EXPLORE

Newsletter for the Association of Exploration Geochemists

NUMBER 94 JANUARY 1997

PRESIDENT'S MESSAGE

David Garnett

We enter 1997 in good shape. This is due to the commitment of time, effort and skills of many individuals, and I would like to acknowledge all who have contributed to this. In particular, my thanks go to Bill Coker who decided to make his year as challenging as possible by changing jobs as well as taking on the role of President. He has kept the Association of Exploration Geochemists (AEG) on a steady course in 1996 and I look forward to receiving his advice in the year ahead as he continues to serve on Council.

A special thanks also to Sherman Marsh, both as Secretary of the AEG and as co-editor of **EXPLORE**; Gwendy Hall as an indefatigable Treasurer; Eion Cameron as our financial advisor and Editor-in-Chief of the *Journal of Geochemical Exploration* (JGE); and Betty Arseneault, our Business Manager, all of whom have made a major contribution to the continuing success of the AEG. I would also like to acknowledge the contribution made by our retiring Councillors, and make special mention of Graham Taylor - our President in much of 1993 and 1994 - who obviously has Council blood running in his veins since he has just accepted the position of Vice President of the Australian Geoscience Council.

Renewal is vital in any organization and this has certainly happened with our Regional Councilors, ten of whom have been appointed in the last two years. They will become increasingly important as the AEG broadens its membership and I wish them well in their efforts to raise the level of enthusiasm for exploration geochemistry to even higher levels in their respective regions.

The AEG is a dynamic organization. This is clearly demonstrated in the demographics of our members: while our overall membership numbers remain much the same today as they were in 1991/92 the mix has changed in that we now have a greater proportion of members outside North America. In 1991/92 some 65% of our members came from Canada or the USA. Today that figure is under 50%, but that is balanced by increases in active exploration areas such as South America. The greatest increase has been here in Australia where we have seen membership jump by over one hundred to take us from 11% to over 20% of the total AEG membership in just five years. Why has this happened? The simple answer is that exploration geochemistry works well here. The more we understand about the underlying processes the better it works, and the better it works the more members we get - so long as we share our information, but more on that later.

Much of the research work which has driven this understanding has come from the CSIRO Division of Explora-

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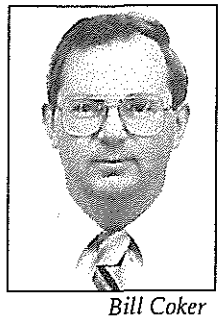
PAST-PRESIDENT'S MESSAGE



Bill Coker

It hardly seems like a year has past since I took on the role of President of the AEG. Things for the most part have been relatively quiet through 1996. However, the AEG and its members have been gearing up for a really busy 1997: at the 18th International Geochemical Exploration Symposium (IGES), Jerusalem, Israel, May 25-29, 1997, at the 4th International Symposium on Environmental Geochemistry (ISEG), Vail, Colorado, U.S.A., October 5-10, 1997, and at Exploration '97, Toronto, Canada, September 14-18, 1997. I hope to have the chance of meeting with as many of you as possible at these meetings.

During the course of my term as President, I have had a number of letters concerning the role and direction that the AEG should be undertaking regarding exploration versus environmental geochemistry. The AEG was built on an exploration focus with a mandate that environmental aspects of geochemistry should be very much part of the AEG's interest and responsibility but in context with the AEG's reason-for-being which is the advancement of geochemistry as an exploration tool. It is this exploration focus and the established exploration geochemical expertise and world-wide geochemical databases, which have been instrumental in the discovery of many mineral deposits, which makes exploration geochemists, with a strong background in the geosciences, the best people to deal with metals related environmental issues. Those who have an understanding of the geochemical characteristics of mineral deposits, which they in turn use to explore for and discover these deposits,

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Information for Contributors to EXPLORE

Scope This Newsletter endeavors to become a forum for recent advances in exploration geochemistry and a key informational source. In addition to contributions on exploration geochemistry, we encourage material on multidisciplinary applications, environmental geochemistry, and analytical technology. Of particular interest are extended abstracts on new concepts for guides to ore, model improvements, exploration tools, unconventional case histories, and descriptions of recently discovered or developed deposits.

Format Manuscripts should be double-spaced and include camera-ready illustrations where possible. Meeting reports may have photographs, for example. Text is preferred on paper and 5- or 3-inch IBM-compatible computer diskettes with ASCII (DOS) format that can go directly to typesetting. Please use the metric system in technical material.

Length Extended abstracts may be up to approximately 1000 words or two newsletter pages including figures and tables.

Quality Submittals are copy-edited as necessary without re-examination by authors, who are asked to assure smooth writing style and accuracy of statement by thorough peer review. Contributions may be edited for clarity or space.

All contributions should be submitted to:

EXPLORE
c/o J.T. Nash, Box 25046, MS973, Denver Federal Center
Denver, CO 80225, USA

Information for Advertisers

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

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

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

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EXPLORE

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Editors: Sherman P. Marsh (303) 236-5521
J. Thomas Nash (303) 236-5515
Assistant Editors:
Steve Cone (303) 232-8371
Anne M. Leibold (303) 295-1101
Fredrick P. Schwarz (702) 758-9234
J. Stevens Zuker (303) 989-6608
Business Manager: Owen P. Lavin (303) 837-5820
FAX (303) 236-3200, ATTN: Sherman Marsh, USGS
e-mail: smarsh@helios.cr.usgs.gov

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NOTES FROM THE EDITORS

Sherman Marsh and Tom Nash

Renewal is the theme of this issue. New officers bring fresh ideas to the Association, while maintaining the best of our traditions through global friendships and respect for past accomplishments. A new President and Councilors from Australia bring much wisdom from that part of the world, and it is in good harmony with new input from a Vice President and Councilors from Europe. Newly elected Councilors bring experience from industry, academia, and government. Volunteers add their special perspectives. If anyone feels left out, do not hesitate to step forward as the AEG never has too many sources of energy and ideas to cover the gamut of activities.

