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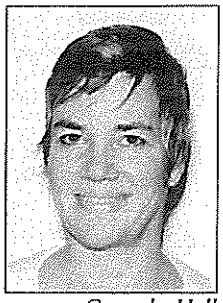
EXPLORE

Newsletter for the Association of Exploration Geochemists

NUMBER 88 JULY 1995

REVIEW OF 17th IGES TOWNSVILLE

PRESIDENT'S MESSAGE



Gwendy Hall

The 17th IGES in Townsville is a conference which will be fondly and vividly remembered by those 500 or so of us lucky enough to attend. I stopped counting the number of times I heard "best IGES ever" coming from the mouths of seasoned veterans. The reasons are numerous: the excellence of the oral and poster presentations; the professionalism evident in the field-trips and the locations themselves; the variety of short course topics; the opportunities provided to mingle with one another (and with the fish at the Great Barrier Reef!); the smooth functioning site itself (the beautiful Sheraton Breakwater); and those smiling helpful faces of the James Cook EGRU organising committee manning the operations desk. It all ran so well, thanks to the energy, capability and hard work of the committee headed by Mark Elliott, ably assisted by Jim McGregor-Dawson, Marian and Russell Myers, Kaylene Camuti, Kevin Blake and a host of others.

Themes included: Supergene Deposits, the Australian Regolith, Lithogeochemistry, Primary Dispersion Haloes, Geochronology, New Techniques, Data Processing, Applied

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AEG MEDAL PRESENTATIONS

By Graham F. Taylor

Past-President Taylor gives AEG Gold Medals to Charles Butt (center) and Ray Smith (left)

The 25th Anniversary Dinner held in conjunction with 17th IGES was an appropriate occasion for the presentation of the Association's medals to three long-standing members.

Defying normal protocol, the co-recipients of the Gold Medal, Dr Charles Butt and Dr Ray Smith of the CSIRO Division of Exploration and Mining, were presented with their medals by Past President Graham Taylor. This inaugural award of the Gold Medal to Charles and Ray recognised their outstanding scientific achievement in the development of geochemical exploration techniques for locating mineral deposits in highly weathered and lateritic terrains. Measures of their success are the discovery of

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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
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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

Newsletter No. 88 JULY 1995

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NOTES FROM THE EDITORS

Sherman Marsh and Tom Nash

This issue is full of news from the 17th IGES Meeting in Townsville: a recap for those fortunate to be present (but asleep on the beach?) and a chance for others to catch up with the many exciting developments. From the formal and informal communications from Down Under it is clear that exploration geochemistry is rising to new levels of sophistication, and also is in high demand in many parts of the world. To paraphrase from Alan Coope's keynote address: let us keep the pace, interact, communicate, and challenge conventional wisdom.

Communication is a cornerstone of the AEG, and the benefits of that process were evident at Townsville. Our Australian colleagues took the lead in sharing their experience and new methods. Their open style and hospitality is a reminder that we all need to do our part if the profession is to prosper and progress. As Editors we challenge you to use **EXPLORE** as a medium to express your technical and professional views and information. Only a small fraction of the AEG contributes letters and technical reports. We will welcome your communications, however brief or simple they may seem to you.

The Special Award to Owen Lavin was clearly deserved for his diligence and creativity over the past five years as sole Editor of **EXPLORE**. Owen is incredibly busy with the work he must do for Newmont Exploration. So it is time to wish him well and turn over the editorial chores to Sherm and Tom. From now until they turn the lights off at the Federal Center, please send your communications to us. Not coincidentally, we work together on a daily basis, have offices a few doors apart, and easily share paper or electronic mail. Our addresses are elsewhere on this page and we hope that you will use them frequently in the coming months.

Contributor's deadlines for the next four issues of EXPLORE are as follows:

Issue	Publication date	Contributor's deadline
89	October 1995	August 31, 1995
90	January 1996	November 30, 1995
91	April 1996	February 28, 1996
92	July 1996	May 31, 1996

President's Message

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Geochemistry and Environmental Geochemistry. Many of us appreciated the single session approach, not having to run between concurrent sessions hoping that the talks were on schedule. Long *tea*-breaks in the vicinity of the posters and exhibits under Marquees on the lawn worked well to encourage interaction of presenters with the delegates. The posters were left in position throughout the conference, again a nice change to the frustration I usually encounter in missing the short time window often allotted to posters. Those lavish lunches, also under Marquees, will be remembered too (perhaps with a tinge of guilt?) -most people are to be congratulated for forcing themselves to leave that idyllic surrounding to catch the first afternoon talk!

The Annual General Meeting on Monday evening was .....interesting. Graham Taylor initiated a lively debate on the AEG's future directions into environmental geochemistry. We heard very diverse opinions from members, for and against. Consensus was certainly not evident! Personally, I do not feel that expansion into the environmental geochemistry field will have a negative impact on our exploration publications or activities. The journal has always been open to accepting pertinent papers in this field - look back at Eion Cameron's Foreward in the first issue in 1972. He said then "There may be occasional papers which reflect the close relationship between the work of exploration geochemists and those who study the chemistry of man's environment". This past year some of us in Applied Geochemistry at the Geological Survey of Canada have become familiar with the reports which form the basis for multi-lateral decisions leading to legislation and joint protocols on metals in the environment. It is clear that we, the geochemistry community, should and must be involved in the process leading to these decisions which will undoubtedly affect the mining industry. That is not the situation currently. More on this in another issue.

The AEG 25th anniversary moonlight dinner on Tuesday night was well attended and formed the venue for presentation of awards - the Past Presidents' Medal to the first AEG President, J. Alan Coope; the Gold Medal to Charles Butt and Ray Smith; the student prize to Trevor Boyd (in absentia); and a special prize to Owen Lavin, Editor of **EXPLORE**. Alan Coope, founding member of the AEG, presented us with a history of the Association from its inception in 1970 to the present, recalling those who have put so much effort into making the AEG a strong and interactive community of well over 1000 geoscientists. Thank-you, Alan. The expedition to the Great Barrier Reef on Wed., 'break day', was absolutely spectacular, even through the after-effects of the substantial amount of wine consumed the previous night. After swimming around in that amazingly colourful, vibrant and fascinating world of the Reef, I have found it impossible to eat fish since!

It was exhilarating to see the amount and depth of exploration geochemical research being carried out in Australia - it proved to be an excellent milieu for celebrating our 25th anniversary. The 18th IGES will be held in Jerusalem in 1997. Ron Bogoch, a member of the Israeli committee, attended the Townsville meeting to learn more of the Association and to glean advice on running such a meeting. Good luck, Ron, and **Thanks again to the EGRU Organising Committee for a job superbly done!**

Gwendy Hall

Medals

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several gold deposits in Western Australia, the granting of A$16 million for the continuation of their research, the many excellent papers at 17 IGES by members of their teams and a highly successful field trip to their study areas in Western Australia (see Excursion 3: Regolith Exploration Geochemistry, Yilgarn Craton, Western Australia on Page 15 of this issue of **EXPLORE** for details).

In addition to receiving the Gold Medals, Charles and Ray were chosen to be the AEG Distinguished Lecturers for 1995-97. An itinerary will be published in later issues of **EXPLORE**.

The Past President's Silver Medal was presented by President Gwendy Hall to J.Alan Coope for his dedicated service to the Association. It was most fitting that Alan, a founder of the Association, its first President, and an architect of the present strong and influential position that the Association holds, was present at these 25th anniversary celebrations with his wife Carol. Following the presentation, Alan gave the 300+ dinner guests a guided tour of the Association and his thoughts on its future.

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Medals

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The full text of medal citations and acceptance speeches will be published in the special issue of JGE together with the papers from 17th IGES. The text of comments made by J. Alan Coope after receiving the Past Presidents' Medal are reported in this issue of **EXPLORE.**

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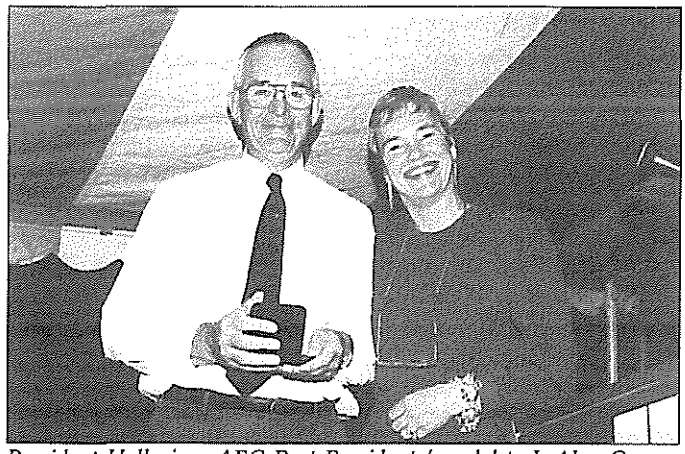

President Hall gives AEG Past Presidents' medal to J. Alan Coope.

The Association of Exploration Geochemists — Past, Present, and Future

The following is the text of the after-dinner address by J. Alan Coope at Townsville, May 16, 1995, eds.)

Thank you, Graham [Taylor], for your kind introduction.

The history of our Association began during the boom years of the 1960's in British Columbia, Canada. The objective of many exploration programs in the western Cordillera at that time was the discovery of porphyry deposits and exploration geochemistry was being widely used. However, to have reports on exploration geochemistry accepted for assessment purposes, the author had to be a professional engineer registered in the province. A structural engineer could write, and have accepted, geochemical reports but the unregistered, qualified exploration geochemist (with upwards of 10 years experience) could not. We expressed our concerns to the authorities at the time but the disappointing response was that the regulators were "less concerned about the qualified few than the unqualified many".

This British Columbia experience indicated we had no status. Despite the wide use and great success of geochemistry in that decade in the discovery of porphyry copper and other types of deposits, the exploration geochemist had no professional recognition.

In 1967, a movement began to change that. I wrote several letters to geochemists in Canada and the U.S.A., who were employed in industry, government and academia, stating that exploration geochemists should form a society to promote the profession and foster its growth and development. Some people were enthusiastic, some were more cautious. But the interest and activity grew.

A group met at the Prospectors and Developers convention in March 1968, but the key meeting was during the 2nd IGES held in the Holiday Inn West, Golden, Colorado in April 1968. It was at this meeting of 16 persons (Table 1) that the decision was made to create the Association of Exploration Geochemists.

Table 1: Attendees at Golden Meeting, 1968

J. J. Barakso	R. G. Garrett
H. Bloom	C. F. Gleeson
W. F. Bondar	J. A. Hansuld
R. W. Boyle	H. E. Hawkes
F. C. Canney	A. Y. Smith
J. A. Coope	W. M. Tupper
A. H. Debnam	J. L. Walker
F. D. Forgeron	J. S. Webb

The meeting named a working committee of three, Frank Canney, Johnny Walker and myself, to get the show on the road. The first major exercise was to write a constitution and by-laws. To do this, we obtained copies of the by-laws of four societies; Society of Economic Geologists, Institution of Mining and Metallurgy (London), Geological Association of Canada and Society of Exploration Geophysicists. These I carried around in my brief case wherever I went.

It was a tedious process identifying the most appropriate

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The Association...

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structure and language for the AEG constitution, but the break came during the winter of 1968-69 when I was stranded by ice-fog in Watson Lake, Yukon for four days. I was able to put together, after several uninterrupted hours, the first complete draft of the document.

The working committee prepared several drafts with input from many people across Canada and the United States until the first constitution and by-laws evolved. With this framework established, the working committee also assembled a charter or founding membership and a pro-tem slate of Officers and Ordinary Councilors (Table 2). All attention was focused on a meeting of these charter geochemists called during the 3rd IGES in the King Edward Hotel in Toronto, April 17, 1970.

