*

Some capabilities of RockWorks and Exploration Office overlap, but the programs have different strengths and applications.

- RockWorks is best used for stratigraphic deposits, geologic modeling, and for a variety of data analyses. It has a broad range of geological utilities, including rose diagrams, Piper and Stiff diagrams, and much more. When displaying a 3D model, it is easy to strip layers that show iso-surfaces representing grade or concentration differences. Objects can be appended and bitmaps shown.
- Exploration Office is particularly useful for companies who use specialized software (like higher end mining packages) and need to access ODBC and proprietary databases for fieldwork and to add or view model data. Viewing sections and models is easy and flexible. The classic method of 'stepping' through sections or plans is an attractive feature.

For an expenditure of less than \$1700 a field computer can be supplied with geological interpretation software for almost any project. Pencils, paper, a laptop, and Rockworks or Exploration Office are all the tools anyone needs to have productive field seasons, produce believable interpretations, and deliver a digital product ready to use for further planning. Many large companies are effectively using these inexpensive programs to complement more complex and training intensive software packages. Field personnel are using the programs with a minimal amount of training. The affordable price makes these programs a good choice for geologists in any size company who need quick results but don't have time to learn complex software.

Using RockWorks or Exploration Office for exploration and field data gathering and analysis is worth serious consideration. Both programs are available from RockWare, Inc. Demos and trial ware are available for download from the web site: <http://www.rockware.com>.

Betty L. Gibbs, President
Gibbs Associates

<http://www.earthsciswinfo.com>

Email: mining@earthsciswinfo.com

Starpal – GPS Enabled Software for Field Data Collection

Starpal software runs under both Windows and Windows CE. It is a GIS-GPS application, which is ideally suited to field navigation, mapping and sampling. If these activities are being run from a vehicle then the software could be run on a notebook but normally you would run the software on a Windows CE PDA such as a Compaq IPAQ or HP Jordana. The PDA is linked to the GPS by way of a cable or joined cables. If you use the cable supplied by the PDA manufacturer to connect to the RS232 port of your computer for downloading, then this will need to be connected to the normal GPS download cable by means of a "Null Modem" joiner. These are available at places like Tandy electronics. Special single cables can be purchased from specialist cable manufacturers as well (www.gpsoz.com.au). Any GPS, such as the Garmin 12XL, that will send a NMEA output string is suitable.

There are two aspects to the use of this type of system (Navigation and Data Collection).

Navigation

While it is not necessary to have topographic information for navigation, it makes this type of system a lot more useful. The topographic data can be either raster or vector.

Raster - BMP, JPEG and TIF files with associated world files are supported.

Vector - Point, line and polygon themes can be loaded in either Arcview (.SHP) or Mapinfo (.MIF) formats.

Starpal will project on-the-fly so these files can be either latitude-longitude or projected UTM. To start, you load the layers that you need for navigation (streams, roads, geology etc), then connect the PDA to the GPS (output mode set to NMEA). In Starpal, select GPS on and once contact has been made a cursor appears on the screen, indicating the current position. You have all the normal functions such as zoom and pan, but normally it is best to select the option which shifts the navigation layers as you move off the edge of the screen re-centring on the next part of your topography.

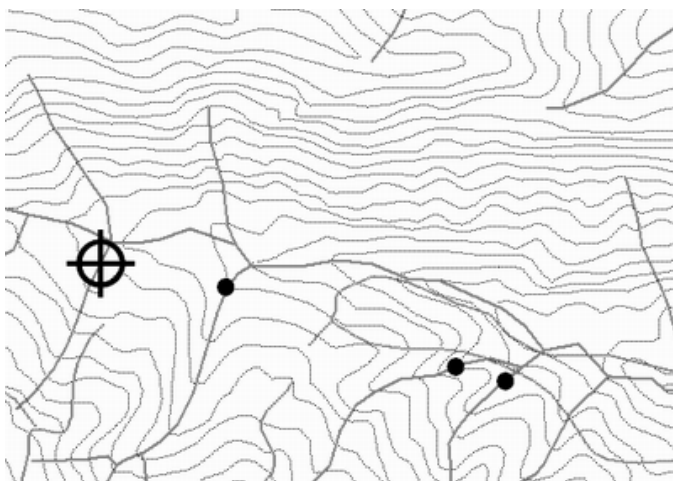


Figure 1 shows a typical navigation screen in which loaded vector layers of roads streams and contours appear on the PDA screen. The round dots are previously sampled sites and the operator is at the stream site at the cross hairs.

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Data Collection

Data collection simply uses another vector layer, which can either be a DBF, SHP, or MIF file. The latter allows for the collection of multiple object types (point, line, and polygon) in the one file. Points are used for geochemical sampling, and lines and polygons are used for geological mapping or recording tracks or roads.

You can use the software to create data entry templates, or if you use software that will create and/or modify DBF files (Paradox, Arcview, Mapinfo, Access), you can easily clone new templates from an uploaded table created in Starpal on your PDA. Excel is not suitable because it does not retain the format of the critical latitude longitude variables. You can upload a DBF file from any of those sources and use it as a template or as a data file to which new data will be appended.

If the file is loaded as a template then the application will create a new empty table with the fields in the DBF used as a template. In addition, all data in the fields will be used as look-up data for that field, which can be accessed by a drop down at the time of data entry. The table to be used as a template can therefore have fields pre-filled with the required entries for geology or other attributes, which means that you will be spared typing using the stylus at the time of data entry.