A guest editorial from Eion Cameron, Editor of our *Journal of Exploration Geochemistry*, tells part of the recent unfortunate dealings with the publisher, Elsevier. Managing the science of the journal has been a huge undertaking for Eion over the past 25 years, but dealing with the quixotic bureaucrats in Amsterdam has become an increasingly frustrating effort for our patient Editor, and also has required much work by our Business Manager Betty Arseneault There is abundant new evidence that our publications are being hurt, and dissemination of our science to libraries around the world is being stifled by the group that does the publishing in Holland. Recent Council meetings have addressed some of the policy and contractual issues in this unproductive situation. Members and Fellows of the AEG have a stake in what is happening, and you have a role to play in decisions that may be made in the coming months and years regarding the way in which we publish our science. We urge you to pay attention to the difficulties with Elsevier and to consider the significance to you of **possible** changes in our journal publication, such as minor changes in title and format from a less prestigious (but more efficient) publisher. We will continue to keep you appraised of this developing situation through articles. letters, and editorials.

Sherm and Tom

President's Message

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tion and Mining. The research team there has now joined with specialists in relevant disciplines at the Australian Geological Survey Organisation; the Australian National University and the University of Canberra to form The Cooperative Research Centre for Landscape Evolution and Mineral Exploration (CRC LEME). This is partly funded by the participants themselves, but also receives government and industry funding, and it must rank as one of the world's largest research groups in which exploration geochemistry plays a major role. It is an exciting development and I mention it because I believe that it is a model that is worthy of consideration in other parts of the world where the debate over education of geochemists is raging. It seems to me that universities, on their own, may not have the resources to carry out the type of integrated research which is necessary if we are to move exploration geochemistry to a higher plane. However, if they are part of a larger group then students can benefit from contact with the broader range of expertise to which they are exposed. The end product should be a more rounded geochemist.

There has been some concern recently about a shortage of papers for the JGE. This appears to have been overstated but in any case I am confident that groups such as CRC LEME will prove to be a steady source of papers in the years ahead. In addition I would be interested to hear members comments on the desirability of producing more thematic issues such as that currently being coordinated by Gwendy Hall on partial extractions. For example, West Africa is an exploration hot-spot and an issue devoted entirely to geochemical exploration there would appear to be worth considering. We only increase the profile of exploration geochemistry if we talk to each other, both formally and informally, and while some information may need to remain confidential there is much that can and should be shared. All members should do a little prospecting through their own files: some of you are sitting on world class 'deposits' that could be published in the JGE, and many more members must have fascinating information which would be ideal for **EXPLORE**. What successes have you had? What failures? How about a bit of humour - surely we are not serious scientists all of the time?

Our Annual General Meeting will be held in February. I urge as many members as possible to attend, but if you cannot please contact members of Council, Regional Councillors, or make your views known through **EXPLORE** if you have any points you wish to raise. Planning for the 18th International Geochemical Exploration Symposium in Jerusalem in May is well advanced, as is planning for the AEG field trip to West Africa which will be run as an adjuct to the 18th IGES. The 4th International Symposium on Environmental Geochemistry to be held Oct. 5-10 in Vail, Colorado, USA already has the makings of a great success and can be expected to offer much of interest to exploration geochemists. Numerous other relevant meetings are listed in the calendar of events.

I look forward to 1997, I wish you well for it, and I hope to meet many of you before it ends.

David Garnett
Becquerel Laboratories
PMB 1, Menai, NSW 2234, AUSTRALIA
Tel: (612) 9543 2644
Fax: (612) 9543 2655
email: naa@bq.com.au

Past-President's Message

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are in my opinion the best qualified to contribute to the remediation of these deposits and to the development of realistic environmental regulations, based on sound and complete science.

I do believe that the geochemists of the world have a substantial role to play and a wealth of expertise and data to bring to bear on the issue of metals in the environment. If we do not play a significant and continuing role in addressing this issue, the mining industry will come under an ever increasing threat. However, I also firmly believe it is exploration geochemists with a broad geoscientific base and exploration experience, not environmental (geo?)scientists, with limited expertise or exposure to any given scientific field, in particular the geosciences, that are most knowledgeable and best qualified to deal with the environmental issue of metals in the environment.

So the question is: Where are these exploration geochemists going to come from in the future? It is really getting to the stage where there are very few places left where you can actually go and get any training as a specialist in exploration geochemistry. In this regard, I am pleased to announce that Queen's University, Kingston, Ontario, Canada has officially established *"The Ian Nichol Chair in Exploration Geochemistry"* and is beginning the process of working towards the establishment of an endowment in support of full funding for this chair.

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Past-President's Message

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I do want to see the *Journal of Exploration Geochemistry* and the Association of Exploration Geochemists continue to grow and flourish. Continued research towards the development of new and improved geochemical exploration techniques is definitely needed by the mineral exploration industry. In addition, exploration geochemists have, and must, continue to play a significant role in making sure good and complete science is brought to bear in addressing the environmental issue of metals in the environment, and the AEG definitely has a role to play here.

On another front, you as members of the AEG should be aware that the AEG has now reached a critical stage in it's dealings with Elsevier. This is due to a number of persistent and ongoing issues, which have recently been brought to a head by Elsevier's unilateral decision to raise the institutional subscription rate for the JGE by a huge 53%. The AEG must take a hard look at our relationship with Elsevier and where we are going with the JGE in the future.

In closing, I would like to say that I have really enjoyed my term as President of the AEG. My thanks to all members of the Council and the Executive, in particular Sherm Marsh for his ongoing input and help which really keep the AEG ticking smoothly. I also thank Eion Cameron for his constant hard work and quality input into keeping the *Journal of Exploration Geochemistry* on track. Many thanks to Betty Arseneault and Gwendy Hall for the efficient and professional running of the business office and the AEG Treasury. And, I wish David Garnett best wishes and every success as he takes on the position of President of the AEG through 1997.

William B. Coker
BHP Minerals Canada Ltd.,
33 Yonge Street, Suite 610,
Toronto, Ontario, Canada. M5E 1G4
Tel: (416) 368-3884 ext. 250
Fax: (416) 365-0763

OBITUARY

HERBERT EDWARD HAWKES

Herbert E. Hawkes, one of the "founding fathers" of exploration geochemistry, passed away in Hanover, New Hampshire, on December 4, 1996 at the age of 83.