Table 2: Pro-Tem Council 1970-71

President	J. A. Coope
Vice Presidents	J. A. Hansuld
	F. C. Canney
Secretary	I. Nichol
Treasurer	C. F. Gleeson
Ordinary Councillors	
H. Bloom	H. E. Hawkes
R. W. Boyle	H. W. Lakin
D. R. Clews	T. S. Lovering
I. L. Elliott	J. H. McCarthy
R. L. Erickson	J. L. Walker

The Toronto IGES was a very successful one (700 delegates from 26 countries). The room chosen for the founding meeting of the AEG was full, the constitution and by-laws were approved and the pro-tem Council elected. I recall a general feeling of immense relief and excitement and could sense the momentum building as we all looked forward to tackling all the things that had to be done.

Soon afterwards, several committees were formed and the volunteer spirit was incredible. There was no coercion - people wanted to contribute and get involved. The leaders of these committees were:

*	Admissions Committee	- John Hansuld
*	New Membership }	
*	Bibliography Committee }	- Herb Hawkes
*	Computer Application Committee	- Ian Nichol
*	Research and Education Committee	- Hal Bloom
*	Case History Committee	- Ralph Erickson
	Geochemical Analysis Committee	- Bert Lakin

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The AEG took over the responsibility for organizing future International Geochemical Exploration Symposia, and not long into the Association's first year, Council accepted an invitation to convene with the IMM in London in April 1972 for the 4th IGES. John Webb agreed to be the Symposium Committee Chairman. This committee activity and Council's desire to build international communication and activity helped generate considerable publicity and there were well over 200 paid up members by the end of the AEG's first year. Our timing was perfect. On its first anniversary, the AEG was able to invite nominations for a Regional Councilor for Australia and Correspondents for the United Kingdom and Continental Europe.

Despite the accumulating memberships, money was tight. Several early members loaned money to the AEG so that we could launch our activities. There was no spare money and no spare time, but there were many Maalox moments and Metamucil minutes.

The Journal was born at this time. Eion Cameron's research of publication output through 1970 clearly indicated the potential for a journal dedicated to exploration geochemistry and Council strongly endorsed Eion's recommendation to proceed at a Council meeting early in 1971. John Hansuld (in his presidential year) worked closely with Eion and by January 1972 a contract was signed with Elsevier and the first **Journal of Geochemical Exploration,** under Eion's editorship, was in the membership's hands by the late summer of 1972. Eion's stewardship of the Journal through the 52 volumes that we currently have on our bookshelves is one of the most prominent of the many outstanding achievements of the AEG membership over the past 25 years. Not only has the Journal become one of our most visible communication products, it's contents have positively influenced the thinking and the careers of many of our members.

The first AEG Newsletter came out under John Hansuld's leadership at the end of the first year (1971) and has continued as a quarterly publication with only a few hiccups along the way. The Newsletter has become an important part of the AEG's service to the membership, providing up-to-date technical information and other news and the opportunity for additional communication and involvement.

The name **EXPLORE** was not introduced until the 1980's. In recent years, **EXPLORE** has become a model for other successful newsletters produced by other societies such as the Society of Economic Geologists.

Herb Hawkes' first **Bibliography Volume** (Sp. Vol. #1) appeared in 1972 and was distributed free to the membership.

Early in 1976, Council decided to incorporate the Association. The legal work was done in Toronto and the president (Gerry Govett) and Council were kept abreast of progress and gave their approval to the new document which is the one that all of you became used to from the mid-1970's onwards. The contents of the new document were essentially the same as the original document of 1970 but appropriately rewritten and re-arranged to conform with the requirements of federal incorporation in Canada. It was a good, well balanced document. The Association's changeover to an incorporated entity was very smooth. When all the necessary documentation and approvals were obtained, and since the federal government in Ottawa did not recognize the active, unincorporated Association, three of us, Peter Bradshaw, Johnny Walker and myself were identified as the first members of the (new) Association. We met in Toronto five days before the Annual General Meeting of the (old) Association scheduled for Vancouver, and ratified and approved the new By-law No. 1.

When we all met in Vancouver, two Associations existed - the unincorporated body with some 500-600 members and the incorporated body with only three members. For just five days there were two AEG presidents and also two AEG secretaries. In the space of about 30 minutes on April 26th, 1977, at the Annual General Meeting, the old (or prior) Association was dissolved, the new By-law No. 1 was again approved and all memberships, assets and obligations were transferred and assumed by the new incorporated Association. Peter Bradshaw, Johnny Walker and myself were fired (actually, we resigned) and the new Council, elected much the same way as it is today, took over.

This brief account gives you some appreciation of the volunteer effort, dedication and the excitement that accompanied the creation of the Association. Over the years, 10 members from industry, 9 from government, and 6 from academia have served as president of the Association (Table 3). This has been a good mix of the estates and has contributed, I am sure, to the Association's success.

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Table 3: AEG Presidents

1970-71	J. A. Coope	1982-83	J. H. McCarthy
1971-72	J. A. Hansuld	1983-84	L. G. Closs
1972-73	R. L. Erickson	1984-85	R. G. Garrett
1973-74	I. Nichol	1985-86	I. Thomson
1974-75	I. L. Elliott	1986-87	G. A. Alcott
1975-76	R. W. Boyle	1987-88	S. J. Hoffman
1976-77	G. J. S. Govett	1988-89	M. A. Chaffee
1977-78	R. F. Horsnail	1989-90	A. E Soregaroli
1978-79	P. M. D. Bradshaw	1990-91	D. D. Runnells
1979-80	P. K. Theobald	1991-92	W. K. Fletcher
1980-81	A. W. Rose	1992-93	J. A. Jaacks
1981-82	K. A. Lovstrom	1993-94	G. F. Taylor
		1995	G. E. M. Hall

Another feature of the success of the AEG over the years has, of course, been the **International Geochemical Exploration Symposia.** As you will remember the symposia predate the Association, the first of which was organized by Eion Cameron, Bob Boyle and other GSC colleagues in Ottawa in 1966. We are counting number 17 this week and as you can see, the Association has interacted with explorationists and geoscientists around the world (Table 4).

Table 4.: Locations of International Geochemical Exploration Symposia

1.	1966	Ottawa	9.	1982	Saskatoon
2.	1968	Golden	10.	1983	Helsinki
3.	1970	Toronto	11.	1985	Toronto
4.	1972	London	12.	1987	Orleans
5.	1974	Vancouver	13.	1989	Rio de Janeiro
6.	1976	Sydney	14.	1990	Prague
7.	1978	Golden	15.	1991	Reno
8.	1980	Hannover	16.	1993	Beijing
			17.	1995	Townsville

The breakdown of symposia locations is:

Canada	5	Australia	2
Europe	5	South America	1
U.S.A.	3	Asia	1

It is interesting to observe that there has not been a symposium in Canada for 10 years, but Gwendy Hall tells me that provisional plans are in place to hold the 19th IGES in Vancouver in 1999.

The AEG has matured and grown through its association with various institutions who organized and hosted symposia in these various countries over the years. I think it is true to say that, in return, these institutions have benefited from their association with the AEG as it has established its reputation as an objective society focused on technical and scientific advancement of geochemistry and its integration with other disciplines in the exploration for mineral deposits.

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Now that I have given you some background on how the Association started, rather than make reference to exploration geochemistry's discovery successes — these now total in the hundreds — I would like to review the contribution the AEG has made to exploration geochemistry and peoples' careers. I have received some feedback on these topics from several people over the past year.

All will agree that the AEG has become a very significant communication catalyst in exploration geochemistry. Several AEG members have emphasized that some of the Association's early activities including the momentum of its formation in 1970, the International Symposia in Toronto (1970) and London (1972) and also the launching of the Journal in 1972 served to:

- Firstly, establish global communication links and contacts in exploration geochemistry;
- Secondly, provide fertile vehicles for interaction between geochemists in industry, government and academia and for the cross-fertilization of ideas and experiences gained in contrasting environments and terrains;
- Thirdly, make it apparent that the understanding of geochemical behavior in a variety of contrasting environments - tropics, temperate regions, deserts and forests - was the steepest learning curve in geochemical prospecting;
- Fourthly, helped legitimize geochemical exploration, making it possible to establish it in university teaching programs; and
- Fifthly, provided the necessary interdisciplinary focus that helped attract some of the brighter minds (as students) into the field.

This comprehension and intellectual interest came at a critical time, building on the successes of the 1950's and 1960's when geochemical exploration demonstrated its important role in the mine-finders arsenal, and establishing a greater scientific respectability for secondary dispersion processes and geochemical methodology.

The feedback also identified several milestones. These milestones are by no means recognized universally and it is clear that certain activities and events influenced some more than others. Several agree with me that the **Journal of Geochemical Exploration** has been one of our most important achievements. Much of the vigor and philosophy of exploration geochemistry stems from publications in the early issues of JGE. It established not only concepts and ideas but also reputations and careers.

Geochemical conceptual models demonstrated a means to put science into systems involving landscape, geomorphology, hydrology and geochemical response. Conceptual models were introduced to explorationists by Peter Bradshaw in the Journal (and Special Volume #3) in March, 1975. This holistic approach was developed from pioneering conceptual developments in landscape geochemistry by the Russians in the 1930's and explained to the western world by John Fortescue in 1960's and 1970's. This is probably one of the best ways to teach exploration geochemistry.

Another significant (multiple) milestone has been the **Exploration Geochemistry Bibliography.** This was a major dedication by Herb Hawkes and various colleagues, publishing special volumes and supplements between 1971 and 1988. The bibliography includes approximately 10,000 exploration geochemistry-related citations spanning as far back as Herb could compile through to the end of 1987.

For many of us, Herb Hawkes' Bibliography has been the first source of information on any new topic and the cross-reference feature built into these volumes has been of inestimable value. Most of us have said 'thank you' to Herb many hundreds of times for providing us with this magnificent reference record.

Several **symposia, regional meetings, special volumes, short courses and workshops** have individually and collectively brought improved understanding, inspiration and awareness to many of our more productive members at different stages of their careers. All these events were organized under the auspices of the Association at different locations around the world.

These positive experiences of the few that wrote to me have been duplicated with many others and it is clear that the Association has had a huge, virtually unmeasurable, effect on spreading awareness of geochemical exploration technology, demonstrating and fostering its scientific significance and positively influencing standards of professional geochemical practice.

This, in brief, is what the Association has given to us until now. What is ahead? Let's look into the future. After all, this is where all of us are going to spend the rest of our lives.

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PACRIM '95

19-22 November 1995

Auckland, New Zealand

PACRIM '95 will examine the geology and ore deposits of the dynamic environment of the Pacific Rim. It will also examine the political, economic and environmental constraints on mining and exploration in this area of increased investment. The Congress will have eight main themes.

1. Metallogeny at plate boundaries
2. Case histories of recent discoveries
3. Mining and the environment
4. Mining geology: problems and solutions
5. Mining and metallurgy
6. Political and economic constraints
7. Structural geology, tectonics, geophysics and geodynamics
8. Petrology, geochemistry and volcanology

Abstracts and papers will be published in a proceedings volume which will be available at the conference. To express interest, and for more information: Mrs. Charmayne Perera, The Australasian Institute of Mining and Metallurgy, P.O. Box 660, Carlton South, Victoria 3053, Australia Phone: +61-3-662-3166, Fax: +61-3-662-3662 or E-mail: J.Mauk@auckland.ac.nz

The Association.....