Collecting Data

With a suitable data collection layer loaded and the GPS operational, it is just a matter of tapping the point, line, or polygon symbol on the floating menu bar which will record the current GPS location to the file (Figure 2). Once the point has been recorded it is just a matter of selecting the table symbol on the menu bar and entering the data (Figure 3).

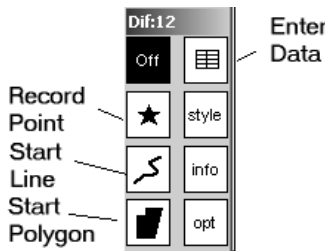


Figure 2: Floating GPS data entry tool bar

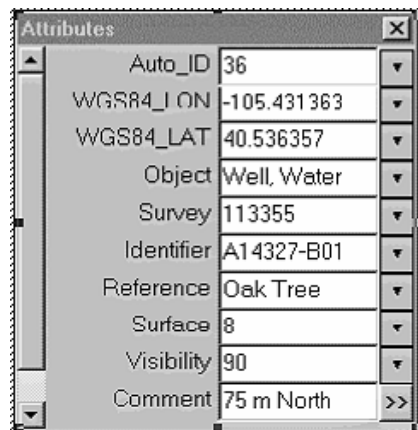


Figure 3: Data entry form with drop down pick lists.

As indicated above, if the template file contains lists then these will be available as drop downs on the form. Additionally, all unique values that the user enters in a field will be added to the drop down list, which always has the last recorded value at

the top of the list. This means you do not have a problem if you have neglected to put all the rock types into your template.

Periodically you should save the file from memory, as it will be lost if the batteries go flat. When saving you are given the option of saving the file as a DBF (points only) or a SHP or MIF file. These files can then be uploaded to your computer at night and used directly in your GIS or other software package.

Point data is easiest to collect because each point is a separate entity. The recording of location information can be either manual (as described above) or automatic. In the case of automatic recording, the trigger is either time or distance. You can therefore get the software to record the location automatically every 10 seconds or every time you move 50m from the previous point. This mode is most useful if you are creating lines or polygons by walking around an outcrop or along a fault or contact. It is also very useful for collecting topographic information, such as tracks where the system automatically records your route as you drive, ride, or walk along.

Things to Watch

I have used the software for two years and it is robust. It is rare for it to crash, but as with any software, it is best to save the file regularly. The main problems you are likely to have are with the hardware, particularly the PDA.

- These are not waterproof, and while they will handle a bit of moisture it can be a problem. This usually manifests itself as the screen becoming unreadable. By this stage you will have saved the file, but will have to resort to the GPS and paper to finish the day and spend time in the evening drying the PDA out.
- The other main issue is the batteries. This is not an issue in a vehicle where you can use a cigarette plug adaptor for power. If you are on foot, it is best to carry a spare main battery as they only last for 4-8 hours. More critical is the lithium back-up battery (small disk). These do not go flat very often but if they do all the files and programs will be erased. This is not such an issue if your software and data are stored on a memory card.
- Watch your GPS setting. Invariably, if your GPS and PDA are on and not communicating, you have the GPS set to GARMIN/GARMIN rather than NMEA/NMEA. If you lose the signal after start up and it is not due to poor satellite coverage, check the Null Modem cable join.

Summary

The use of this type of system for fieldwork greatly improves efficiency and can change the way you work. As you always know where you are, you can concentrate on the geology and the sample collection. It is also great for resolving issues with topographical maps in countries where information about the projections, etc., are sparse. Additional information on Starpal is available at www.starpal.com.

Richard Carver

Gcxplore Pty Ltd
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 Phone (618) 92279905
 Email Richard.carver@gcxplore.com



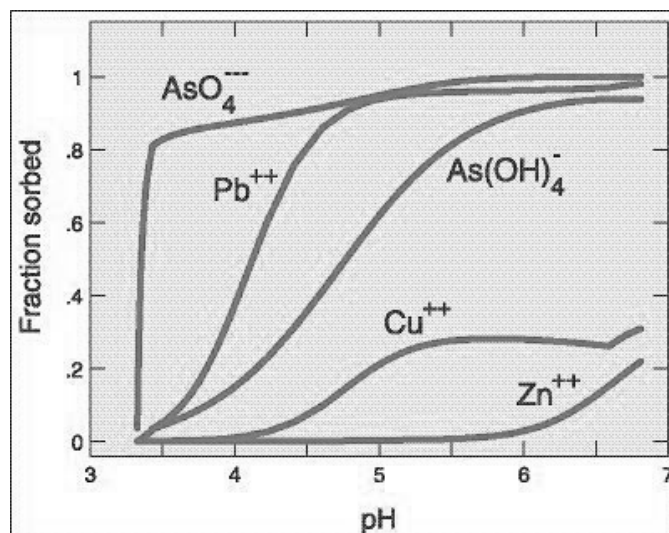
Computer Software...

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The Geochemist's Workbench® - a geochemical modeling tool kit

The Geochemist's Workbench® as the name suggests, is a collection of tools for solving a variety of problems in geochemistry. It is capable of assisting with a wide range of chores, from everyday tasks – such as balancing reactions and calculating equilibrium constants – to developing sophisticated models of natural systems. The MS Windows®-based software, informally known as the *GWB*, contains modules for balancing reactions, creating phase diagrams, calculating speciation and modeling reaction processes. *GWB* can be used in both low-temperature aqueous and higher temperature hydrothermal settings, and therefore has broad application in the mineral industry, spanning research, exploration, production, and environmental remediation.