Educated at Dartmouth College, Columbia University, and the Massachusetts Institute of Technology, where he earned his PhD in 1940, Herb was employed by the U. S. Geological Survey from 1940 through 1953. Near the end of World War II, the Chief Geologist of the Geological Survey requested proposals for postwar research projects. Herb, who had acquired an interest in trace elements as guides to ore from Hans Lundberg, a Swedish-Canadian geophysicist, proposed a project to investigate the use of trace elements in soils as indicators of mineral deposits. This, along with projects involving water sampling and biogeochemical research by Lyman Huff and Helen Cannon, was approved and marked the birth of the Geochemical Prospecting Section of the USGS. Under Hawkes' dynamic leadership, this small group began the development of a series of rapid, inexpensive methods of analysis, principally colourimetric, to supplant the emission spectrographic procedures then in common use. An early landmark was the field project performed by Hawkes and H. W. Lakin at the Friends Station zinc deposit in eastern Tennessee, where they demonstrated that the zinc content of residual soil over the deposit clearly indicated its location. This discovery, now so apparent, was an eye-opener to private industry. Company geologists soon followed with one of the first large-scale soil sampling programs in North America, which ultimately led to the discovery of commercial zinc deposits.

Frustrated with problems involved in measuring and interpreting the distribution of trace elements in water, Herb began to suspect that stream sediments might be a more effective sampling medium for reconnaissance surveys. Work performed by the Geochemical Exploration Section, in particular the development of the ammonium citrate-soluble heavy metals test by Hal Bloom, convinced Herb that a new powerful reconnaissance tool was available. Believing that it was a once-in-a-lifetime opportunity to participate in commercial exploration work, Herb left the USGS for a privately sponsored stream sediment survey in New Brunswick and the Gaspe Peninsula of Canada. This survey was a milestone, being the first large-scale commercial stream sediment survey conducted in North America. Stream sediment sampling was shown to be a highly effective method of reconnaissance mineral exploration, and those areas of high geochemical relief are now known to contain most of the known base metal deposits of New Brunswick and the Gaspe.

While the New Brunswick work was under way, Herb accepted a teaching position at the Massachusetts Institute of Technology. Subsequently, he moved to the University of California at Berkeley, where he taught in one of the early multidisciplinary departments of mineral technology established in the United States. In addition to teaching, Herb's interest in the dissemination of knowledge in the field of exploration geochemistry manifested itself in his co-authoring with John Webb the first English language textbook in the field *"Geochemistry in Mineral Exploration,"* published in 1962. This book, subsequently revised with A.W. Rose, has remained the standard text in the field for more than three decades. Following his teaching career, Herb served as a consultant for the United Nations and for a number of exploration companies. From the early days of the Geochemical Exploration Section, Herb Hawkes recognized that familiarity with the literature was a necessary adjunct to aggressive research work. Accordingly, he has been a leader in the compilation of bibliographies of geochemical exploration, first within the Geological Survey, and subsequently through the Association of Exploration Geochemists.

When the founding of this journal was mooted, Herb Hawkes was one of its most enthusiastic supporters. He was a member of the editorial board when the first issue was published and continued in this role for many years. His advice, support, and kindly nature are remembered by its "green" editor. Herb Hawkes was a strong, modest and gentle man. Although born in New York, he had the appearance of a rugged Western American, someone who, in an earlier time, might have led the wagon trains. Instead, in his time, he was a leader of the science of geochemistry.

Eion M. Cameron
based on material by Frank Canney and Edward Post.

EDITORIAL

Arbitrary Price Increases Hit *Journal of Geochemical Exploration*

In the 90's most developed countries have enjoyed a low inflationary environment. This has resulted from global competition, technological change, and deficit cutting by governments, which has lowered interest rates. A conspicuous exception to this trend has been the price of scientific journals. Price increases have come in spite of a technological revolution coming from computer-assisted publishing. Increases for journals well above the inflation rate have been documented by numerous authorities. One source of statistical information that is relevant to the earth sciences is the Science Library of the Scripps Institute of Oceanography (http:/scilib.ucsd.edu/sio/guide/five-yr.html).

Journal cost inflation has come at an unfortunate time, when the deficit cutting alluded to above has been affecting the budgets of science libraries. Some libraries have managed to maintain a constant budget; that of others has steadily declined. However, all have had to cut the number of periodicals to which they subscribe; differences between libraries have been in the rate of reduction. Economists would describe journals as being price sensitive: as cost increases, sales decrease. Thus publishing houses do not gain revenue in proportion to price increase. And, unlike manufacturers of cars, there is little marginal cost to printing and distributing extra journal copies. The principal casualty of the price explosion has been the wide dissemination of knowledge.

This journal is sponsored by the Association of Exploration Geochemists and the secondary title, shown on the cover, identifies this link. The raison d'être for the Association's sponsorship is the dissemination of knowledge. Thus price increases, of any magnitude, are of concern to the Association. There is, of necessity, close contact between the publishers, the editor and the Association. However, in November we became aware of a dramatic price change in the journal only as a result of a complaint from an institutional subscriber. The institutional subscription cost for 1997 has increased by 52% over that for 1995. The president of the AEG, Dr. W.B. Coker, wrote to Elsevier Science protesting this increase and asked that it be rolled back to a more reasonable level. In denying this request he was told *"The main factor involved in the large rise that you have pointed out is the unfortunate weakness of the US$ against the Dutch Guilder"* In fact, according to the International Monetary Fund database, one guilder was worth US$ 0.58 on January 2, 1995 and US$ 0.58 on 1 December, 1996.

One purpose of this editorial is to express the regret of the Association of Exploration Geochemists and the Editor for this substantial increase in the institutional subscription price. Negotiations between the AEG and Elsevier will continue, but any change in pricing will be at Elsevier's discretion until the termination of the present contract in December 1999. Those readers who find that this journal is no longer available in their library may wish to consider joining the AEG. A personal subscription is included in the annual membership dues of $70.

Eion M. Cameron
Editor, Journal of Exploration Geochemistry
Ottawa, 31 December, 1996.

AEG ANNUAL GENERAL MEETING

The Association of Exploration Geochemists will hold it's Annual General Meeting (AGM) in conjunction with the Society for Mining, Metallurgy, and Exploration (SME) meetings in Denver, Colorado on **Wednesday, February 26, 1997.** The meeting will be held in the Parisienne room of the Hyatt Hotel and will start at 5:00 PM. We would like to encourage all members who are attending the SME meetings to plan on coming to the AGM.

1997-1999 COUNCIL ELECTIONS

On January 1, 1997 The Association of Exploration Geochemists elected Councilors for the 1997-1999 term. Five Councilors were elected; two are returning for a second 2-year term, one is returning to Council after having served from 1988-1992, and two Councilors will be serving for the first time.