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With careful planning and good management, the AEG will certainly carry us successfully to greater goals. I believe the success of any organization such as the AEG is inevitably based on a common, agreed **objective and focus.**

Good vision. Twenty-twenty. Look at the numbers for a moment and you will realize that the year 2020 will be the 50th anniversary of the AEG. It is important to our continued success that we be **visionary.**

The Association's Outlook and Future
20 20

Our reason for being has been the advancement of geochemistry, both scientifically and technically, as it relates to the discovery and orderly development of natural resources - particularly, but certainly not exclusively, mineral resources. Whatever your persuasions, the future develop-ment of all the nations in this world of ours will be intricately related to our skills and abilities in the husbandry of the world's natural resources. This will include their discovery and development. It also includes — as we have acknowledged in the Association over the last decade — the fostering of a greater scientific and practical awareness of environmental challenges related to discovery, exploitation and reclamation in natural resource development. The Association's objectives are, therefore, very noble ones and in order to be a productive organization it must maintain this same, clear and objective purpose.

We should ask ourselves if we have the right kind of scientific vision to meet the **2020 challenge.** My observation over the years has been that geoscientists tend to justify themselves more on what they *have* achieved rather than what they *can* achieve. A big demand, in the past, from many of our industry colleagues has been for case-history successes and practical direction rather than for scientific understanding in exploration geochemistry. Scientific understanding from sound scientific research and development is absolutely essential to progress and, while continuing to recognize the more immediate needs of industry, it is very important for the Association to foster this scientific research much more aggressively than in the past.

Like all of you who have made the journey to Townsville this week, I have been very impressed by the quality of work and exciting new directions indicated in many of the presentations at this Symposium. It is also my belief that some of the misguided government policies and regulations introduced in certain countries around the globe are destined to give the scientific aspects of geochemistry new and fresh momentum. Those, like myself, who gained geochemical experience in tropical countries in the early part of their careers, became aware of the variety of factors including geomorphology, weathering processes, climate, topography and vegetation in addition to geology and mineralogy that exercised significant controls on geochemical dispersion. Somehow the importance of these factors did not always become implanted in exploration practice in higher latitudes.

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The Association.....

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Now that more and more exploration capital is being invested in tropical countries, their importance is being appreciated and resurrected. This Symposium illustrates this change and we should encourage the Association to nurture this revival by promoting the exciting aspects of exploration geochemistry research.

I congratulate the CSIRO. The Cooperative Research Center for Landscape, Evolution and Mineral Exploration is a very positive step. Earlier CSIRO research, the adoption of findings by industry, and the promise of the CRC LEME 10 year plan clearly indicates that intelligent geochemical exploration is back in Australia and hopefully in other parts of the world too.

In addition to the emphasis on landscape, there are complementary advancements which are being highlighted by this Symposium. These advancements relate to ways that metals move - not just where they move such as we determine by observation, but *how* they move. We have not progressed very far in understanding the "how" of geochemical dispersion processes but this is crucial to improving the effectiveness of geochemical prospecting. The data we collect every year provides us with subtle hints of how little we know. We must learn to acknowledge data *that does not complement our favored hypotheses or does* not conform with conventional wisdom. Conventional wisdom is, perhaps, our worst enemy.

Presentations at this Symposium indicate a growing awareness that there are important dispersion processes occurring that we do not yet fully understand. Most of us, over time, have recognized several puzzling things. For example:

* Radon dispersion from deep, buried sources that seems to defy this element's 2.8 day half-life;
* Anomalies in shallow-rooted vegetation related to deeply buried sources beneath transported overburden;
* Responses from CHIM, GEOGAS, methylated arsenic, and other collector methods tens to hundreds of meters *vertically* above deeply buried sources;
* Many examples of haloes or anomalies thousands of meters *vertically* above an oil or gas reservoir contained in the petroleum geochemical literature over the last 30 years. These are not only anomalies of hydrocarbons but also halogen and metallic elements.

We should also ask ourselves:

- What did we learn from Airtrace and Surtrace?
- What are results from the microlayer, TMGM, MPF techniques and the enzyme-leach and the "mobile metal ion" analyses telling us?

Careful consideration of these examples, and evaluation of the situations where these methods work well and not so well, may provide us with some insights into dispersion processes that we do not yet fully understand and have yet to utilize in what promises to be more sophisticated exploration practice in the future. The proceedings of this conference will introduce many to and, predictably, stimulate others into researching these exciting cutting-edge aspects of geochemical dispersion.

As we look upon these encouraging prospects in our future, we should be careful not to permit technology to highjack scientific progress. Such highjackings are not uncommon in the history of geochemical exploration and the nature of our enterprise will ensure similar temptations and distractions will challenge us into the future. Let me give you an example.

In the 1950's and the 1960's, several partial extraction techniques - for example, CxCu and CxHM - developed quite rapidly when it was appreciated that, properly applied, these methods enhanced the anomalous response from mineralization in several media. Despite the obvious applicability of these methods in exploration, suddenly, in the late 1960's and through the 1970's, high technology intervened. Several *instrumental methods capable of high volume, multielement* analysis were developed. The higher capital costs incurred with the introduction of this technology resulted in sales pressure promoting the larger volumes of cheaper (per analysis) data that the instruments could produce.

Geologists and many geochemists elected to take the multielement "total" analysis route and this, in turn, created an increasing demand for computer technology to manage the high volume of data generated by these instruments and accommodate increasingly sophisticated statistical software that many explorationists assumed or expected would solve their interpretation needs.

In exploration, with the exception of a very few, geochemistry became a numbers game with limited creativity. Meanwhile, the evolution of partial analysis - the method of great promise in identifying mineralization targets

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-was forced into the proverbial back seat in all but one or two institutions. In other words, technology and attendant sales pressure highjacked a promising and more scientific development phase of geochemical methodology.

Personally, I consider such highjackings to mark dark ages in geochemical development. The large amount of unused, misused and useless data characterizing the multielement surge I have just described, justifies more derogatory labeling as a period of darker diarrhetic days in this development history.

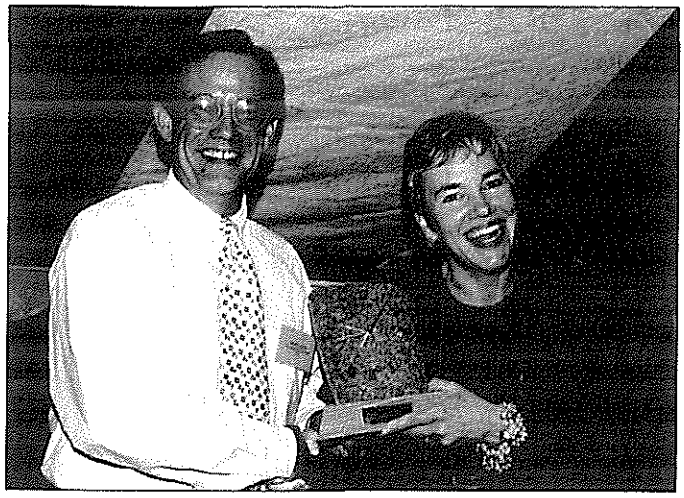
Today, "partial analysis" constitutes geochemical buzz-words and there is a growing realization of the potential importance of this analytical application. At the same time, multielement analysis is attaining its own significant thresholds of maturity as we advance our knowledge of the secondary environment.

It is important that, as the Association faces the 2020 challenge, it continues to exert its influence as a communication catalyst to identify both cutting-edge developments and potential highjackings so as to achieve productive interaction between scientific understanding and technical advancement. Further, in deference to the exciting new horizons created at this symposium and to the geochemical enigmas in existing data sets, the Association should make a conscious effort to focus communication and research in geochemical exploration on what appears to be puzzling and unconventional. This will improve vision, lead to new perceptions, understandings and scientific advances that will enhance the discovery potential of geochemical exploration methodology in keeping with the Association's purpose.

I plan to be around in 2020 but my wife tells me I might not be up to much at that time. However, by then many of you will have resampled and re-analyzed, re-evaluated and re-interpreted, persevered and progressed and predictably turned the conventional wisdoms of today on their ear.

I wish you well. When you succeed, mankind will be grateful.

J. Alan Coope



Owen Lavin receiving AEG Special Award from President Hall for outstanding service during his five year term as Editor of EXPLORE. Owen is stepping down as editor but will continue as business manager for EXPLORE.

LETTERS TO THE EDITOR

June 2nd, 1995

Dear Sirs;

This letter is in response to Stu Averill's Letter in EXPLORE 87 regarding an XRAL advertisment in EXPLORE 86. XRAL's advertisement introduced Lithium Metatungstate (LMT) and Ammonium Metatungstate (AMT), new non-toxic, water based solutions, sold at specific gravities of 3.0 and 2.4 respectively. The advertisement implied that organic heavy liquids traditionally used for heavy mineral separations are toxic and carcinogenic. Mr. Averill asked us to either substantiate this claim, or print a retraction in your magazine. We respond as follows;

Heavy organic liquids used in mineral separations have long been known for their toxicity, and more recently for their carcinogeneity. Extreme caution is necessary in their use. Effects from exposure to these liquids is cumulative, as absorbed chemical is not rejected by the body but rather

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tends to accumulate in the liver. As these heavy liquids have high vapor densities, exhausted vapors can fall to ground level where they may be recirculated in laboratory fresh air systems.

The following examples describe the hazardous nature of some of these liquids. For further information, MSDS sheets and packaging labels should be consulted for the different organic heavy liquids used in mineral separations. There are also many references to be found in the scientific literature.

The State of California has listed bromoform, methyl iodide, carbon tetrachloride and perchloroethylene (PCE) under proposition 65 as chemicals known to the state to cause cancer. (California Environmental Protection Agency List of Chemicals Known To the State to Cause Cancer)

The IARC (International Agency for Research on Cancer) has concluded that there is sufficient evidence for the carcinogeneity of bromoform, methyl iodide, carbon tetrachloride and PCE in animals, resulting in their classification as animal carcinogens. There is insufficient data on humans at this time. (IARC Monographs)

The California Air Resources Board lists PCE as a toxic air contaminant. (Environment Reporter, October 25, 1991). Mental confusion, unconsciousness and even death can occur at high concentrations or prolonged exposures to PCE above 500 ppm. (Vulcan Chemicals MSDS for PCE)

Warning labels for carbon tetrachloride and methyl iodide state that these chemicals may be fatal if swallowed, inhaled, or absorbed through the skin. (J.T. Baker Chemical Co. MSDS)

It is our understanding that tetrobromoethane (TBE) has not yet been tested for carcinogeneity, but was banned in the United Kingdom about 10 years ago following the death of a 32 year old researcher at the Royal School of Mines due to TBE overexposure.

Because of the extreme toxicity of organic heavy liquids, many universities have banned their use and have switched to non toxic water based heavy liquids such as LMT and AMT, for mineral separations up to SG 3.2.

Now that non toxic alternatives are available, companies and institutions still using hazardous organic liquids should seriously consider the implications of continuing to use them. To the extent that the EPA and OSHA become aware of the ability to substitute, change will be mandated. No doubt many readers either conduct heavy mineral separations themselves, or send such work to in-house or commercial laboratories, and may not be aware that non-toxic alternatives now exist.