React, the most versatile and powerful module in the *GWB*, makes quick work of reaction path modeling. The user sets up an initial system, consisting of an aqueous fluid and perhaps coexisting minerals and gases. Next, he specifies a reaction path, that is, a process that affects the system's composition or temperature, or both. *React* calculates the equilibrium state of the initial system, predicting the distribution of dissolved mass among inorganic and organic aqueous species (this is known as speciation). It then steps along the reaction path in a user-specified number of increments, until the system reaches its final state. The user visualizes how the system evolved along the reaction path with the *GWB*'s powerful graphic tools. It's a simple matter to diagram parameters such as the fluid's saturation state with respect to various minerals, evolution of gas fugacity, variation in pH and oxidation state, and sorption of aqueous species onto a mineral surface (see inset).



A plot created in *React*: metal sorption onto ferric hydroxide formed during neutralization of acid mine drainage, calculated according to two-layer method

The user can build a surprising level of complexity and reality into a reaction model. *React* can account for:

- Reaction kinetics according to any rate law; users can simply type out the equation's form.
- Redox equilibrium and oxidation-reduction reactions.
- Solutions spanning a broad range of ionic strength, using Debye Hückel-type activity coefficients, or at high salinity, the "Pitzer equations".
- Sorption onto mineral surfaces according to two-layer surface complexation model (including constant capacitance and constant potential methods as well as the full model), ion exchange, distribution coefficients (K_d s), and Langmuir isotherms.
- Microbial metabolism, including the growth and decay of microbes and their effect on system geochemistry.
- Catalysis, enzymes, and biotransformations.
- Stable isotope fractionation.

Three modules – **Act2**, **Tact**, and **Rxn** – complement *React*. *Act2* calculates and plots stability diagrams on activity and fugacity axes, while *Tact* creates temperature-activity and temperature-fugacity diagrams. With these modules, plots on axes of Eh, pe, pH, species activity, and gas fugacity can be generated in seconds, saving hours of tedious work. The user can overlay on his diagram scatter plot data from laboratory analyses, and project onto his plot the trace of a reaction path calculated with *React*. The module *Rxn*, among other things, makes quick work of balancing reactions and calculating equilibrium constants.

Applications of The Geochemist's Workbench® in the minerals industry are numerous and diverse. *GWB* can be applied equally well to study low temperature aqueous solutions and hot hydrothermal fluids. It can be used to model processes such as sediment diagenesis, evaporation, and acid drainage; turn any reaction into a geothermometer; evaluate reaction kinetics and the fractionation of stable isotopes. Mark Logsdon, Geochimica, Inc., provides useful insight into the package's real-world application:

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SGS-XRAL Laboratories
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Internacional
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Tel: (52-62) 106535
Fax: (52-62) 100350

Sample preparation: Flin Flon (Manitoba), Saint John (N.B.), Red Lake, (ONT), Grand Falls, (NFLD), Tumeramo (Venezuela), and Ulaanbaatar (Mongolia).

Laboratories: Ecuador, Bolivia, Brazil, Chile, Ghana, Zimbabwe, Kazakhstan, Europe and elsewhere.



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Computer Software...

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"Since 1998, The Geochemist's Workbench has become the standard set of geochemical modeling tools for Geochimica, Inc. (Ojai, CA, USA). Typical applications in our practice include:

- Evaluating the geochemical evolution of a water body in a mine pit at closure under high evaporation conditions (southwestern U.S.).
- Evaluating geochemical controls on secondary minerals near the surface of a tailing impoundment undergoing seasonal wetting and drying (southwestern U.S.).
- Modeling column tests and field data for ARD reacting with calcite-bearing alluvium (southwestern U.S.).
- Evaluating stability of tailing byproducts under conditions of submarine tailing disposal (Offshore).
- Evaluating options of mixing waste streams during remediation of a tailing-dam release (Europe).
- Evaluating aqueous geochemistry of zinc during waste-rock weathering (Andes).
- Evaluating aqueous geochemistry of copper during waste-rock weathering (southwestern Pacific).

We use the GWB tools because of their simplicity and power, particularly when combining results through the graphical interfaces for presentation."

Discussion of the power and versatility of the GWB should be tempered by certain realities. The user may need to compile

thermodynamic data specific to his problem, especially when working with highly saline brines or fluids over 300° C (The default thermodynamic database used by GWB is a broad compilation from Lawrence Livermore National Laboratory database, although several others are included, and all are easily modified and extended.). The user should have a strong grasp of the geochemistry of natural systems, or at least a keen interest in developing one. Properly conceptualizing and constructing a geochemical model of a natural system is critical, as is assessing the uncertainty in the model. Uncertainty in sample analyses, thermodynamic data, and rate laws, as well as a proper characterization of equilibrium in the system need to be taken into account. GWB's latest release, version 4, features an easy-to-use graphical user interface that provides significant feedback to the user and eliminates some of the difficulty in constructing a model.

We have found the GWB code to be remarkably reliable and bug-free. The software, developed by the Hydrogeology Program at the University of Illinois, has been in existence since 1991, is very stable, and frequently updated. A single user license is available for sale from RockWare, Inc. at \$2999 (\$1599 academic). For more information, please visit: <http://www.rockware.com/catalog/pages/gwb.html>.

Tim Menzelaar

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2221 East Street, Suite 101

Golden, CO 80401, U.S.A.