Steve Cone and Barry Smee will be returning for second terms and Shea Clark Smith will join Council again after serving as Councilor and Editor of **EXPLORE.** We welcome them back. J. Robert Clark and Stephen Day will be our two new Councilors and we look forward to working with them. Bill Coker will complete the 1997-1999 slate of Councilors as the "ex officio" President.

Sherman P. Marsh, *Secretary*

NEW OPTION FOR SENIOR MEMBERS

For some time now, we have been contacted by senior and/or retired members of the AEG concerning some sort of membership at reduced cost. Many of these members are no longer working in exploration geochemistry but wish to remain in touch with the activities of the Association. In order to address this issue the Council of the Association recently passed a motion to allow senior members to receive **EXPLORE** only for a cost of $15.00 per year. The motion reads: "that retired members over the age of 55 that have ten (10) years of total membership in The Association of Exploration Geochemists be offered subscriptions to the **EXPLORE** newsletter only for $15.00 per year" and was passed unanimously. Those members who qualify and wish to take advantage of this arrangement should contact the Business Manager. Please note that members using this option would no longer receive the Journal of Geochemical Exploration.

ITINERARIES FOR AEG DISTINGUISHED LECTURERS

The current Distinguished Lecturers for the AEG, Ray Smith and Charles Butt, will continue to be active in 1997. Their itineraries are listed below. If you are in or near any of these locations we would encourage you to attend one or more of the lectures by these world-class experts on geochemistry of deeply weathered terrains. In 1995, Ray and Charles were awarded the AEG gold medal for outstanding contributions to the science of exploration geochemistry.

Ray Smith

Date
January 25 and 26
Place
University of British Columbia, BC, Canada
Lecture title
Background to regolith and geochemical research in Australia
The importance of regolith-landform control in exploration geochemistry
Laterite and lag geochemistry- lessons learned from Australia
Date
January 29
Place
Geological Survey of Canada, Ottawa, Canada
Lecture title
The importance of regolith-landform control in exploration geochemistry
Date
January 31
Place
State University of New York, Binghamton, USA
Lecture title
The importance of regolith-landform control in exploration geochemistry

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Lecturer's Itinerary

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Date
February 3
Place
U.S. Geological Survey, Reston, Virginia, USA
Lecture title
The importance of regolith-landform control in exploration geochemistry
or
Laterite geochemistry for mineral exploration
Date
February 5, 6, or 7
Place
Marseilles, France
Lecture title
The importance of regolith-landform control in exploration geochemistry
or
Laterite geochemistry for mineral exploration
Date
March 14
Place
Ballarat, Australia, AusIMM Annual Conference
Lecture title
Exploring in Australian regolith environments
Date
September 14-15
(approximate)
Place
Toronto, Canada, Exploration '97
Lecture title
Use and implications of paleoweathering surfaces in mineral exploration
Date
To be arranged
Place
Technical University of Berlin, Berlin, Germany
Lecture title
Laterite geochemistry for mineral exploration
To be arranged
Place
British Geological Survey, Keyworth, UK
Lecture title
The importance of regolith-landform control in exploration geochemistry

Charles Butt

Date
January 29-30
Place
Tucson, AZ, USA (exact site to be announced)
Lecture title
Geochemical approaches to exploration in deeply weathered terrains
Calcrete (caliche) geochemistry in gold exploration
Date
January 31
Place
Mackay School of Mines, University of Nevada, Reno, NV, USA
Lecture title
Geochemical approaches to exploration in deeply weathered terrains
Calcrete (caliche) geochemistry in gold exploration
Date
February 3
Place
Colorado School of Mines, Golden, CO, USA
Lecture title
Geochemical approaches to exploration in deeply weathered terrains
Calcrete (caliche) geochemistry in gold exploration
Date
February 11
Place
British Geological Survey, Keyworth, UK (exact site to be announced)
Lecture title
Geochemical approaches to exploration in deeply weathered terrains
Calcrete (caliche) geochemistry in gold exploration
Date
February 12
Place
Imperial College, London, UK
Lecture title
Geochemical approaches to exploration in deeply weathered terrains
Calcrete (caliche) geochemistry in gold exploration

REPORT OF THE EUROPEAN GEOCHEMISTRY TASK GROUP

Regional Geochemical Surveys undertaken in Europe at the national scale are the subject of a new comprehensive report prepared by the Geochemistry Task Group members of the Forum of European Geological Surveys (FOREGS), chaired by Professor Jane A Plant, British Geological Survey (BGS, UK), and assisted by the Task Group Scientific Secretariat, Ms Fiona M Fordyce, (BGS, UK), for submission to the annual general meeting of FOREGS Directors in September 1996 (Plant and others, 1996).

Many of the regional geochemical surveys listed in the report were originally developed as an important component of integrated regional geoscientific research and development programmes, with the primary objective of assisting national strategic and commercial exploration for mineral and energy resources. The outcome of this systematic and well planned approach has been rewarded with the discovery, and in many cases, effective development of previously unknown world class deposits of metals and energy minerals throughout Europe, both onshore and offshore.

A secondary but increasingly important aspect, is the creation of large, systematic, digital regional geochemical databases, which are available for further interrogation and application to a wide range of studies for the future. This is increasingly important for the organizations which undertook the original surveys, since these databases help to establish a Europe-wide network of authoritative geoscience-based centres for a range of environmental issues and stimulate new opportunities for follow-up R&D investigations. They are also useful for others requiring access to high quality regional geochemical data sets.

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Technical Note

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The globalization of the world economy and increasing environmental concerns have latterly imposed economic and environmental limitations on European opportunities for exploitation of local sources of metals and energy minerals in the short term, with greater preference given to the development elsewhere of large scale low cost producers, together with their attendant clean-up and environmental costs. Economic pressures have been matched by the evolution of increasingly stringent environmental legislation by national governments, in association with the European Union (EU) and the European Environment Agency (EEA), which has headquarters in Copenhagen. The EEA has powers to determine 'safe levels' of Potentially Harmful Elements and Species (PHES), often based on limited amounts of data which may lack adequate quality control for the purpose of establishing environmental geochemical baselines. One of the objectives of this report is to address this issue by providing a clear account of the present status of the European Regional Geochemical Database which is currently available for this purpose.

The report reflects and further emphasises the modern trend of developing multiple uses for geochemical datasets, and especially the growth of environmental applications required to satisfy the new legal framework. Government agencies, the legal profession, the insurance industry and land developers are also becoming more aware of the availability and the importance of applying geochemical baseline data to a wide range of geotechnical and geoenvironmental land use applications. The use of regional geochemistry is increasingly important in geochemical baseline studies of surface and ground waters, soil, stream sediment, rock and geogenic gas and in studies designed to maximise and optimise the use of land since the maps also help to minimise the risk of sterilization of resources by inappropriate development.