Sincerely,

Dave McInnes
XRAL Laboratories
Golden, CO 80401

TECHNICAL NOTES

Reviews of the 17th IGES

An Australian Perspective

by David Garnett

The 17th IGES has come and gone, leaving many happy memories and, hopefully, not too many sunburned backs from the Barrier Reef excursion. It was encouraging to see that Australian geochemistry is not just alive and well, but also vigorous and innovative and showing every sign of continuing to grow and prosper in the years ahead. Half of the authors of papers and 300 of the 480 delegates were based in Australia. This was the second IGES to be held in Australia. The 6th IGES was held in Sydney in 1976 and it is a measure of the growth of interest in geochemistry over the nineteen years that the 38 papers presented in Sydney grew to 123 papers in Townsville. In addition, one half day workshop in 1976 was replaced by seven short courses that spanned a total of twelve days in 1995. It says something for the stamina of Australian geochemists that six of the committee members of the 6th IGES were not only present but prominent in Townsville: congratulations to Charles Butt, Richard Davy, Nick Marshall, Richard Mazzucchelli, Ray Smith, and Graham Taylor for lasting the pace so well. In addition, a certain G. J. S. Govett was President of AEG in 1976 and although we had not yet claimed him for Australia, the lure of Sydney was clearly too great because he moved here shortly afterwards. It was a pleasure to see him in Townsville, together with numerous other past Presidents. I wonder what would be the most appropriate collective noun for AEG past Presidents, or indeed for geochemists in general? An 'anomaly'? A 'grid'? All suggestions will be gratefully received and treated with appropriate seriousness.

What was the highlight of the 17th IGES? The quality of the papers was extremely high, with much new and interesting material, but I would have to say that for me the highlight was meeting old friends and making new ones. This is one of the most valuable functions of such meetings and my congratulations go to the organising committee who took the bold step of limiting the number of oral presentations in order to allow more time for informal gatherings during the extended tea and lunch breaks. My thanks to the organisers and participants who made the 17th IGES such a success, and I hope that the 18th IGES in Jerusalem in 1997 will be equally memorable.

David Garnett
Vice President of AEG
Sydney, Australia

The AEG wishes to convey their sincere gratitude to Mark Elliott and all members of the Organizing Committee of the 18th IGES in Townsville for carrying out such a superb job in every way.
Many Thanks!

TECHNICAL NOTES

Review of Short Course #2: Applied Geochemistry in Mineral Exploration and Environmental Studies

Colin E. Dunn, David Cohen and Gwendy Hall

This course comprised one and a half days of lectures and a half day field trip. The lectures outlined biogeochemical principles, methods, analytical methods, and case history studies from diverse geological and climatic regimes around the world. The emphasis was on applications to mineral exploration, whilst demonstrating that the procedures to be adopted and the information obtained provide a 'double-edged sword' in that the data are also valuable for environmental studies.

The Australian content of the course was organised by David Cohen (Univ. New South Wales) who presented some significant newly acquired reconnaissance survey data from NSW. Mel Lintern (CSIRO) discussed several surveys from Western Australia, and Pauline Catt (James Cook Univ.) reviewed studies that she conducted with Monica Cole some years ago. Pauline organised, also, the field excursion to a nearby environmental park during which sampling procedures were demonstrated as was the geobotanical response to different substrates.

It is interesting to note that at a number of widely scattered institutions steady progress is being made in defining parameters that need to be considered in biogeochemical studies, and in establishing the valuable niche that the analysis of tree and shrub tissues can fill in both exploration programmes and environmental studies.

Colin E. Dunn
Geological Survey of Canada

Review of Short Course at 17th IGE, "Progress and Pitfalls in Analytical Chemistry"

David Garnett and Gwendy Hall

Analytical geochemistry today offers a wider range of tools than ever before to the exploration geochemist, but the full potential of many has still to be realized and the boundaries beyond which they should not be used are often poorly defined. The Analytical Short Course examined some of these issues.

1. "No-see-um" / undetectable gold

In probably the most controversial presentation of the day, Dean Butler (Action Gold) argued that there is considerably more gold in many types of samples than is detected by conventional techniques. His modified leach technology (MLT) involves repeated extractions with fresh batches of activated carbon at low pulp densities. Zinc and resins have also been used instead of carbon. Each batch is analysed and the cumulative total gives the amount of gold in the sample. MLT gold values for the Canmet MA2 standard are 6.15 g/t, compared with the recommended value of 1.86 g/t, show that his claims are far from modest. In another example, a sample giving a value of 0.22 g/t by conventional analysis gave 14.6 g/t using MLT. Butler argues that gold is easily resorbed back onto ore particles at high pulp densities and is therefore not available for analysis. His problem at this stage is that while he can analyse to get elevated values, he cannot commercially recover the gold. Potential pitfalls: No explanation was put forward as to why two such dissimilar techniques as fire assay and neutron activation analysis generally give similar gold values if both are claimed to be wrong. Are the cumulative totals simply a product of adding many small amounts of background noise? Are small amounts of pulp, entrained with each batch of carbon, confusing the final figure? If not, what other explanations are available? There is need for rigorous public scrutiny of the method and Dean Butler has agreed to make available full details so that any interested laboratory can test it (see future issue of **EXPLORE**).

2. ICP-MS in hydrogeochemistry.

From the Geological Survey of Canada, Gwendy Hall highlighted some of the recent advances in exploration geochemistry due to the constantly improving detection power of ICP-MS. The impact this technique has had on analysis for the *precious metals*, in a variety of media, was reviewed. Further details of the promising laser ablation ICP-MS analysis of partially cupelled Pb buttons for PGEs were given (published in **EXPLORE** #86). Progress in the application of *selective leaches* (including the MMI approach, see later section) is certainly dependent on the use of this technique for accurate and precise measurement at ppb, ppt and even ppq elemental concentrations. Papers given later in the conference attest to the high level of interest in the information to be derived from these specific leaches, both in exploration and in environmental geochemistry programs. Where we were limited previously to studying elements such as Zn, Cu, Ni which occur at high enough concentrations for measurement by ICP-ES or AAS, now we can examine the patterns shown by, for example, Hg, Cd, As, Sb and the precious metals present in specific phases or in specific forms in soils and sediments. Presently benefiting from, or poised to reap the advantages of ICP-MS's super sensitivity are the exploration approaches of: specifically extracting the metals bound to 'scavenging' phases such as humics and fulvics in humus material and amorphous Fe and/or Mn oxide phases in soil; and dissolving those elements only loosely bound or sorbed to the outer structures of the medium under study. *Pitfalls*: Watch out for possible readsorption of analytes back onto the sample substrate during application of these leaches, thus negating 'trueness' of results. Although ICP-MS suffers

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from relatively few spectral interferences, the possible presence of these and matrix-induced interferences must be checked.

The second half of Gwendy's slides illustrated the promise of *hydrogeochemical surveys* as an exploration and mapping tool. Rare earth elements measured by chelation ICP-MS at low ppt levels in lakes in Baie D'Espoir, Newfoundland, delineate the contrasting bedrock geology clearly, even more so than the corresponding sediment patterns (fewer confounding factors such as grain size fraction taken, organic content etc.?). The application of hydride generation ICP-MS for determination of Sb, Se, Te and Bi in streams, again at low ppt concentrations, shows anomalies in undisturbed areas of known Au mineralisation in Baie Verte, Newfoundland. These hydrogeochemical surveys, where over 50 trace elements are determined, provide information leading to further understanding of surficial processes. Potential pitfalls: The effect of rainfall on analyte signatures so far has proven insignificant compared to the overall geochemical contrast seen in these surveys but further time studies on selected streams are needed. Concurrent collection and analysis of contaminated streams (3 orders of magnitude higher in most analytes) from leaching of poorly impounded tailings revealed that cross-contamination between such different samples can easily be avoided through sufficient rinsing of processing apparatus. Ppt concentrations can be accurately measured with care - Teflon collection bottles and expensive clean rooms for analysis are not needed, but common sense is. Filtration for 'size fractionation' and acidification for preservation remain necessary nuisances to carry out in the field laboratory but stay tuned for progress bulletins.

It's time we saw more ICP-MS instruments in geochemical production laboratories. They are now far more robust, the amount of down-time is acceptable and capital cost is decreasing, thanks to competition amongst the manufacturers.

3. Portable infrared mineral analyser

Geochemists sometimes forget that elements that they measure normally occur in minerals, and that these minerals can also show patterns which are useful in mineral exploration. An example is alteration minerals around ore deposits. Nick Merry (Spic) demonstrated some of the capabilities of the *PIMA II* field portable infrared mineral analyser. This instrument measures the reflectance spectra of rocks and minerals in the short wavelength infrared range. Vibrational transitions associated with hydroxyl and water in mineral lattices are responsible for the majority of silicate mineral spectra. Many types of sample can be assessed, e.g. drill core, rock chips, outcrops, and soils, allowing recognition of patterns not visible to the naked eye. The analyser can be used for both identification and for assessment of such features as crystallinity and amount of element substitution. Each measurement takes 30-60 seconds. Potential pitfalls: You still have to interpret the spectra, which can be complex. With the exception of monomineralic samples, most spectra will be a superposition of spectra from several minerals in the sample. Perhaps this should be regarded as more a challenge than a pitfall.

4. Gas vapour phase chemistry

Detection of ore-bodies covered by barren overburden poses an interesting challenge and the last two presentations addressed this problem. Gas vapour phase (GVP) compounds collect in the soil profile, particularly on clays, and the technique works best in arid to semi-arid climates where water content of soil pore spaces is low. There are hundreds of GVP compounds in natural soils and initial work in North America showed that specific GVP compounds could be detected above blind mineralisation. David Thiede (Magellan Petroleum) describe some of the refinements which he has developed for his GVP work in Australia. He has discarded use of collectors for soil gas because these are subject to short-term fluctuation, and he favours analysis of the clay fraction instead. This provides a more integrated measure of GVP content. Gases are analysed using a mass spectrometer and over 40 compounds or groups of compounds are evaluated for their signatures over the deposit. Ratios are used in preference to simple concentrations because these reduce the effect of short-term variations in GVP concentrations. Each deposit type appears to have its own signature, so the technique is best used as a follow-up tool in areas where there is some known mineralisation. Potential pitfalls: Early work was less effective because it did not look at enough compounds. A minimum of 10-15 are needed to delineate an anomaly and eliminate false ones. With over 40 compounds or groups of compounds available for assessment, the number of possible ratios is enormous and further work is required to optimise choice at a particular site. Be careful with sample preparation or adsorbed species will be lost. In contrast to conventional soil or stream sediment sampling, nylon mesh sieves should be avoided because they have their own GVP compounds. Use a metal sieve instead. Similarly, use an old metal shovel—new ones are coated with organics. Watch out for sunscreen, and whatever you do, don't sweat while sampling; these cause contamination!

5. Mobile metal ions

Alan Mann (Geochemistry Research Centre) invoked the intriguing concept of active anomalies having inputs and losses every day. His mobile metal ion (MMI) technique focuses on a very weak partial extraction of loosely bound metals which may constitute less than 2 percent of the total metal content of the sample. No particular phase is attacked and the nature of the sample does not matter very much. At this stage of his research, Mann uses two digestions on each sample, one involving a proprietary mix of water soluble organic and inorganic compounds. Samples are digested for 24 hours at room temperature with agitation every two hours at the start, and the extracts are analysed for Cu, Pb, Zn, Ni, Cd, Au, Ag, Pt, and Pd. Two types of anomaly may be detected: vertically above the deposit and/or an up-dip projection. There are very few false anomalies according to Mann, and the anomalous elements reflect the composition of the ore itself. Potential pitfalls: The metals are so loosely bound that samples should not be ground and wet samples should not be dried. There is some difference in the absolute

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amounts measured when repeating surveys, due to the active nature of the anomalies and to subtle variations in analytical conditions. Consequently, response ratios (value divided by background value) are used. MMI anomalies need time to develop and may be swamped by elements in recent, rapidly deposited cover. And a final word of warning: the MMI technique should not be regarded as a universal panacea: it does not always work.