Phone (303) 278-3534 x104

Email tom@rockware.com



SEMINARS

The AEG is delighted to announce the availability of recorded lectures by Dr. Clemens Reimann, AEG Distinguished Lecturer for 2002. Dr. Reimann presented two lectures at the Colorado School of Mines earlier this year on two topics: *The Kola Geochemistry Project: An environmental investigation in Arctic Europe*; and *Geochemical Provinces: Do they exist and what is their relation to regional Geology*. We thank Clemens Reimann for agreeing to make these presentations available and for his successful tour as AEG's Distinguished Lecturer.

The Kola project presentation describes the work behind the collaborative volume, "Environmental Geochemical Atlas of the Central Barents Region". This beautifully illustrated work was completed by the geological Survey of Norway, the Geological Survey of Finland, and the Central Kola Expedition from Russia. The atlas documents regional multi-element dispersion patterns in moss, humus, B-horizon soils, and C-horizon soils over approximately 225,000 square kilometers on the Kola Peninsula.

The Geochemical Provinces presentation is a stimulating discussion of the significance of large scale, regional element patterns seen in nature, along with descriptions of several of these.

The presentations are available on CD-ROM media, and played readily using Windows Media Player. The AEG business office has agreed to facilitate distribution of the CD's and interested parties should contact Betty Arseneault in Ottawa for payment and mailing details.

Betty Arseneault, Business Manager: Tel: (613) 828-0199
Email: aeg@synapse.net





6th INTERNATIONAL SYMPOSIUM ON ENVIRONMENTAL GEOCHEMISTRY

The 6th International Symposium on Environmental Geochemistry will follow on from previous symposia held every three years, the most recent being at Vail, Colorado, USA (1997) and Cape Town, South Africa (2000).

The Edinburgh Symposium under the chairmanship of John Farmer and involving the participation of AEG, BGS, IAGC, IMM, IWGMG and SEGH, will bring together geochemists, environmental chemists, biologists, soil scientists, aquatic scientists and medical specialists. The main themes for the scientific programme will be:


- Archives of Environmental Contamination
- Geochemical Surveys
- Mining
- Contamination and Cleanup
- Geochemistry and Health
- Analytical Geochemistry

For further programme and registration details, visit our website on www.iseg2003.com.

The call for papers will be distributed in early summer 2002.

For further details contact:

Janet Beard
In Conference Ltd
10b Broughton Street Lane
Edinburgh EH1 3LY, Scotland, UK
Tel: +44 (0)131 556 9245
Fax: +44 (0)131 556 9638
E-mail: Janet@in-conference.org.uk





Software Recommended for Geochemists

Product	Description	Cost US \$
FIELD DATA CAPTURE		
	Software running on a PDA eg Compaq IPAQ which is connected to a GPS allowing real-time navigation and data collection	
Starpal	Starpal is a compact GIS that runs on PDAs. Both vector and image files can be used for navigation. Field observation and locations (captured from the GPS) can be easily recorded. Uses Arcview .SHP and Mapinfo MIF files for data display and capture. Captured point data can also be placed in .DBF files www.starpal.com	\$299
Arcpad	Arcpad is similar to Starpal in its operation. As it is an ESRI product it integrates well with Arcview. www.esri.com	\$495
GIS		
Arcview	www.esri.com	\$1195-\$1500
Mapinfo	www.mapinfo.com	\$1499
Manifold	Fully featured GIS package which imports and exports Arcview and Mapinfo files. Worth considering if the budget will not run to the heavy weights in this class. www.manifold.net	\$245
Map Viewer	MapView is an affordable analytical tool that allows you to produce publication-quality thematic maps easily. www.goldensoftware.com	\$249
Global Mapper	View, merge, import and export a wide variety of vector, raster and elevation GIS data sets. www.rockware.com	\$129
Mapping		
Rockworks	Comprehensive surface and subsurface mapping software. Post maps, contour and grid maps, solid models, volumetrics, boring logs, cross-sections, fence diagrams, stratigraphic block models, statistics, stereonet, rose diagrams, Piper and Stiff diagrams, ternary diagrams, coordinate conversion. www.rockware.com	\$999
Surfer	Comprehensive mapping software – gridding, variograms, post and contour plots, 3D wireframe and surface maps, shade relief maps, images as base maps. www.goldensoftware.com	\$599
GeosoftChimera	Extensive range of applications –gridding, mapping (contour, post and images), line profiles, management imaging, statistics. Crosses the boundaries into the areas of GIS, image processing and statistics and data management. www.geosoft.com	
DATABASE		
Access	Most popular database. Most commonly used for storage and display of data. Application development is by way of Visual Basic. www.microsoft.com	\$340
Paradox	Integrated database and application development. Uses .DBF files or Paradox .DB tables. www.corel.com	
Foxpro	Integrated database and application development. Uses .DBF files. www.microsoft.com	\$549