It has recently been noted by insurance underwriters, for example, that failure to take proper account of environmental geochemistry as a component of geoenvironmental studies, may have the undesirable effect of creating uninsurable risk. This is not in the interest of the professionals involved, their clients, the general public or the environment. This is particularly well exemplified in the UK, as a result of major civil litigation associated with the Cambridge Water Company case which exposed the complexity of geoenvironmental factors and conflicting policy choices which culminated in a decision of the House of Lords. This has resulted in publication, for the first time in the UK, of criteria which can be used for the identification of contaminated land which is now embodied in the UK Environment Act 1995. The act also provides a systematic methodology and legal framework for dealing with both anthropogenic contamination and geogenic enrichment which may affect land, buildings, people and animals, using the source-pathway-target relationship. Regional geochemical maps are already being used to help provide geochemical baselines for this purpose.

The report summarises the current status of geochemical mapping in FOREGS countries. It also represents an important contribution to the International Union of Geological Sciences Working Group on 'Continental Geochemical Baselines', which is also sometimes known as 'global geochemical baselines'. It provides a concise summary of the regional geochemical surveying undertaken by 56 organisations from 33 European countries, including Greenland. Of the 150 geochemical surveys listed, 12% are classified as environmental, 24.7% as exploration and 62.7% as multipurpose. It is well illustrated with maps, figures and summary tables which provide a comprehensive study of the extent and limitations of existing regional geochemical cover over most of continental Europe. The FOREGS area extends southwards from the North Cape to the Mediterranean and as far east as Turkey and the Ukraine, but with no data from Yugoslvia which presently forms an obvious and unfortunate gap in the regional coverage.

20TH INTERNATIONAL GEOCHEMICAL EXPLORATION SYMPOSIUM, 2001

The Association of Exploration Geochemists is looking for a venue for the 20th IGES. The Association will consider all proposals for hosting this event. Proposals must include the following:

- Location
- Date
- Sponsoring organization
- Meeting title or theme
- Contact person(s)
- Suggested outline for meeting
- Suggested field trips and short courses
- Facilities
- Brief description of the locality

Any interested organizations should submit their proposals to the AEG Business Office

The Association of Exploration Geochemists
P.O. Box 26099
72 Robertson Road
Nepean, ON K2H 9R0
CANADA

Report on European Geochemistry

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All FOREGS Countries have contributed information on nationally held data to this report, with only four exceptions, Croatia, Iceland, Latvia and Switzerland where the geochemically mapped areas do not reach the minimum of 5000 km^2 required for inclusion in this report, a figure which has been selected to exclude local surveys, which have been undertaken by mining and exploration companies and universities, from further consideration. Data from Bulgaria, which has recently joined FOREGS, and which are not included in the report, will be available in the digital version of the inventory.

There are six main headings in the report : 1 Introduction; 2 The Survey, which defines the seven main types of sample media selected for inclusion in the report (drainage sediment, lake sediment, overbank sediment, soil and regolith, heavy mineral, surface water, radiometric) and information on associated availability of rock and biological samples, which form the basis of a questionnaire which was sent to the 56 organisations in FOREGS Countries listed in Appendix 2; 3 results, which describes under six subheads;- regional coverage, sampling density, size fractions, sieving techniques, analytical techniques, quality control procedures, archive sample material and digital databases; 4 conclusions; 5 recommendations, and 6 bibliographic references.

In addition the four appendices provide additional information, as follows, Appendix 1, an example of the form used in the questionnaire, Appendix 2 , a list of organizations included in the FOREGS geochemical inventory, Appendix 3 , information on regional geochemical surveys in Greenland and Appendix 4, a very detailed summary table of information held in the inventory database, which includes important details such as contact names, addresses, telephone and fax numbers for those requiring further information on individual datasets.

The report is available from the publishers at £25 plus postage and packing. It is essential reading for regional geochemists with interests in Europe. The task group members and scientific secretariat are to be congratulated on the rapid preparation of such an excellent, authoritative and systematically presented study. Let us also hope that the EEA will now begin to use regional geochemical databases, which demonstrate natural variations in geochemical baselines in a wide range of media, to guide the future selection of 'safe level' thresholds in Europe.

Reference

Plant, J. A., Klaver, G., Locutura, J., Salminen, R., Vrana, K., and Fordyce, F. M., 1996. Forum of European Geological Surveys Geochemistry Task Group 1994-1996 Report. British Geological Survey Technical Report WP/95/14. British Geological Survey, Keyworth, NG12 5GG, UK.

Peter Simpson
BGS Honorary Research Associate
British Geological Survey
Kingsley Dunham Centre
Keyworth, Nottingham, NG12 5GG
United Kingdom
Int +44 1159 363532
e-mail: p.simpson@bgs.ac.uk

AEG - WEST AFRICA FIELD TRIP

The AEG West Africa field trip will run from May 14 to May 22, 1997, starting in Mali and finishing in the Ivory Coast. It will visit a number of major new discoveries made in the last ten years (Syama, Sadiola) as well as some lesser known deposits (Ity) in francophone West Africa. It will also provide the opportunity to examine some very promising advanced projects (e.g.Loulo) and some interesting prospects. The field trip will provide a climatic cross-section through West Africa, from the dry savanna climate of Mali to the very wet tropical forest conditions of western Ivory Coast, and the geochemical response of the different deposits will be examined against this backdrop. There will be a strong emphasis on the relationship between mineralization and weathering in order to assess the effectiveness of geochemistry as an exploration tool in this environment.

The field trip leaders will be Eric Hanssen and Philippe Freyssinet, both of whom have extensive experience in West Africa. We have not yet finalised a price but anticipate that it will be in the region of $US 4000. The following summary is close to the final itinerary, but it is possible that there may be minor changes both in the route and the dates. We will keep you informed of any changes. If you have any queries, please contact me. The field trip will be limited to about 10 - 12 participants, and we expect it to fill up quickly. Payment for the excursion will be required by 15 March 1997, but if you are already sure at this stage that you would like to participate in the field trip a deposit of $US 500, payable to the Association of Exploration Geochemists, will secure your place.