David Garnett and Gwendy Hall

Excursion 3; Regolith Exploration Geochemistry, Yilgarn Craton, Western Australia

Owen Lavin

Last May 5th, approximately 30 participants from seven different countries began one of the most interesting and informative field trips this writer has ever attended. Ably lead by Drs. Ray Smith, Charles Butt, and Ravi Anand (CSIRO), participants were shown convincing examples of the ravages of long-term weathering on the distribution of elements and minerals. Anyone who does not believe in the mobility of gold in the surface environment needs to take this trip. In mine after mine, participants were shown ore-block sections where gold grade followed weathering horizons and was underpinned by primary mineralization that was clearly different in distribution from the upgraded weathered ore.

Heavy rains (for Western Australia) immediately preceded the field trip and put the trip organizers in a panic, but participants were none-the-wiser. Routing was modified "on-the-fly" but we were able to view a wide variety of gold deposits and see complete and varied exposures of the weathering profile. Deposits visited were primarily gold: Mount Gibson, Lawlers (district), Bronzewing, Kalgoorlie (multiple exposures in the district, including Mount Percy), Kanowna Bell, Paddington, and Panglo. The Mount Keith Nickel deposit was also visited and examined.

Participants were impressed with the hospitality and generosity of the many mining companies that put on the tours. This is undoubtably the result of excellent relationships and respect established between the tour leaders and the company geologists over the past twenty years that CSIRO has been researching regolith geology and geochemistry in the area.

Two other characteristics of the field trip deserve note. Travel was by a highway bus company that specializes in "safaris". Because of limited infrastructure in Western Australia, the underbelly of the bus is loaded with a huge fuel tank, sleeping bags, tents, food-filled coolers, tables and chairs. When the appropriate time arrives, the driver/cook pulls over, sets up the tables, lays out the food and we eat. In less than an hour, we were on our way again.

Given the long distances between stops, hours of bus riding was inevitable. Rather than let us sleep, talk show host wanna-be, Ray Smith organized moving question and answer sessions, making efficient use of the time, talent and experience of all participants. Believe it or not, the time literally flew by. This was a great idea and could be effectively adopted on many field trips.

Anyone with the opportunity should make all efforts to take this trip, or any piece of it that is available. Failing that, the Excursion guidebook alone is a valuable and timely summary of current thinking about the environment and would make interesting reading. It is entitled *17th International Geochemical Exploration Symposium Excursion 3; Regolith Geology and Exploration Geochemistry in the Yilgarn Craton, Western Australia,* and is available from the Publications Officer, CSIRO Exploration and Mining, Private Mail Bag, PO, Wembley, WA 6014, Australia, for A$50.00.

Owen Lavin
Newmont Exploration
Denver, CO

Excursion to Far North Queensland and to Ravenswood/Charter Towers

David Garnett

The McWilliams have been making wine in Australia for many years and in these days of mega-corporations it was good to see that this fine old Australian family business could attract such stalwart support from a determined group of geochemists/geologists at the half way point of the Far North Queensland Excursion. Some would say that consuming five bottles of port was a bottle too far, but it does go to show that field excursions are certainly not all work and no play. What was even more impressive was that this true multinational force - drawn from North and South America, Africa and Australia - all managed to appear for an early morning breakfast only a few hours after they had finished doing their bit for the Australian wine industry.....although it must be said that some looked more as if the Australian wine industry had done for them. Certainly most seemed to be glad to disappear into the quiet and dark of the Undara lava tubes for a brief interlude of peace and meditation.

Group of sober geochemists at Heberton tin fields: Back row, left to right: David McDonald, Graham Greaves, John Parianos, Jenny Birch, David Joy, Clinton Rivers, Andrew Garner; Middle Row: Christian Marriott, Ros O'Sullivan, David Garnett, Edgar Brauer, Brad Sim; Front row: Graham Closs, Warren Stevenson (coach driver), Gustavo Abreu, Eric Hannsen, Anggun Seto, Joas Kabete, Simon Beans, excursion leader, and Tom Orr.

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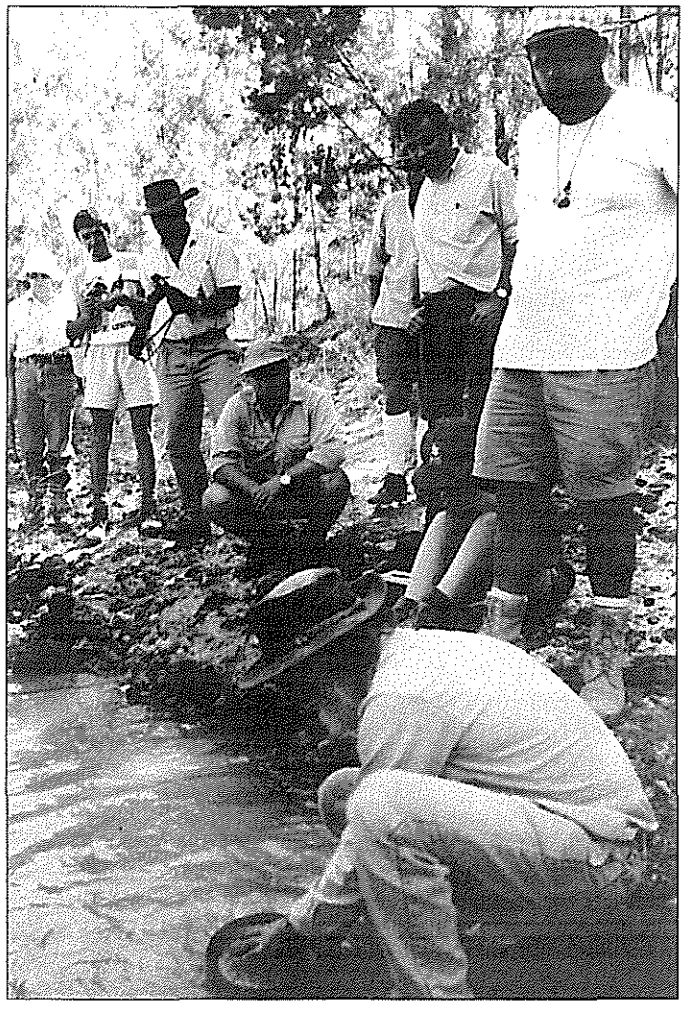
We did work. In fact, in the course of two excursions lasting a total of six days we visited eleven mines, former mining areas or prospects. These included the hydrothermal breccias that constitute Queensland's largest (Mount Leyshon) and second largest (Kidston) producing gold mines. In addition we examined numerous core displays and listened to consistently high quality presentations from local geologists or, in some cases, from geologists who had traveled considerable distances to join the excursion to explain the features of a particular area. Ravenswood, Mount Wright and Triple Crown added to the gold tally, but the menu also included polymetallic volcanic-hosted massive sulphide deposits of the Mount Windsor Subprovince; the largest economic lateritic nickel deposit in Australia at Greenvale; skarns at Mount Garnet and Pinnacles; and the Herberton tin fields. For those interested in the weird and wonderful it would be difficult to go past the skarns. The zinc-rich skarn at Mount Garnet included outcrops of garnet-dominated skarn which still contained crinoid fossils while Pinnacles produced the aptly named wrigglite, an unusual fluorite-rich skarn consisting of rhythmically finely layered contorted rock. In addition to magnetite, up to three other spinels may coexist in a single sample - surely some kind of a record. A cautionary tale from the nickel deposit at Greenvale: avoid roasting your nickel laterite if its chlorite content is above 15%. If you do it will not roast, it will melt to produce, among other things, a nickel rich olivine. Back to square one after all that hard work weathering it.

The main challenge with the gold deposits is to find extensions to known mineralisation in areas that, in some cases, have been contaminated by gold mining activity for over a century. Trenching through the contaminated surface layers and drilling were the favoured approaches—simple and effective. More regional exploration was confronted with the problem of a blanket of Tertiary cover in many areas, but more of that later.

Graham Greaves' demonstration of prospectors assaying techniques (photo) was a particular highlight of the visit to the Herberton tin fields. Alluvial and lode tin deposits required different sampling techniques, but if these were carried out properly grade of tin could be estimated to within 0.1%. In the age of the big, black box it was a reminder that simpler techniques can still be very effective, but is this a dying art? I hope not. We did more than just look at the rocks: there was plenty of exploration geochemistry to go with the geology, much of it made available from hitherto confidential company data sets. What's more, this was not presented as a quick twenty second glimpse before it disappeared back into the company archives. It was all summarised in one of the most exciting compilations of regional geology and exploration geochemistry that I have seen in a long time, and every excursion participant had a copy. All 277 pages of it, many in colour. If you are exploring in north-east Queensland you MUST have a copy of this volume (Mineral Deposits of Northeast Queensland: Geology and Geochemistry, Economic Geology Research Unit Contribution 52, James Cook University) .....even if you have to beg, borrow or steal one. It is the product of an enormous amount of effort by a large number of people but I think it is fair to say that the catalyst and driving force for it all was its compiler and editor, Simon Beams of Terra Search. Just to prove that he really is superhuman he also lead not only these two excursions, but also a pre-conference excursion to the Drummond Basin. He describes himself as a dilettante geologist, so I would like to suggest that he sets himself the target of producing similar volumes for the rest of Australia if he wants a real challenge once he starts to take himself seriously. What is most impressive is the amount of support he received from the companies and individuals involved. Such goodwill and cooperation must surely strengthen the mining and exploration industry as a whole and should be wholeheartedly applauded.



Demonstration of quantitative geochemistry for alluvial cassiterite at Heberton by Graham Greaves.

What point has exploration geochemistry reached in north-east Queensland? Large areas have been subjected to routine geochemical screening (soils and stream sediments, generally -80 mesh, BLEG, pan concentrates and rock chip sampling). For example, over 200,000 regional stream sediment samples have been collected in the Drummond Basin alone. This has probably located most, if not all, of the

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large, outcropping base and precious metal deposits in the region, leaving the areas covered by Tertiary sediments as the challenge for the future. Much of this ground is highly prospective, and some successes have already been achieved by stepping out from known mineralisation by percussion drilling e.g. at Thalanga and Reward. These provide good test cases for refining our approach to covered areas. Can we pick up any signature at surface which might eliminate the need for drilling? If we are to succeed it is essential that more attention is paid to the nature of this cover. Percussion drilling tends to be used as a cheap method of sampling the bedrock, cover sequences are largely ignored and there is not even any guarantee that bedrock has been reached. We must be able to do better than that.

The Far North Queensland excursion ended in civilised fashion with a leisurely boat ride round the basalt crater lake at Lake Barine.....and there was not a bottle of port in sight.

David Garnett

Excursion to Papua New Guinea

V. Sopuck and J. McGregor-Dawson

The 15 participants on the field trip to Papua New Guinea will not soon forget the spectacular scenery, excellent mine tours, and evening entertainment on this trip. The difficult logistics were very capably handled by leader, Jim McGregor-Dawson, "Mr. Congeniality." Jim also had an *inside track to the weather gods as it rained only once, for 10* minutes one day, in an area where annual rainfall exceeds 10 m. Participants visited the Cu-Au deposit at Ok Tedi and Au deposits at Porgera, Misima, and Lahir Island. Opportunities to observe the interaction of porphyry-, skarn-, and epithermal-type systems in these world-class deposits highlighted the trip.