Software Recommended for Geochemists

Product	Description	Cost US \$
STATISTICS		
<i>Fully featured commercial statistical packages with numerous statistical processes, data management and graphing</i>		
Statistica	www.statsoft.com	\$1190
Statgraphics	www.statpoint.com	\$1195
Systat	www.systat.com	\$1299
SPSS	www.spss.com	\$1498
<i>Cheaper commercial, shareware and free statistical applications. They provide an adequate range of statistical functions but lack the fancy graphs</i>		
Xlstat	Statistical add on for Excel. www.xlstat.com	\$195
NCSS	Full range of statistical functions. www.ncss.com	\$399
DBStat	Shareware stats package which operates on Dbase files. www.dbstat.com	Shareware
Openstat2	Full range of univariate and multivariate stats. Uses csv text files for input and output. openstat.homestead.com/OS2.html	Freeware
GRAPHING		
SigmaPlot	One of a number of top end scientific graphing packages. Difficult to justify at the cost for normal geochemical work where the graphing is best provided by Excel, the packages below or a statistical package if you go for the top end products. www.spss.com	\$699
Grapher	Comprehensive graphing package with a wide range of plot types including box and whisker plots, ternary plots and rose diagrams. www.goldensoftware.com	\$299
Harvard Chart XL	Low cost simple to use (csv text data files) Numerous plot styles including Box and Whisker. www.harvardgraphics.com	\$135
SPECIALIZED		
Geochemist's Workbench	A set of software tools for manipulating chemical reactions, calculating stability diagrams and the equilibrium states of natural waters, tracing reaction processes, and plotting the results of these calculations. Most applicable for geochemical research and environmental applications. www.rockware.com	\$2999
Proplot	An Interactive Computer Program to Fit Mixtures of Normal (or Log Normal) Distributions with Maximum Likelihood Optimization Procedures (C.R. Stanley). Available from the AEG	\$30 Members \$55 Non Members
Pgraph	A probability plotting program in which the user interactively selects and moves the break points until a perfect fit is achieved Philip.baker@bigpond.com	\$30
DataDesk	A combination of Exploratory Data analysis, statistics and graphs. Interactively linked graphs. www.datadesk.com	\$650
Textpad	A powerful, general purpose editor for plain text files. It has been included because as one of its many features in a block edit mode in which columns can be highlighted and search, replace etc can be restricted to the column which is very useful for editing tabular data. Shareware. www.textpad.com	\$27



Geochemistry Web Sites of Interest

The following column highlights some of the favorite geochemical and technical web-sites of our members. If we have missed your favorite technical sites and would like to contribute, please send site addresses with a brief description along to the editor, and we will include them in our list. This list is of course provided for information only; AEG and the editors do not endorse nor specifically recommend any of the service providers.

Geochemistry Link Sites

(offering a variety of other Geochemistry sites)

www.aeg.org Association of Exploration Geochemists
<http://www.geo.cornell.edu/geology/classes/Geochemweblinks.HTML> Cornell University

Geochemical Standards

www.nrcan.gc.ca/mms/canmet-mtb/ccrmp/ - This is the Canadian Certified Reference Materials Project home page. There is a price list and summary information on CANMET standards here.

www.iaea.org/programmes/nahunet/e4/nmrm/index.htm
 This is the International Atomic Energy Agency's database of natural reference materials home page. Here, you can browse by periodic table to find CRM's from around the world that are certified for each element. It is fairly comprehensive.
<http://ts.nist.gov/ts/htdocs/230/232/232.htm> - The NIST also has a page covering standard reference materials.

www.oreresearch.com
 Ore Research & Exploration Pty Ltd (Commercially available geochemical standards).
<http://geoanalyst.org/> Reference Standards

Geochemical Laboratories

www.actlabs.com ACTLabs Laboratory
www.acmelab.com ACME Laboratories
www.alschemex.com ALS-Chemex Laboratories
<http://www.genalysis.com.au/> Genalysis Labs
www.sgs.ca SGS Labs

Geochemical Software

See Table assembled by Richard Carver in this issue of Explore detailing these and other useful software web sites.

www.geosoft.com Geosoft (Oasis Montaj)
www.esri.com ESRI (Arcview)
www.rockware.com Rockware (Geochemist's Workbench)
www.statsoft.com Statsoft (Statistica, Statistica Neural Networks)
<http://www.delorme.com/> Consumer Mapping Products
www.starpal.com Starpal
www.mapinfo.com MapInfo
www.manifold.net Manifold
www.goldensoftware.com Golden Software (Surfer, Grapher, Didger, MapViewer)
www.visidata.com.au Interdex
www.statpoint.com Statgraphics
www.systat.com Systat
www.spss.com SPSS

Geochemical Field Supplies

<http://www.cgsmule.com/> CGS Field Supplies
www.coleparmer.com Chemical and Field Supplies
www.esupplyshop.com Field Supplies
www.geosourceonline.com Field Supplies
www.benmeadows.com Chemical and Field Supplies
www.geologistica.com Field Supplies

Mineralogy and Geology

www.webmineral.com
 In addition to the excellent mineralogy information, enough for even the biggest geek or crystallography fanatic, what is most wonderful for geochemists is the "Chemical Composition" button because it brings up a periodic table from which you can index ALL minerals containing any element. The resulting table is sorted by decreasing abundance of the element in the given mineral! This is very, very useful when trying to figure out the possible mineral source of an interesting geochemical anomaly. Of course, it doesn't include all the various adsorption and substitution possibilities in weird secondary or hydrothermal mineral phases that contain trace elements, but it does a reasonable job with solid solutions. It's at the very least a great place to start when wondering where that thallium in your sample might have come from or just how much zinc should be in your average gahnite.

<http://minerals.net/mineral/> The Minerals and Gemstone Kingdom - complete information guide to minerals.

<http://www.smenet.org/opaque-ore/> Virtual Atlas of Opaque minerals
<http://www2.cri.enscm.fr/gm/listeesp.html> Mineral Species, 3700 descriptions, some with images, sorted alphabetically.