Historical Context

West Africa is a very old, historical gold producing area. Herodotus, in the 1st century BC already mentions the gold trade with western Africa. The oldest Islamic sources date back to the 7th century. The Sadiola deposit in western Mali is located in a region which is known as the "Bambouk", one of the main gold producing areas during the Middle Ages. It has huge surface and underground old workings. Pottery shards found in old workings in the Syama area in southern Mali date from the 14th century.

In the late 19th century the Mandingue king Samory exploited alluvial placers and bedrock mineralization in central Mali to finance his war against the invading French army.

Artisanal exploitation is still extremely active today. It is not unusual to find an "orpailleur" camp with a population of several thousand exploiting alluvial placers and even high grade veins in the Kenieba area. Many villages have their small placer where people try to earn some cash in the dry season when there are no crops to be tended.

Highlights

The Sadiola deposit was rediscovered through a FED funded regional geochemistry survey in the late eighties. The Loulo deposit was rediscovered through a very widely spaced BRGM regional geochemistry survey. It is hosted by a folded unit of toumalinized sandstone (QT) and mineralization is associated with intense quartz-carbonate veining and brecciation along the fold axis. Folding may be related to drag along the nearby Senegalo - Malian Shear.. Gold seems mostly to be associated with pyrite and is free milling. Extensive geochemical anomalies in the vicinity remain to be tested but point to the presence of a major hydrothermal system with high exploration potential.

The Syama deposit was rediscovered in 1984 during a UNDP funded regional geochemistry survey. It is the major resource among a number of satellite orebodies spread out over 20 km along the Syama - Boundiali Shear. Mineralization is hosted by basalts and sediments of the Syama Unit, which are thought to have been deposited in an intracratonic rift. The host rock to the orebody is intensely altered, fractured, stockworked, brecciated and quartz-carbonate veined and is intruded by andesitic "dykes". Alteration is zoned from a chlorite - calcite outer halo to a sericite, Fe-carbonate, albite and quartz inner zone. Gold is dominantly associated with pyrite.

The Ity deposit was first discovered as a Cu anomaly during a BRGM funded geochemical survey in the early sixties.

More details on the deposits we will visit will be available shortly. Persons having an urgent need for additional information on the field trip should contact David Garnett, at one of the addresses given on page 3.

General Information

Air Travel to and from West Africa

Both Bamako and Abidjan are well connected with western Europe, particularly with Paris, Brussels and Geneva. There are daily flights to and from both airports by either Swissair, Sabena, Air Afrique or Air France. You will need to check with airlines on exact flight schedules. Once in Europe onward travel to the 18th IGES in Jerusalem is easy. There are daily flights from Paris to Tel Aviv as well as from Brussels to Tel Aviv (except on Friday).

Participants will need a valid passport and will probably need entry visas for Ivory Coast and Mali. If you have difficulty contacting representatives of these two countries, try the French embassy where you may get more information.

Health

A number of serious diseases are endemic in West Africa and elementary precautions must be taken in order to ensure a successful and healthy field trip. We strongly advise that you consult with health experts who have some knowledge of tropical diseases at least two months in advance of the beginning of the field trip. This will allow for the necessary vaccinations, some of which will require more than one injection e.g. yellow fever will take three weeks. Every participant must carry an "International Health Certificate" (yellow booklet) with a valid yellow fever vaccination. This is a must. Participants arriving without an international health certificate will have serious problems at airports and may be refused entry.

Vaccinations against hepatitis, typhoid, polio, tetanus, meningitis and TB are strongly recommended. Consult your physician!

Malaria is probably the most serious and widespread disease to which a participant may be exposed. Fortunately malaria prophylaxis is possible and efficient. It is a must for short term travellers. Participants should start taking anti-malaria medication two weeks before the beginning of the trip and should continue up to four weeks after they leave.

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West Africa ...

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The use of mosquito repellent is highly recommended as an efficient supplementary prophylaxis.

You should bring your own aspirin or paracetamol. Diarrhoea is not inevitable and many travellers never get it. Do bring some medicine to cure it. Diarrhoea is mainly contracted from drinking contaminated water. During this field trip there will always be water of excellent quality available.

Please note that while the AEG will do everything that is reasonably possible to make the field trip both safe and healthy it is up to you to look after your own health during the course of the trip. We shall be visiting some isolated areas that lack sophisticated medical facilities and we strongly advise that you take out individual health insurance that includes repatriation.

Climatic Conditions

The month of May corresponds to the end of the dry season in Mali and northern Ivory Coast. This means that temperatures will be high, 40 to 45 degrees, with a relatively high humidity. It will be "sweaty" weather. In southern Ivory Coast some dramatic rainstorms may be expected.

Travelling and Lodging

Transport to western Mali and Syama will be by air. We will use the SAS twin engine Cessna 202. SAS is a small US airline which maintains a very high safety standard. However, the use of small planes does place a severe constraint on the amount of luggage that can be carried along. Please provide for a small bag containing a minimum of luggage, your geopick and an emergency beer for the three day visit to the Kenieba area. Limited major luggage can be trucked to Syama where we will arrive on day three of the trip. The planes have a maximum load capacity and excess luggage will be left behind in Bamako.

From Syama to Abidjan all travel will be by road. Lodging will be of variable quality, from rather primitive in Loulo to comfortable in Sadiola and Syama. Wherever possible hotels of international standard will be used. In Syama laundry facilities will be available.

Photography

Photography is no problem provided you do not photograph official buildings or military installations. Ask permission to take snapshots of people. Do not bring high ASA films.

Itinerary May 13 to May 22

13th May:
Everybody arrives in Bamako.
Overnight at Grand Hotel or Hotel Mande.

14th May:
SAS flights to Sadiola. Visit Sadiola Hill deposit (ANGLO - IAMGOLD - MALI) in the Kenieba window.
Overnight in Sadiola.

15th May:
Leave for Loulo. Afternoon visit to Loulo.
Overnight in Loulo.

16th May:
Visit Loulo (RANDGOLD - LA SOURCE - MALI) and outlying prospects.
Late afternoon flight to Syama.
Overnight in Syama.

17th May:
Visit the Syama deposit (RANDGOLD - IFC - MALI) in the Syama Boundiali greenstone belt.
Overnight in Syama.

18th May:
Visit outlying prospects. Afternoon drive to Korhogo.
Overnight in Korhogo, Hotel Mont Korhogo.

19th May:
Drive to Yamoussoukro, visit Fetekro greenstone belt (GENCOR - BRGM - SODEMI), near Dabakala.
Overnight in Yamoussoukro, Hotel President.