Participants were treated to comprehensive mine tours and thorough discussions of mine geology, mineralisation, and alteration. The unusually good weather allowed "fly-overs" of the four mines plus aerial views of the volcanic destruction of Rabaul. The combination of detailed and general views allowed the participants to gain an appreciation of the mineral potential of PNG, as well as the realities of operating conditions for exploration and mining.

Special thanks go to the geologists and engineers at each of the mine sites, as well as those from the University of PNG and the PNG Dept. of MInerals and Energy, who were instrumental in making this trip an open and rewarding experience.

V. Sopuck and J. McGregor-Dawson

Excursion to Mt. Isa

[or don't make the drive from Townsville to Mt. Isa any flatter or longer]

Lynda Bloom

An international group left Townsville on Saturday morning after the 17th IGES, and 10 hours later arrived at Mt. Isa. The landscape is flat and dry, with not much to break the monotony except counting dead kangaroos on the side of the road (the winning count was 24). The group of 25 participants included Americans, Australians, Canadians, a few Europeans, South Africans, a Canadian living in Chile and a Ghanaian living in Tanzania, resulting in entertaining cross-cultural exchanges.

The excursion leader, Geoff Derrick, has extensive experience in geology of the region and organized a thorough tour of the geology and mining of the region. Alan Hughes, CRA, thanked Geoff in an eloquent speech for his synthesis of the complicated regional geology. Alan said that he had visited the area before, but Geoff's understanding of the geological history combined with a familiarity with local outcrops provided a lucid explanation of the geology.

Geoff convinced the group that the Mt. Isa area consists of much more than a single world class Pb-Zn deposit, although this required hours of driving each day. In addition to the Mt. Isa deposit (where labor unrest forced cancellation of an underground mine tour), the group visited the operating Starra mine, the Ernest Henry project at pre-feasibility stage (Cu-Au-magnetite type); reviewed the Dugald River exploration project and examine core from the Century deposit (stratiform sediment-hosted Ag-Pb-Zn); toured the Great Australian historical mine site currently under review for renewed mining (Cu-Au); examined the Tick Hill mine (mined out, unusual structurally controlled Au deposit); and saw the abandoned Mary Kathleen open-pit mine (U granite skarn type).

There was limited discussion of surface geochemical exploration techniques because these have not had much success in this region of thin laterite development and generally thick colluvium on flat plains. However, we learned how the Tick Hill deposit was discovered using a Bulk Cyanide Leachable (BCL)Au survey and follow-up of a 7 ppb Au anomaly with soil sampling. The soil anomaly was very impressive, but only covered a 200 x 25 m area. The deposit itself was small (470,000 t) with a surface expression of only 140 m, but was extremely high grade, averaging 28 g Au/t. Tick Hill was mined by MIM and is being rehabilitated.

Many local geologists and mining companies were generous with their time and access to properties. In particular, CRA, MIM, BHP, Australian Resources, and Cloncurry Mining are thanked for their participation.

It is suspected that the rock throwing/biggest splash competition at the calcite pit on Day 4 might have been a symptom of one too many stops at calcite pits, or perhaps too much driving (did I mention there was a lot of driving?). The star-gazing instruction for attendees from the Northern Hemisphere at the requisite Australian BBQ (barbie) was much appreciated. The highlight of the trip for many people was the unexpected stop coming down from the Microwave Tower where our favorite red-vested academic bounded after Skippy the Kangaroo (a live one) to capture the beast on film.

On Day 6 the group split up to either drive back to Townsville, or to fly on to Sydney/Brisbane. Geoff was commended again for his geological knowledge, organizational skills, and his cooking. Many of us returned to our respective countries to speak English again. If someone tells you to "give them a cooee (sp?) to talk about the results from the costean over the pot of Gold," how would you feel?

Linda Bloom

ERRATA

Oversight in announcement of bibliography disc

An unfortunate oversight occurred in the previous issue of EXPLORE where we described the preparation of the new bibliography disc sent out to AEG members. In extracting a segment from the introduction on the disc itself, the name of the first author, Eric Grunsky, was inadvertently left off this announcement. Eric has devoted much of his 'free' time in the past four years to this compilation and has directed Dorthe Jakobsen's activities on the data entry and editing. Without Eric's energy, enthusiasm and hard work, this disc would not be available today. Eric, please accept our apologies from the AEG for this 'bungle' and our appreciation for the production of this very useful informational database. *Eds.*

STUDENT PAPER PRIZE

TREVOR BOYD

The Association of Exploration Geochemists and X-Ray Assay Laboratories, a Division of SGS Supervision Services, take pleasure in announcing the 1994 Student Paper Competition Award. This is awarded for the best paper in a refereed scientific journal by a student, on work performed as a student, published within five years of graduation which addresses an aspect of exploration geochemistry. The student must be the principal author and nominations may be made by anyone familiar with the student's work. Entries closed at the end of 1994 for the Association's tenth biennial Student Paper Competition. There were seven entries from as far afield as Canada, Nigeria, Malaysia, Brazil and Greece. They were of a very high standard and the choice was difficult. The winner, this time, was Trevor Boyd, of the University of Toronto, who is completing his PhD thesis at the Scotiabank Marine Geology Research Laboratory, supervised by Prof. Steven D. Scott. He is studying the geochemistry and mineralogy of modern hydrothermal Fe-Si-Mn oxyhydroxides, many of which are spatially associated with seafloor sulphide and/or sulphate showings. His research pays particular attention to comparing these deposits to their ancient exhalite equivalents to improve the geochemical exploration techniques for gold and massive sulphides.

Trevor obtained his BSc degree in physical geography from UBC in 1980. He worked as an exploration technician for Anaconda and was involved in Au exploration in Australia. He completed his MSc (Applied) at McGill in 1988 and then worked for Noranda and Falconbridge in Canada before commencing his doctoral studies.

He receives a $500 cash prize from XRAL, a two year membership of the Association, together with the Journal and EXPLORE, a certificate of recognition and $500 of expenses to attend an AEG-sponsored meeting. Unfortunately he was unable to attend the Annual General Meeting in Townsville to receive his award in person.

Boyd's award-winning paper is entitled "Trace element patterns in Fe-Si-Mn oxyhydroxides at three hydrothermally active seafloor regions" which was published in Resource Geology, Special Issue, No 17, p 83-95, 1993 and was co-authored with Steven D. Scott and Roger Hekinian. The published abstract follows:

"Hydrothermal Fe-Si-Mn oxyhydroxide deposits were sampled at Franklin Seamount, western Woodlark Basin, Papua-New Guinea; 11- 13°N East Pacific Rise (EPR); and the Society Islands submarine hotspot volcanoes, South Pacific. The oxyhydroxide deposits are spatially associated with barite spires containing 3.8 to 21.1 ppm Au and 120-505 ppm Ag at Franklin Seamount and with numerous sulphide-sulfate chimneys containing significant Zn and Cu at 11-13°N EPR. No significant sulfide or precious metal mineralizations are known in the vicinity of the Society Islands oxyhydroxide deposits.

Bulk compositions of the oxyhydroxide samples are very erratic because of their extreme heterogeneity which is caused by the highly variable amounts of incorporated non-hydrothermal detritus and also by the variable mineralogies of the deposits at the three sites. Mass balance equations were used to filter out the detritus from the oxyhydroxides thus isolating their hydrothermal component. When the recalculated hydrothermal compositions for samples of similar mineralogy at the three sites are compared, there are positive anomalies for As, Mo and Au at Franklin Seamount and for Zn at East Pacific Rise.

Trace metal contents of seafloor oxyhydroxides reflect, but not unequivocally, the presence of spatially associated seafloor base or precious metal deposits. This reflection is best identified in the amorphous iron-silica component of the oxyhydroxides. The results of this study suggest that, by analogy, the trace metal contents of ancient ferriginous sediments may be a useful indicator of nearby ore. In the past, the search for useful pathfinders to massive sulphide deposits in iron formations has been hampered by the highly erratic nature of the anomalous trace metal levels. Systematic treatments of analytical data using mass balance equations combined with detailed mineralogical study are tools for overcoming this problem."

I.D.M. Robertson
Chairman, Student Paper Competition Committee

BOOK REVIEW

Drift Exploration in the Canadian Cordillera, British Columbia Ministry of Energy, Mines and Petroleum Resources, Paper 1995-2 edited by P.T. Bobrowsky, S.J. Sibbick, J.M. Newell and P.F. Matysek. Crown Publications, 521 Fort Street, Victoria, British Columbia, Canada, V8V 1E7, $40.00.

This volume includes 27 papers on various aspects of drift exploration in the glaciated mountainous terrain of British Columbia and the Yukon. It is an expanded version of

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Book Review

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notes that accompanied the Cordilleran Roundup short course Drift Exploration in Glaciated and Mountainous Terrain held in Vancouver in 1994. The volume is a combination of case studies and technical papers covering the general principals of Quaternary geology, till geochemistry and mineralogy and overburden geophysical methods.

Quaternary papers summarize techniques for recognizing ice flow directions, drift potential mapping, overburden sampling in areas of thin or thick drift, and dispersal studies using indicator clasts. Geochemical papers include various case studies around known mineral and placer gold occurrences using till and soil geochemistry, lake sediment geochemistry, and biogeochemistry. Technical papers describe analytical methods and influences of weathering and grain size on till geochemistry. The volume emphasizes the extent to which drift prospecting has become an important exploration method in British Columbia, highlights the extensive and valuable data resource on drift prospecting in government assessment files and provides an extensive bibliography of published articles and governments reports on drift prospecting in British Columbia. It will be useful reference for anyone exploring in the glaciated mountainous terrain of the western Cordillera.

M.B. McClenaghan
Terrain Sciences Division
Geological Survey of Canada

ANNUAL GENERAL MEETING

Annual General Meeting of The Association of Exploration Geochemists, Townsville, Australia, May 15, 1995

On May 15, 1993, The Association of Exploration Geochemists (AEG) held their Annual General Meeting (AGM) at the Sheraton Breakwater Hotel in Townsville, Australia. The meeting was held in conjunction with the 17th International Geochemical Exploration Symposium, Exploring the Tropics.

I. Call to Order (Past President, Graham F. Taylor)

The Past President called the AGM to order at 5:12PM and established that a quorum was present (59 Members of which at least 30 were Fellows).

II. Executive and Council

The Past President announced the results of the last election of Councillors and introduced the Executive. Elected to Council January 1, 1995 were:

John S. Cone
Mark A. Fedikow
R. Steve Friberg
Alistair J. Sinclair
Barry W. Smee
Graham F Taylor (ex-0fficio)

The new Executive are:
Gwendy E.M. Hall (President)
William B. Coker (First Vice President)
David Garnett (Second Vice President)
Sherman P. Marsh (Secretary)
Eion M. Cameron (Treasurer)

III. Minutes of the 1994 AGM

The Past President asked if there were any matters arising from the 1992 AGM minutes as published in EXPLORE number 84. There were no matters arising.

It was moved (M. Chaffee) and seconded (G. Taylor) that the minutes of the 1994 Annual General Meeting of The Association of Exploration Geochemists be approved as published in EXPLORE number 84 and filed with the Secretary. The Past President asked for a vote on the motion. Passed unanimously.

The Past President turned the AGM over to the President.

IV. Presidents Report (Gwendy E.M. Hall)

New Contract With Elsevier

The AEG has signed a new five year contract with Elsevier to publish the Journal of Geochemical Exploration (JGE).

There are some new conditions in the contract.

Royalties will be paid on the basis of the number of institutional subscribers (currently 485).

The JGE Editor's contract is now separate from the general contract.