<http://www.sdnhm.org/fieldguide/minerals/> Minerals Field Guide, San Diego Natural History Museum

<http://www.uvminerals.org/index.html> - This is the home page of the fluorescent minerals society. There is useful information here about fluorescing minerals and how to identify them.
<http://www.uni-wuerzburg.de/mineralogie/links.html>

Links for Mineralogists
<http://visibleearth.nasa.gov/> Satellite Images of Earth
<http://geology.net> Earth Science information and software

Libraries, Publications, Books, Reference

<http://www.webelements.com> A very comprehensive, award-winning Periodic Table for chemists
www.chemsoc.org/viselements/pages/periodic_table.html

Periodic Table
<http://www.carl.org> Public Library Database
<http://132.156.35.177:81> Geoscan - Searchable database of Canadian geoscience publications

<http://www.blackwell-science.com/~cgilib/jnlpage.asp?Journal=xajes&File=xajes&Page=aims>
 Australian Journal of Earth Sciences

<http://www.nrc.ca/cisti/journals/mineral/>
 Canadian Mineralogist Journal Abstracts

http://www.duke.edu/~boudreau/IPS_Abtracts.htm
 Complete set of extended abstracts for the July 2002 Pt Symposium, Montana USA.

Web Sites of Interest..

<http://www.northernminer.com> — continued from Page 26
The Northern Miner
www.abebooks.com - This is the best source I've found for out of print and other hard to find technical books. Far from perfect, but because it links many retailers together under one umbrella, your odds of success are good.

Language Translation

<http://world.altavista.com/tr> - This is a neat little translation engine run by Babelfish software into which you can paste paragraphs, words, or sentences and get a translation into English from several languages and vice versa.

Geological Surveys, Associations and Conferences

<http://www.bgs.ac.uk/> British Geological Survey
www.brgm.fr BRGM
<http://www.dem.csiro.au/> CSIRO
www.gsc.nrcan.gc.ca Geological Survey of Canada
www.usgs.gov USGS
<http://minerals.usgs.gov/news/> USGS Mineral Resources Program newsletter.
www.segweb.org Society of Economic Geologists
www.seg.org Society of Exploration Geophysicists
www.pdac.com Prospectors and Developers Association of Canada

<http://sgag.gsa.org.au> Specialist Group in Applied Geochemistry as a specialist group of the GSA (Geol Society Australia).

<http://leme.anu.edu.au> CRC LEME (Cooperative Research Centre for Landscape Evolution and Mineral Exploration)
One of several organizations around Australia researching regolith, landscape evolution and mineral exploration.

<http://www.iseg2003.com/> 6th International Symposium on Environmental Geochemistry

<http://www.conferencepartners.ie/igesandnams2003>
AEG IGES2003 Conference

Environmental

www.epa.gov U.S. Environmental protection Agency (EPA). This site opens up into a myriad of subsites that will take days to investigate. For example, the 2002 Drinking Water Regulations and Health Advisory Tables are at www.epa.gov/waterscience/drinking/standards/. Lead in drinking water is at www.epa.gov/ogwdw/lead/index.html or one can simply begin with a specific element: www.epa.gov/arsenic.

The USGS also has an environmental group address for mining and even an arsenic working group that can be accessed through their general email address.

www.infomine.com Provides a variety of mining-related subsites from exploration to final processing. Acid rock drainage can be accessed through: www.infomine.com/technology/enviromine/ard/home.htm but the more general address is: www.infomine.com/technology/enviromine/ which will open into of subsites that include acid rock drainage.

<http://www.safedrinkingwater.com/html>. This site keeps up with environmental water chemistry on an elemental and worldwide basis. Anyone can subscribe to this free newsletter that comes out about once a month filled with links to even more information.



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CALENDAR OF EVENTS

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

■ October 28 - November 1, 2002, Technical Short Course: **The Environmental Review of Mines**, Iqaluit, Nunavut, Canada. Registration Deadline: September 13, 2002. Information: Michelle McChristie (867) 975-4548 Email: mcchristiem@inac.gc.ca or Paul Smith (867) 975-4550 smithp@inac.gc.ca.

■ October 27-30, 2002, **Annual Meeting of the Geological Society of America**, Denver, Colorado. INFORMATION: TEL 1-800-472-1988, meetings@geosociety.org.

■ November 20-23, **Role of Natural Resources and Environment for Sustainable Development in South and Southeast Asia (NESDA)**, Dhaka, Bangladesh. Information: Afia Akhtar, Geological Survey of Bangladesh, 153 Pioneer Road, Segunbagicha, Dhaka 1000, Bangladesh, 880-2-418545.

■ December 14-19, 2002 **Geochemistry of Crustal Fluids: The Role and Fate of Trace Elements in Crustal Fluids**,

Seefeld in Tirol, Austria, by the European Science Foundation. (Dr. J. Hendekovic, European Science Foundation, EURESCO Unit, 1 quai Lezay-Marnesia, 678080 Strasbourg Cedex, France, Phone: 33 388 76 71 35 FAX: 33 388 36 69 87 EMail: euresco@esf.org Web: <http://www.esf.org/euresco/02/lc02106>)

■ February 24-26, 2003, **Society for Mining, Metallurgy, and Exploration (SME) annual meeting**, Cincinnati, OH. INFORMATION: SME (sme@smenet.org). SME, Meetings Dept., P.O. Box 277002, Littleton, CO 80127, 800-763-3132. SME (sme@smenet.org)

■ March 12-14, 2003, **Geological Society of America, South-central and Southeastern Section meeting**, Memphis, TN.

■ March 23-25, 2003, **Geological Society of America, North-central Section meeting**, Kansas City, Mo.

March 27-29, 2003, **Geological Society of America, Northeastern Section meeting**, Halifax, Nova Scotia.