20th May:
Visit Angovia (BRGM - SODEMI). Drive to Man.
Overnight in Man.

21st May:
Visit Ity (BRGM - SODEMI)
Overnight in Man or Yamoussoukro.

22nd May:
Drive back to Abidjan.
Overnight in Abidjan - Hotel Palm Beach OR fly out on late night flights.

CALENDAR OF EVENTS

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

■ February 24-27, 1997, **Society for Mining, Metallurgy and Exploration (SME)**, Denver, Colo. INFORMATION: SME, P.O. Box 625002, Littleton, CO 80162-5002.

■ March 17-19, 1997, **NORTHEASTERN GSA SECTION**, King of Prussia, Pennsylvania. INFORMATION: Allan Thompson, Dept. of Geology, University of Delaware, Newark, DE 19716-2541, TEL 302-831-2585, thompson@bach.udel.edu.

■ March 20-21, 1997, **SOUTH-CENTRAL AND ROCKY MOUNTAIN GSA SECTIONS**, El Paso, Texas. INFORMATION: Elizabeth Anthony, Dept. of Geological Sciences, University of Texas at El Paso, El Paso, TX. 79968-0555, TEL 915-747-5483, anthony@geo.utep.edu.

■ March 23-26, 1997, **SEGH 15th European Meeting**, Dublin, Geological Survey of Ireland.

■ March 24-27, 1997, **4th All Portuguese Language Countries Geochemical Congress and the 10th Portuguese Geochemical Week**, Braga, Portugal. INFORMATION: Graciete Dias, Dept. Ciencias da Terra, Univ. Minho, Campus de Gualtar, 409 Braga Codex, Portugal, FAX +351-53-604-304, TEL +351-53-604-305, geoquimica@ci.uminho.pt, URL http://delta.ci.uminho.pt/ct/port/homepage.html.

■ March 27-28, 1997, **SOUTHEASTERN GSA SECTION**, Auburn, Alabama. INFORMATION: Mark G. Steltenpohl, Department of Geology, Auborn University, Auburn, AL 36849-5305, TEL 334-844-4893, steltmg@mail.auburn.edu.

■ May 1-2, 1997, **NORTHEASTERN GSA SECTION**, Madison, Wisconsin. INFORMATION: Bruce Brown, Wisconsin Geological and Natural History Survey, 3817 Mineral Point Rd., Madison, WI 53705, TEL 608-263—3201, babrown@facstaff.wisc.edu.

■ May 17-19, 1997, **Europe's Major Gold Deposits**, Irish Assoc. for Economic Geology and the Inst. of Mining and Metallurgy, Down, No. Ireland. INFORMATION: Kerr Anderson, TEL 353-46-22363, FAX 353-46-22372, navanr@iol.ie and Eibhlin Doyle, TEL 353-1-4785656, FAX 353-1-478-5660, BHP@iol.ie.

■ May 19-21, 1997, **Geological Association of Canada—Mineralogical Association of Canada, Ottawa, Canada.** INFORMATION: Geological Survey of Canada, 601 Booth St., Room 757, Ottawa, Canada K1A OE8, Canada, TEL 613-947-7649, FAX 613-947-7650, OTTAWA97@emr.ca.

■ May 21-23, 1997, **CORDILLERAN GSA SECTION**, Kailua-Kona, Hawaii. INFORMATION: Fred Mackenzie, Dept. of Oceanography, University of Hawaii-SOEST, 1000 Pope Rd., Honolulu, HI 96822, TEL 808-956-6344, fredm@soest.hawaii.edu.

■ May 25-29, 1997, **18th International Geochemical Exploration Symposium**, Jerusalem, Israel. INFORMATION: International Geochemical Exploration Symposium, P.O. Box 50006, Tel Aviv 61500, Israel, TEL 972-3-5140014, FAX 972-3-5175674/660325, iges@mail.gsi.gov.il.

■ May 27-30, 1997, **Spring Meeting, American Geophysical Union and American Geochemical Society**, Baltimore, Maryland. INFORMATION: Ronald D. Zwickl (U) , R/E/SE NOAA, 325 Broadway ERL/SEL, Boulder, CO 80303-3328, TEL 303-497-3029, FAX 303-497-3645, rzwickl@sel.noaa.gov

■ June 1-5, 1997, **GEOANALYSIS 97**, 3rd Conference on the Analysis of Geological and Environmental Materials, Vail, CO. INFORMATION: Belinda Arbogast, USGS, Denver Federal Center, Box 25046, MS 973, Denver, CO 80225, TEL 303-236-2495, FAX 303-236-3200, geo97@helios.cr.usgs.gov.

■ June 2-6, 1997, **7th Annual V.M. Goldschmidt Conference**, Tucson, Arizona. INFORMATION: LeBecca Simmons, Goldschmidt Conference, Lunar and Planetary Institute, 3600 Bay Area Boulevard, Houston TX 77058-1113, USA, TEL 281-486-2158, FAX 281-486-2160, simmons@lpi.jsc.nasa.gov

■ June 15-18, 1997, **South American Symposium on Isotope Geology**, Sao Paolo, Brazil. INFORMATION: M. Basei/W. Teixerira, Instituto de Geociencias, USP, Rua do Lago 562, 05508-900 Sao Paolo, SP, Brazil, TEL 55-11-818-3994, FAX 55-11-818-3993, baseimas@usp.br.

■ June 15-21, 1997, **Eleventh International Clay Conference**, Ottawa, Ontario. INFORMATION: Jeanne Percival, Geological Survey of Canada, 601 Booth St.,Ottawa, Ontario K1A 0E8, Canada, FAX 613-943-1287, ICC97@gsc.emr.ca.

■ June 23-25, 1997, **4th International Conference on the Biogeochemistry of Trace Metals**, Berkeley, Calif. INFORMATION: I.K. Iskandar, US Army Cold Regions, Res. & Eng. Lab, 72 Lyme Rd., Hanover, NH 03755, TEL 603-646-4198, FAX 603-646-4561, iskandar@crrel.usace.army.mil

■ August 10-15, 1997, **Gordon Research Conference on Inorganic Geochemistry**: Ore Deposits, New Hampton, NH. INFORMATION: Mark Reed, Dept. of Geological Sciences, University of Oregon, Eugene, OR 97403-1272, TEL 541-346-5587, FAX 541-346-4692, mhreed@oregon.uoregon.edu or Kevin Shelton, Dept. of Geological Sciences, University of Missouri, Columbia, MO 65211, TEL 573-882-6568, FAX 573-882-5458, geosckls@showme.missouri.edu.