AEG digital membership database must be manually transferred by Elsevier into their database resulting in many of the problems with delivery of the JGE.

Negotiations with Elsevier are an ongoing activity.

New format for the JGE

Will be published in June, 1995 in a 19x27 cm format with a blue cover.

AEG participation in meetings in 1994-95.

Prospectors and Developers Association of Canada Convention, Toronto, CAN, (March 1995). Started the 25th aniversary year activities of the AEG. AEG had a booth, a hospitality suite, and a table at the banquet.

Geological Society of Nevada meeting in Reno, NV, (April 1995).

SEGH meeting in Aberdeen, Scotland (April 1995).

SME meeting in Seattle, WA (May 1995).

17th IGES in Townsville, Australia (May 1995).

SEG meeting in St. Louis, MO (June 1995).

Membership and Publicity

Andrew Bourque has been appointed to chair the Publicity Committee. Membership is currently about 1000 and the Association has goal of 1200 for the comming year.

Most of the membership is in Canada, the United States, and Australia. The Association would like to increase membership from other areas as well.

South America
Asia
Africa
Eastern Europe and Russia

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Annual General Meeting

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Need for Regional Councillors

To help attract new members and to further exploration geochemistry in other areas of the world the Association would like to have additional Regional Councillors.

Some vacancies exist for existing Regional Councillor positions and some new positions need to be created.

Two tiered membership

The AEG Council has discussed the need and desirability of having a two tiered membership.

Traditional membership

Reduced cost membership for potential members in developing countries and retired members.

Would be members and would receive **EXPLORE** but would not receive the JGE.

Corporate Members

The new Elsevier contract does not allow for Corporate members and this class of membership will be discontinued starting in 1995.

Internet

The AEG is investigating the possibility of having a "web site" or "home page" for the Association.

An interactive bulletin board could be provided and access to programs and documents. Cost would be about $1000/year.

Conferences

The AEG needs to establish written policy on how to handle conferences.

V. Treasurer's Report (G. Hall for E. Cameron)

The President thanked E. Cameron for all his diligent work on behalf of the Association as Treasurer.

The auditor's report for 1994 has been received and will be made available to members upon request.

The Associations revenues increased in 1994. Dues increased from $26,900 to $77,260.

Revenue excess of $12,836 in 1994 as opposed to a revenue deficit of $24,551 in 1993.

Two changes in accounting were made in 1994. All credit card transactions were converted from $CAN to $US upon receipt to avoid currency fluctuations.

Investments

Current assets were formerly held in short term certificates of deposit in both Canadian and United States banks. Held at low interest rates.

Current assets have been converted into an investment account in $US.

Ford Motor Credit Bonds maturing in 2000.

Walmart Stores Bonds maturing in 2004.

The current rate of return on investments is more than 8%. Will generate over $10,000 income in 1995 and 1996.

Elsevier

Very difficult to obtain timely and accurate inormation on monies owed and monies due.

New contract allows the AEG to pay for subscriptions in the year following.

In 1995, the dues are expected to be in balance with expenditures.

Additional revenues for the AEG are generated from Symposia and meetings.

It is important that the AEG develop a long term symposium plan.

VII. Secretary's Report

Business of the AEG

The business of the AEG is conducted through meetings of the Council and

Executive via conference telephone calls, 5 to 6 times/year.

All members have a voice in the Association.

Should contact Councilors or Regional Councillors to bring matters before Council.

EXPLORE newsletter

Published 4 times a year with an all volunteer staff.

Articles and features are accepted, put into digital format, proofed, and sent to a graphic arts company for formatting.

Final format and copy is proofed and sent to a printer.

Printed copies, and inserts, and mailing labels are delivered to a distributor.

EXPLORE is sent via air mail outside the US and via bulk mail within the US.

Financed through paid advertisements and a $1000/issue grant from the AEG.

Distribution

Sometimes difficult to countries outside the US, especially Australia.

EXPLORE staff would welcome suggestion on any improved distribution proceedure.

Bibliography

The AEG has distributed to all paid members (April, 1995) digital copies of the Exploration Geochemistry Bibliography.

Over 11,000 references through 1994.

The bibliography will be up-dated on a periodic basis.

Membership database

Included on the Bibliography diskette is a membership database of all current members of the AEG.

VII. Student Poster Prize

A certificate and one year membership in the AEG was awarded to the best student poster.

VIII. Other Business

It was asked how much environmental emphasis was going to be placed in the JGE as a recent issue had been devoted to environmental geochemistry.

Members noted that environmental issues were intemately related to mining issues and the AEG had to address this, especially where enviromental and mining issues overlaped.

A lively discussion ensued on whether the AEG should change it's name or that of of the journal to reflect this concern with the environment and mining.

Concensus amoung members was that the AEG should definately not change its name nor it's primary concern with exploration geochemistry but should definately embrace environmental issues as they pertained to exploration and mining.

This would include geochemical baseline studies.

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Annual General Meeting

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Remediation and prevention studies,
Predictive studies for environmental hazards and
Provide geochemical data to influence sensible envoronmental and mining legislation.

VIX. Adjournment
It was moved (G. Taylor) and seconded (L. Bloom) that the Annual General Meeting of The Association of Exploration Geochemists be adjourned. The President asked for a vote on the motion. Passed unanimously.

The 1995 Annual General Meeting of the Association of Exploration Geochemists was adjourned at 6:36 PM.

VOLUNTEERS NEEDED

Volunteers for Regional Councillors
The AEG needs YOU!

We need Regional Councillors in *SE Asia, S Africa, W. Australia, Scandinavia and Europe.* These positions have become vacant owing to completion of term in office (two years) and/or relocation of individuals. The duties of a regional councillor are to represent and promote the AEG in their particular region, by for example, organising AEG-sponsored sessions at local meetings/ symposia/workshops. The councillor is responsible for ensuring that opinions and needs of members in that region are brought to council's attention. He/she interacts with the AEG business office and is provided regularly with the relevant membership database and literature. New ideas regarding promotion and direction of the society are welcome, particularly in this exciting age of communication around the globe. If this role is for you, please contact David Garnett who is the Regional Councillor Coordinator or Sherm Marsh, AEG Secretary.

Welcome to Chris Oates, new Regional Councillor for Chile. Chris has taken over from Steve Zuker who has moved northward. Our thanks to Steve for all his efforts on behalf of the AEG while in Chile.

David Garnett, RC Coordinator
email dlg@atom.ansto.gov.au, fax 612-543-2655.

CALENDAR OF EVENTS

International, National and Regional Meetings of Interest to Colleagues Working in Exploration and Other Areas of Applied Geochemistry.

■Aug. 28-31, '95, **Mineral Deposits**, biennial mtg., Prague, Czech Republic, by Ministry of the Environment (Jan Pasava, Czech Geological Survey, Klarov 131/3, 118 20 Praha 1, Czech Republic, TEL: (24) 2-537001; FAX: (42) 2-7980965)

■Aug. 22 .-1 Sept., '95, International Field Conference and Symposium on **Intraplate Magmatism: Petrology and Metallogeny of Volcanic and Intrusive Rocks of the Midcontinent Rift System**, Duluth, Minnesota (Penny Morton, Dept. of Geology, University of Minnesota, Duluth, MN 55812; TEL: (218) 726-7962; FAX: (218) 726-8875; E-mail: pmorton@ua.d.umn.edu.)

■Aug. 28-Sept. 2, '95 **Tectonics and Metallogeny of Early/Mid Precambrian Orogenic Belts**, Montreal, Canada (J.A. Percival, Geological Survey of Canada, 601 Booth St., Ottawa, Ontario K1A 0E8, Canada, TEL: (613) 995-4723; Fax: *(613) 995-9723; e-mail: jpercival@601.C.gsc.emr.ca)*

■Sept. 4-8, '95, Intenational Symposium on **Environmental Biogeochemistry**, Rio de Janeiro, Brazil (Symposium Secretariat, Prof. Luis Henrique Melges, FAX: 55-(0)21-248-4870; E-mail: iseb@bruerj)

■Sept. 29-Oct. 1, '95, **Northern Margin of the Southern Province (Lower Proteroizic) of the Canadian Shield**, symposium, Sudbury, Ontario, Canada (A. J. Naldrett, Dept. of Geology, Univ. of Toronto, Ontario, M5S 3B1; FAX: (416) 978-3938; E-mail: ajn@quartz.geology.utoronto.ca)

■Oct 4-6 ., '95, **Uranium Mining and Hydrogeology**, Freiberg, Germany (B.J. Merkel, Technical University, Bergakademie Freiberg, Institute for Geology, Gustav *Zeunerstr.12, D-09596 Freiberg, Germany; FAX: 0049-3731-*392720; E-mail: merkel@orion.hrz.tu.freiberg.de)

■Oct. 19-20, '95, Symposium on **Gold Mineralization in the Nordic Countries and Greenland**, Copenhagen, Denmark (Henrick Stendal, Geological Institute, Gold Symposium, Oster Volgade 10, DK-1350 Copenhagen K, Denmark; TEL: (+45) 35322451; FAX: (+45) 33148322; E-mail: *henriks.@geo.geol.ku.dk)*

■Oct. 23-27, '95, V Congreso Brasileiro de **Geoquimica**, III Congreso de **Geoquimica** dos Paises de Lingua Portuguesa (Prof. Ricardo Erthal Santelli, Departamento de Geoquimica da UFF, Valonguinho-Centro-Niteroi/RJ, 24020-007-BRASIL; TEL: (021) 717-1313R.43; FAX: (021) 719-7025)

■Oct. 23-27, '95, ***International Mineral Processing**, mtg., San* Francisco (Society for Mining Metallurgy, and Exploration, Box 625002, Littleton, CO 80162-5002; TEL: (303) 973-9550; FAX: (303) 979-3461)

■Nov. 6-9, '95, **Geological Society of America**, ann. mtg., New Orleans, LA (Vanessa George, 3300 Penrose Place, Boulder, CO 80301; TEL: (303) 447-2020; FAX: (303) 447-1133)

■Nov. 19-22, '95, **PACRIM '95**, Auckland, New Zealand (Mrs. Charmayne Perera, The Australasian Institute of Mining and Metallurgy, P.O. Box 660, Carlton South, Victoria 3053, Australia; TEL: +61-3-662-3166; FAX: +61-3-662-3662; E-mail: J.Mauk@auckland.ac.nz)

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Calendar of Events

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■Jan. 16-19 ., '96, Conference on **Tailings and Mine Waste**, Fort Collins, CO (L. Hinshaw, Department of Civil Engineering, Colorado State University, Fort Collins, CO 80523; TEL: (970) 491-6081; FAX: (303) 491-7727)

■Mar. 14-17 . '96, **International Workshop and Exhibition on Geophysics**, Hanoi, Vietnam by Geophysical Society of Viet Nam (T. Muoi, Geophysical Society of Viet Nam, Thanh Xuan - Dong Da, Hanoi, Viet Nam; TEL: 84.4544311; FAX: 84.4.542223)

■Mar. 27, '96, **Environmental and Legislative uses of Regional Geochemical Baseline Data for Sustainable Development**, IGCP Proj. 360 Global Geochemistry Baselines Workshop, Keyworth, Nottingham, UK (Peter Simpson, British Geological Survey, Keyworth, Nottingham, NG12 5GG TEL: (0115) 936-3532; FAX: (0115) 936-3200; e-mail: k_prs@va.nkw.ac.uk.)