■ April 1-3, 2003, **Geological Society of America, Cordilleran Section meeting**, Puerto Vallarta, Mexico. INFORMATION: Elena Centeno, National University of Mexico, Ciudad Universitaria, Coyoacan, 04510 Mexico. Phone 525-622-4314, Fax: 525-550-6644.

■ May 04 - 07, 2003, **CIM Montreal 2003 - Annual General Meeting**, CIM Geological Society, Montreal,

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21st IGES Dublin, 2003

29th August to 3rd September, 2003

1st Announcement

- Technical Sessions
- Workshops
- Posters and Trade Exhibition
- Field Visits
- Social Programme
- Accompanying Persons Programme

For additional information please see the AEG website: <http://www.aeg.org>

Contact
If you have any questions, suggestions for the Symposium or would like to offer assistance to the Local Organising Committee please contact:

The Secretary LOC Eibhlin Doyle (e-mail eibhlin.doyle@gsi.ie)

The LOC comprises representatives from: the Geological Survey of Ireland; the Department of Communications, Marine and Natural Resources; the Environmental Protection Agency; the Irish Association for Economic Geology; and the Institution of

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2002 AEG Student Paper Competition

The Association of Exploration Geochemists will hold its fourteenth biennial Student Paper Competition this year. Papers eligible for the competition must address an aspect of exploration geochemistry and represent research performed as a student. The student must be the principal author, and the paper must have been published in any refereed scientific journal no more than five years after completion of the degree for which the research was performed. A nomination may be made by anyone familiar with the work of the student. Nominations must be accompanied by four copies of the paper. The deadline for receipt of the nominations is December 31, 2002.

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Mail to: Dr. Ian D.M. Robertson
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Bentley
WA 6102
AUSTRALIA

Phone: +61 8 9436 8690
FAX: +61 8 9436 8666
Email: ian.robertson@csiro.au

¹Full details are available from the Chairman of the competition (address above) or from the AEG Home Page under 'Students' (<http://www.aeg.org>)



Calendar of Events

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Quebec. INFORMATION: Prof. David Lentz - V.P. CIM Geological Society Dept. of Geology, University of New Brunswick, Box 4400, 2 Bailey Drive, Fredericton, New Brunswick, E3B 5A3 CANADA, Tel: (506) 447-3190, Tel: (506) 453-4803 - main office, FAX: (506) 453-5055, email: dlentz@unb.ca, www.cim.org.

■ May 7-9, 2003, **Geological Society of America, Rocky Mountain Section meeting**, Durango, CO.

■ May 12-16, 2003, **GeofluidsIV: Fourth international conference on fluid evolution, migration and interaction in sedimentary basins and orogenic belts**, Utrecht University, Utrecht, The Netherlands, by the Netherlands Institute of Applied Geoscience TNO-National Geological Survey. (Ms. J.M. Verweij, PO Box 80015, 3508 TA Utrecht, The Netherlands, Phone: +31 30 256 4600 FAX: +31 30 256 46 05 EMail: j.verweij@nitg.tno.nl Web: <http://www.nitg.tno.nl>)

■ May 18-24, 2003 **39th Forum on the Geology of Industrial Minerals**, John Ascuaga's Nugget Hotel & Casino, Sparks, Nevada, USA, by the Nevada Bureau of Mines and Geology, Nevada Division of Minerals, and Nevada Mining Association. (Terri Garside, NBMG/MS 178, University of Nevada, Reno, NV 89557-0088, Phone: 775-784-6691 ext 126 FAX: 775-784-1709 EMail: tgarside@unr.edu Web: <http://www.nbmgs.unr.edu/imf2003.htm>)

■ May 26-28, 2003 **2nd International Symposium on Contaminated Sediments : Characterisation, Evaluation, Mitigation/Restoration, Management Strategy Performance**, Loews Le Concorde Hotel, Quebec City, Quebec, Canada, by the ASTM (American Society for Testing and materials), CGS (Canadian Geotechnical Society), CSCE (Canadian Society of Civil Engineering). (Helene Tremblay, Département de géologie et de génie géologique, Université Laval, Phone: 1-418-656-2193 FAX: 1-418-656-7339 EMail: 2sisc@ggl.ulaval.ca Web: <http://www.scs2003.ggl.ulaval.ca/>)

■ June 1-5, 2003, **American Society for Surface Mining and Reclamation (ASSMR) 19th National Meeting and Billings Land Reclamation**, Billings, Montana. INFORMATION: Dennis Newman, dneuman@montana.edu, http://www.ca.uky.edu/assmr/Upcoming_Events.htm

■ July 12-18, 2003, **6th International Conference on Acid Rock Drainage (ICARD)**, Cairns, Australia; INFORMATION: Clive Bell, c.bell@mailbox.uq.edu.au or website http://www.ausimm.com.au/events/event_writeups/icard.asp

■ August 29 - September 3, 2003, **21st International Geochemical Symposium (IGES)**, Dublin, Ireland. Information: The Secretary LOC - Eibhlín Doyle (e-mail eibhlindoyle@gsi.ie). <http://www.conferencepartners.ie/igesandnams2003>.