■ August 11-13, 1997, **4th Biennial Society for Geology Applied to Mineral Deposits**, Turku, Finland. INFORMATION: Congress Office/SGA Meeting 1997, University of Turku, Lemminkaisenkatu 14-18B, FIN-20520 Turku, Finland, TEL 358-21-333-6342, ceson@utu.fi.

■ September 1-5, 1997, **Challenges to Chemical Geology, 10th Meeting of the European Geological Societies**, Carlsbad, Czech Republic. INFORMATION: Dr. Martin Novak, Czech Geol. Survey, Geologicka 6, 15200 Prague 5, Czech Republic, TEL 422-581-71-20, FAX 422-581-87-48, Novak@cgu.cz

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Calendar of Events

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■ October 5-10, 1997, **4th International Symposium on Environmental Geochemistry**, Vail Colorado. INFORMATION: R.C. Severson or L.P. Gough, USGS, Denver Federal Center, Box 25046, MS 973, Denver, CO 80225, TEL 303-235-5514 or 5513, iseg@helios.cr.usgs.gov.

■ October, 20-23, 1997, **Annual Meeting of the Geological Society of America**, Salt Lake City, Utah.

■ March 30-April 3, 1998, **9th International Symposium on Water-Rock Interactions**, Taupo, New Zealand. INFORMATION: B.W. Robinson, Wairakei Research Centre, Institute of Geoligical and Nuclear Sciences, Private Bag 2000, Taupo, New Zealand, TEL 64-7-374-8211, FAX 64-7-374-8199, wri-9@cns.cri.nz.

■ October 26-29, 1998, **Annual Meeting of the Geological Society of America**, Toronto, Ontario, Canada. INFORMATION: Pierre Robin, Dept. of Geology, 22 Russell St., Toronto, ON M5S 3B1, Canada, TEL 416-978-3022, FAX 416-978-3938.

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

Virginia T. McLemore
New Mexico Bureau of Mines and Mineral Resources
801 Leroy Place
Socorro, NM 87801 USA
TEL: 505-835-5521
FAX: 505-835-6333
e-mail: ginger@gis.nmt.edu

NEW MEMBERS

To All Voting Members:

Pursuant to Article Two of the Association's By-Law No.1, names of the following candidates, who have been recommended for membership by the Admissions Committee, are submitted for your consideration. If you have any comments, favorable or unfavorable, on any candidate, you should send them in writing to the Secretary within 60 days of this notice.If no objections are received by that date, these candidates will be declared elected to membership. Please address comments to Sherman P. Marsh, Secretary AEG, U.S. Geological Survey, Mail Stop 973, Box 25046, Federal Center, Denver, Colorado 80225, U.S.A.

Editors note:

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

FELLOW

Bajc, Andy F.
Geoscientist
Ontario Geological Survey
Sudbury, ON, CANADA

MEMBERS

Boast, Anthony M.
Manager, Tech Serv - Europe/Africa
RTZ Mining & Exploration
Bristol, U.K.

Bohorquez, Daniel P.
Chemist
Universidad de la Amazonia
Florencia, COLOMBIA

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Geology Dept
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Bangkok, THAILAND

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Goiania, Goias, BRAZIL

Goode, John R.
President
Barrick Power Gold
Beijing, CHINA

Grimley, Michael J.
Geochemist
BHP Minerals
Spring Hill, QLD, AUSTRALIA

Gurney, John J.
Professor
University of Cape Town
Howard Place, R.S.A.

Neira, Jaime L.
Geologist
Santiago, CHILE

Oliver, James
Chief Geologist
Oliver Geoscience Int
Kamloops, BC, CANADA

Orr, Rodney G.
VP Exploration
Mindoro Resources
Edmonton, AB, CANADA

Pattalock, Don A.
Geologist
Santa Fe Pacific Gold
Winnemucca, NV, U.S.A.

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New Members

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Sherlock, Ross
Chief Geologist
TVI Pacific
Calgary, AB, CANADA

Tomich, Christopher S.
Senior Geologist
Herald Resources
W. Perth, WA, AUSTRALIA

Valdez, Mario A.
Geochemist
BHP Minerals
Santiago, CHILE

Wessels, Carla
Senior Geochemist
JCI
Randfontein, R.S.A.

STUDENT

Yingjie, Guo
Penn State University
State College, PA, U.S.A.

RECENT PAPERS

This list comprises titles that have appeared in major publications since the compilation in **EXPLORE** Number 94. Journals routinely covered and abbreviations used are as follows: Economic Geology (EG); Geochimica et Cosmochimica Acta (GCA); the USGC Circular (USGS Cir); and Open File Report (USGS OFR); Geological Survey of Canada Papers (GSC Paper) and Open File Report (GSC OFR); Bulletin of the Canadian Institute of Mining and Metallurgy (CIM Bull); Transactions of Institute of Mining and Metallurgy, Section B: Applied Earth Sciences (Trans IMM). Publications less frequently cited are identified in full. Compiled by **L. Graham Closs**, Department of Geology and Geological Engineering, Colorado School of Mines, Golden, CO 80401-1887, Chairman AEG Bibliography Committee. Please send new references to Dr. Closs, not to **EXPLORE**.

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Akcay, M., Ozkan, H.M., Moon, C.J., and Scott, B.C., 1996. Secondary dispersion of gold deposits in west Turkey. J. Geochem. Explor. 56 (3): 197-218.

Angelica, R.S., da Costa, M.L., and Pollmann, H., 1996. Gold, wolfranite, tourmaline-bearing lateritized gossans in the Amazon region, Brazil. J. Geochem. Explor. 57: 201-215.

Araujo, S.M., Scott, S.D., and Longstaffe, F.J., 1996. Oxygen isotope composition of alteration zones of highly metamorphosed volcanogenic massive sulfide deposits: Geco, Canada, and Palmeiropolis, Brazil. EG 91(4): 697-712.

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Recent Papers

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Recent Papers

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7. Industry/government cooperation
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Correspondence

Contact persons:

Drs. R. C. Severson or L.P. Gough
U.S. Geological Survey, Federal Center
Box 25046, MS 973
Denver, CO 80225 USA
Phone: 303-236-5514 or 5513
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