■Mar. 28-29, '96, British Geological Survey **Minerals Industry Forum**, Keyworth, Nottingham, UK (Peter Simpson, British Geological Survey, Keyworth, Nottingham NG12 5GG; TEL: (0115) 936-3532; FAX: (0115) 936-3200; e-mail: k_prs@va.nkw.ac.uk.)

■Apr. 22, '96, Societal Needs and the Environment: **Earth Sciences and Public Health**, Forum, Washington, D.C. (Frederic R. Siegel, Department of Geology, George Washington University, Washington, D.C. 20052; FAX: 202-994-0450; E-mail: NDFRS@GWUVM.GWU.EDU)

■July 21-28 , '96, Fourth Internatinal Symposium on the **Geochemistry of the Earth Surface**, Ilkley, Yorkshire, England by Internatinoal Association of Geochemistry and Cosmochemistry (Conference Secretariat, Dept. of Continuing Education, Leeds University, Leeds LS2 9JT, UK; TEL: 01132-333-241; FAX: 01132-333-240)

■Aug. 4-14 , '96, **30th International Geological Congress**, Beijing, China (Prof. Zhao Xun, Deputy Secretary General, 30th International Geological Congress, P.O. Box 823, Beijing 100037, P.R. China; TEL: 86-10-8327772; FAX: 86-10-8328928; E-mail: zhaox@bepc2.ihep.ac.en)

■Sept. 14-18, '97 **EXPLORATION 97**, the Fourth Decennial International Conference and Exhibition on Mineral Exploration with a theme of "Geophysics and Geochemistry at the Millennium" will be held in Toronto, Canada. Details on the conference will be outlined in the first circular scheduled to go out in early 1996.

■Sept., '97, **4th International Symposium on Environmental Geochemistry**, Denver, CO (U.S. Geological Survey, The Association of Exploration Geochemists, the Society for Environmental Geochemistry and Health and the International Association of Geochemisty and Cosmochemistry, Dr. Ronald C. Severs en or Dr. Larry P. Gough, U.S. Geological Survey, MS973 Denver Federal Center, Denver, CO 80225; TEL: (303) 236-5514; FAX: (303) 236-3200; E-mail: lgough@helios.cr.usgs.gov)

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

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USA
TEL: (202) 994-6194
FAX: (202) 994-0450
BITNET: ndfrs@gwuvm.gwu.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.

FELLOWS

Eppinger, Robert G.
Geologist
US Geological Survey
Denver, CO, U.S.A.

Wagner, Darin W.
Geologist
Cominco
Vancouver, BC, CANADA

MEMBERS

Alvarado, Sergio
Nepean, ONT, CANADA

Arnal, Inaka J.
Professor
Universidad del Pais Vasco
Bilbao, SPAIN

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New Members

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Bal, Michel
Hansa Geomin Consult
Duisburg, GERMANY

Bateman, Paul
Haileybury School of Mines
Haileybury, ONT, CANADA

Bates, Warren
Geologist
Granges
Port Moody, BC, CANADA

Bishop, Robert
Gold Mining Stock Report
Lafayette, CA, U.S.A.

Blair, Robert
Cyprus AMAX
Englewood, CO, U.S.A.

Bottomer, Lindsay
Director Canadian Exploration
Echo Bay Mines
Vancouver, BC, CANADA

Boucher, Donald R.
Regional Manager
Monopros
Val d'Or, PQ, CANADA

Brennan, Mike
Auridiam Zimbabwe
Harare, ZIMBABWE

Caithness, Scott
Principal Geologist
CRA Exploration (India)
Bangalore, Karnataka, INDIA

Carlson, Jon
Dia Met Minerals
Kelowna, BC, CANADA

Climie, J.A.
VP Exploration
Uranerz Min and Expl
Saskatoon, CANADA

Comia, Geronimo M.
Proj Geol
TVI Pacific Inc
Makati, PHILIPPINES

De Carle, Arthur L.
Saskatoon, SASK, CANADA

Diaz, Leonardo L.
Geologist
Cia Minera Newmont Chile
Santiago, CHILE

Dodd, Clayton
Director
Striker Resources
Perth, WA, AUSTRALIA

Doyle, Buddy
Kennecott Canada
Vancouver, BC, CANADA

Fang, Wei Xuan
Vice-Director
CNNC
Xian, Shaanxi, P.R. CHINA

Finlayson, Eric J.
Reg. Expl. Manager
Kennecott Canada
Vancouver, BC, CANADA

Flight, Deirdre
Geochemist
British Geological Survey
Keyworth, Notts, ENGLAND

Fowler, Jonathon
Burlington, ON, CANADA

Fraser, John R.
N. Vancouver, BC, CANADA

Frazer, W.W.
Director of Environment
Hudson Bay Mining and Smelting
Flin Flon, MAN, CANADA

Graham, Ian
Kennecott Canada
Vancouver, BC, CANADA

Greig, Dan D.
Chief Geologist
Hunter Resources
Perth, WA, AUSTRALIA

Hodgson, C.J.
Queens University
Kingston, ON, CANADA

Iglesias, Luis Villa
Project Chief
Outokumpu Minera Espanola
Oviedo, SPAIN

Jarvis, Bill
Diamond Expl
Belleville, MI, U.S.A.

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New Members

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Karpoff, Boris S.
Senneville, PQ, CANADA

Kirkley, Melissa
BHP
Kelowna, BC, CANADA

Kivi, Kevin
Kennecott Canada
Thunderbay, ON, CANADA

Lecheminant, Anthony N.
Geological Survey of Canada
Ottawa, CANADA

Li, Hui
Director
GEB-MMIC
Baoding, Hebei, P.R. CHINA

Li, Xin Fan
Sr Geologist
CNNMIC
Beijing, P.R. CHINA

Light, Malcolm P.R.
Geological Consultant
LIMAC Associates
Calgary, ALB, CANADA

Lui, Chongmin
Research Geochemist
IGGE-MGMR
Langfang, Hebei, CHINA

Maacha, Lhou
Geol. Engineer
CTT-ONA
Casablanca, MOROCCO

MacDonald, John
Vancouver, CANADA

MacKenzie, Leonard
President
Synmap Information Tech
Halifax, NS, CANADA

Marmont, Christopher
Sr. Geologist
BHP Minerals Canada
Oakville, ON, CANADA

McKelvey, Gregory E.
Phoenix, AZ, U.S.A.

Morrison, Maureen
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New Members

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Wuerzburg, GERMANY

Kasekende, Maggie
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RECENT PAPERS

This list comprises titles that have appeared in major publications since the compilation in **EXPLORE** Number 87. Journals routinely covered and abbreviations used are as *follows: Economic Geology (EG); Geochimica et* Cosmochimica Acta (GCA); the USGS Circular (USGS Cir); and Open File Report (USGS OFR); Geological Survey of Canada Papers (GSC Paper) and Open File Report (GSC OFR); Bulletin of the Canadian Institute of Mining and Metallurgy (CIM Bull); Transactions of Institute of Mining and Metallurgy, Section B: Applied Earth Sciences (Trans. IMM). Publications less frequently cited are identified in full. Compiled by **L. Graham Closs**, Department of Geology and Geological Engineering, Colorado School of Mines, Golden, CO *80401-1887*, Chairman AEG Bibliography Committee. Please send new references to Dr. Closs, not to **EXPLORE**.

Allegre, C.J. and Lewin, E., 1995. Scaling laws and geochemical distributions. Earth and Planet. Sci. Letters 132(1-4): 1-13.

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EXPLORE DELIVERY

Many of you have been experiencing delays in the delivery of **EXPLORE**, often as much as three to five weeks. We are trying to address this issue through our mailing company, Johnson and Hayward in New York. They assure us that **EXPLORE** is sent overseas via air mail within 24 hours of receipt. The last issue (**EXPLORE** 87) was sent out from New York on the 25th of May. Many of you didn't receive this issue until late June. We think that 4-6 weeks for delivery via air mail is unacceptable and are working on trying to improve delivery time. To that end, you will find a card enclosed in this issue that will be used to track delivery dates. Please fill out the card and send it back to Johnson and Hayward. This will be the first step in tracing down the source of the delays and, hopefully, improving delivery of **EXPLORE** in the future. Thanks in advance for your help.

Sherman P. Marsh
Editor

BRITISH GEOLOGICAL SURVEY WORKSHOP

A BGS-AEG Regional Geochemistry Workshop on "Environmental and Legislative uses of Regional Geochemical Baseline Data for Sustainable Development"-organised in association with Global Geochemical Baselines, IGCP Project 360-will be held on Wednesday 27 March 1996 at BGS Keyworth, Nottingham UK in conjunction with the BGS Minerals Industry Forum on 28 March 1996.

Modern sets of regional geochemical baseline data are now prepared by many geological survey organisations. These include easy-to-use digital maps and datasets with facilities for multimedia and remote working applications to a wide range of environmentally sustainable technology foresight studies. Preparation and standardisation of the datasets is coordinated internationally through Global Geochemical Baselines, International Geological Correlation Programme (IGCP) 360.

The determination of chemical elements in systematically collected samples of stream sediment, stream water and soil, build up a picture of the surface chemistry of the earth's landmass. The average sample density for stream sediments and soils varies but may be as high as about one site per 1 km2, and for stream waters one site per 1.5 km2. High analytical precision, fast, automated methods of analysis and strict quality control ensure data consistency over large regions.

It is proposed to hold a one day workshop which will be of interest primarily to environmental scientists, technologists and consultants, legislators, and commercial and industrial enterprises and others concerned with the environmental applications of regional geochemical baseline data to both local and global environmental factors. Invited guest speakers will set out the main topical issues in thematic overviews. There will also be opportunities for presentation of a series of short oral communications with facilities for posters. Visits will also be made to the BGS laboratories at Keyworth, where geochemical data are prepared for the G-BASE database of the UK and Northern Ireland as well as for other projects overseas.

The BGS Minerals Industry Forum will be held on the following day, where open discussions are planned between senior civil servants, mineral industry representatives, local authority planning officers, environmental consultants and special interest groups with a strong interest in environmental and planning issues which concern the Minerals Industry. Workshop registrants should indicate their interest in attending the BGS Minerals Industry Forum on the attached form.

Registration Information:

The registration fee will include a buffet lunch at BGS and a set of meeting papers on arrival.

Registration before 31 Dec 1995;-

AEG Members	£ 20
Non-members of AEG	£ 25
Bona-fide Students	£ 15

Abstracts must be received by 1 October 1995.

A Final Circular with a Provisional Programme will sent to all registrants in mid January 1996. Registration for all comers will be raised to £30 and no refunds will be payable after 1 Jan 1996.

Registration formalities and the issuing of papers and site passes will be completed between 08.30 and 09.30 at BGS, Keyworth on 27 March 1996. You may also indicate your interest in the BGS Minerals Industry Forum on 28 March 1996 on the attached form, whereupon a registration form for the Forum will be sent to you.

Personal Registration

If you are interested in attending or contributing a paper or poster to this BGS-AEG Workshop on Regional Geochemistry please complete the tear off form and return it to the address below, together with your registration fee to:

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Geochemistry Group, Minerals and Geochemical Surveys Division
British Geological Survey,
Keyworth, Nottinghamshire, NG12 5GG, UK
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Fax: Int+ 44 (0) 115 936 3200
email k_prs@va.nkw.ac.uk

I am interested in attending the BGS-AEG Regional Geochemistry Workshop on "Environmental and Legislative uses of Regional Geochemical Baseline Data for Sustainable Development" to be held in conjunction with IGCP 360 meetings at the British Geological Survey, Keyworth, Notts., on Wednesday 27 March 1996, commencing at 08.30hrs.

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t wish to receive further information on the BGS Minerals Industry Forum.

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