■ August 31-September 4, 2003, **Emerging Concepts in Organic Petrology and Geochemistry**, The Banff Centre, Banff, Alberta, Canada, by the Canadian Society for Coal Science and Organic Petrology (CSCOP) & The Society for

Organic Petrology (TSOP). (Dr. Martin Fowler, Geological Survey of Canada, 3303-33rd St. NW, Calgary, Alberta T2L 2A7 Canada, Phone: 403-292-7038 FAX: 403-292-7159 EMail: Mfowler@nrcan.gc.ca Web: <http://www.cscop-tsop2002.com>)

■ September 7-11, 2003 **6th International Symposium on Environmental Geochemistry (ISEG)**, Edinburgh, Scotland (Janet Beard, In Conference Ltd. 10b Broughton Street Lane, Edinburgh EH1 3LY, Scotland, UK, Phone: 44-0-131-556-9245 FAX: 44-0-131-556-9638 EMail: janet@in-conference.org.uk Web: <http://www.iseg2003.com>)

■ September 16-18, 2003 **International Conference on Tectonics and Metallogeny of Central and Northeast Asia**, Scientific Hall, Russian Academy of Sciences, Academy Town, Novosibirsk, Russia, by the Russian Academy of Sciences and U.S. Geological Survey. (Alexander A. Obolensky, United Institute of Geology, Russian Academy of Sciences, Novosibirsk, Russia 630090, Phone: 7-3832-33-30-28 FAX: 7-3832-35-27-92 EMail: obolensk@uiggm.nsc.ru Web: www.uiggm.nsc.ru/uiggm/geology/admin/)

■ September 22-26, 2003 **7th International Conference on Gas Geochemistry**, Freiberg University - Conference hall "Alte Mensa", Freiberg, Sachsen, Germany, by the Freiberg University of Mining and Technology and Saxon Academy of Sciences. (Dr. Jens Heinicke, Saechs. Akademie der Wissenschaften /TU-BAF, B-v-Cotta Str. 4, Phone: +49-3731-392212 FAX: +49-3731-392212 EMail: heinicke@physik.tu-freiberg.de Web: <http://www.copernicus.org/ICGG7>)

■ October 5-10, 2003, **The XII International Mineral Processing Congress**, Cape Town, South Africa. Information: www.impc2003.org.za.

■ November 2-5, 2003, **Annual Meeting of the Geological Society of America**, Seattle, Washington. INFORMATION: TEL 1-800-472-1988, meetings@geosociety.org.

■ June 27-July 2, 2004 **11th International Symposium on Water-Rock Interaction**, Saratoga Springs, New York, USA (Dr. Susan Brantley, Secretary General, Dept. of Geosciences, The Pennsylvania State University, 239 Deike Building, University Park PA USA 16802, Phone: 814-863-1739 FAX: 814-863-8724 Web: <http://www.outreach.psu.edu/C&I/WRI/>)

■ Oct 10-15, 2004, **SEG International Exposition & 74th Annual Meeting**, Denver, Colorado, US, by the SEG. (Debbi Hyer, 8801 S. Yale, Tulsa OK 74137, Phone: (918) 497-5500 EMail: dhyer@seg.org Web: <http://meeting.seg.org>)

■ November 7-10, 2004, **Annual Meeting of the Geological Society of America**, Seattle, Washington. INFORMATION: TEL 1-800-472-1988, meetings@geosociety.org.

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

Virginia T. McLemore

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EXPLORE

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To All Voting Members:

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

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Coming soon in the AEG EXPLORE newsletter:

Technical articles and letters to the editor are encouraged as submissions for discussion within the newsletter. Each issue of EXPLORE contains a series of short discussion papers which provide either an update on a particular geochemical topic, or present current debates about issues of interest. Suggestions for future "Focus" topics may be forwarded to the editor, Mary Doherty (Email: MaryEDoherty@earthlink.net).

Issue: Focus topic and Contact:
 118 Geochemical Process Debate
 Barry Smee bwsmee@geochemist.com
Contributor Deadline November 30, 2002
Publication Date: January 2003

119 Laboratory Update and
 Geochemical Standards
Contributor Deadline February 28, 2003
Publication Date: April 2003

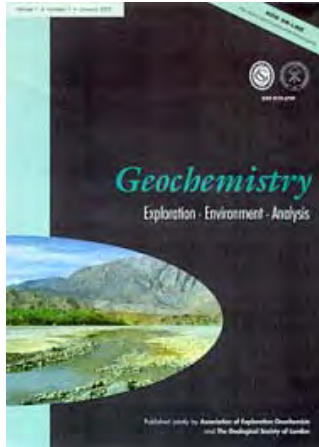
120 Environmental Geochemistry Update
Contributor Deadline May 31, 2003
Publication Date: July 2003

121 TBA
Contributor Deadline August 31, 2003
Publication Date: October 2003

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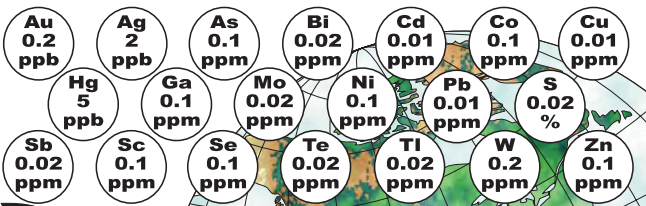
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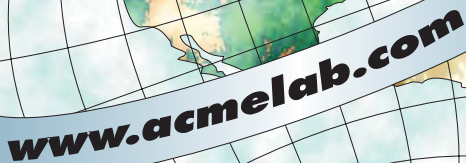
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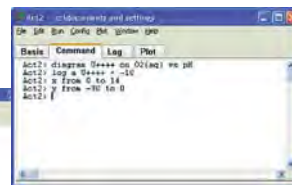
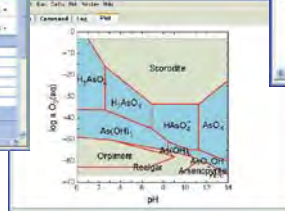
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