

# EXPLORE

Newsletter for the Association of Exploration Geochemists

NUMBER 113

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## In Memory

### Dr. J. Alan Coope

On Sunday August 5<sup>th</sup>, 2001 the Geological Community lost one of its finest. J. Alan Coope passed away as a result of complications following surgery. Late in June the deleterious effects of the medications he had been taking for Hemolytic Anemia necessitated removal of his spleen. He was able to return home on July 5<sup>th</sup> and start physical therapy. However, he suffered a pulmonary embolism approximately two weeks later. Being the determined individual that he was, he succeeded in making it out of the hospital only to end up that evening being re-admitted due to a stroke. His son and daughter were able to visit with him on the following weekend, not knowing, but suspecting the seriousness of his condition. The following Wednesday, August 1<sup>st</sup>, he slipped into a coma and passed away on the Sunday afternoon.

Alan deserves his well-earned recognition due to his countless contributions to professional societies, published literature, as well as his exemplary actions and attitudes as a guardian of the profession of exploration geochemistry. Following an undergraduate degree in geology at Kings College, London, England and work at Falconbridge Nickel and Anglo American he joined Professor John Webb's Geochemical Prospecting Research Centre at Imperial College, London. From there he undertook field studies in Africa developing geochemical prospecting methods for nickel. He completed this graduate work in 1958. On the recommendation of Professor John Webb he was hired by Newmont, with whom he spent much of his professional life.

Alan was in all ways a champion for exploration geochemistry. He was a strong and consistent voice promoting quality in the science and the application, and a tenacious advocate for the integration of all geological disciplines relevant to mineral exploration. He insisted on applying these important principles even at times when it was obviously not to the benefit of his career to do so. He would often confront his superiors who occasionally lacked his long term vision, putting his fundamental beliefs and principles before his own interests.

Alan consistently aided and assisted in the career development of geologists entering into the field of exploration geochemistry. Newmont, under Alan's guidance, supported research programs within various MS and PhD programs across North America. Alan played a key role in each of these supported research programs and always knew the details of each. During his career with Newmont, Alan



positively influenced more than 50 graduate students, many of whom are now the principles of the exploration geochemistry community. He has been a mentor and inspiration to many of us, as

he has always been willing to share his knowledge and experience with those of us who aspire to be first rate explorationists.

Alan pioneered many of the procedures and principles by which our profession has achieved it's widespread success. Through his efforts and talents, Newmont enjoyed a great deal of success and growth. The discovery of the Carlin deposit is one of the more significant events in worldwide mining and in the history of Nevada. Alan played a key role in the discovery of the Carlin mine in 1961 and subsequent development of Newmont's dominant presence in the area. Alan and John Livermore, using a simple geological and geochemical model based on their evaluation of the Blue Star deposit, identified the claim blocks which were to become the site of the main pit of the Carlin mine.

Many academic and governmental agencies have taken advantage of Alan's knowledge and insight by requesting him to review their programs. His thorough understanding of the Geosciences and their practical application kept Alan very busy evaluating and participating in advisory committees on many of the programs and grant applications for the Geological Survey of Canada, the US Geological Survey, the Arizona Geological Survey, Ontario Geoscience Research Review committee, Centre for Earth Resource Research, Natural Sciences and Engineering Research Council, and many other government and private research organizations.

In 1967, Alan was part of a committee of practicing exploration geochemists who assessed the need and reviewed the possibility of forming an association to serve the science of geochemistry. In 1968, at the Golden International Geochemical Exploration Symposium (IGES), Alan was asked to write a constitution and By-Laws for what has become the Association of Exploration Geochemists

*Continued on Page 2*

## Alan Coope ... continued from Page 1

(AEG). This constitution and By-Laws were presented and adopted in 1970 at the following IGES in Toronto. Alan then served as AEG's first president with John Hansuld and Frank Canney as Vice-Presidents. John Hansuld remembers "Alan was way ahead of his time and had the utmost in professionalism". He has also served the Society of Economic Geologists (Chairman of Finance Committee, Technical Program Committee, and SEG Investment Committee as well as being a member of the Strategic Planning Panel and SME Foundation Board of Trustees). He was president of the Geological Association of Canada as well as a member of Council and Chairman of the Mineral Deposits Division. Alan served as a member of the Board of Directors for the Canadian Institute of Mining

and Metallurgy and Petroleum. The Prospectors and Developers Association of Canada elected Alan to serve as a Member of the Board of Directors and as a Regional Representative. He served as a councillor and financial advisor to the Arizona Geological Association.

Alan was honored by many of the organizations he served. Two highlights were in 1995 when he was awarded the Association of Exploration Geochemists Past Presidents' Medal, and this year when he was made an Honorary Member of the Association at the 20<sup>th</sup> International Geochemical Exploration Symposium in Santiago, Chile.

All of those who knew and worked with this remarkable man will miss him.

**Erick Weiland**  
Tucson, Arizona



Nigel Radford

## PRESIDENT'S MESSAGE

My last letter to you was written in the euphoria that followed the successful International Geochemical Exploration Symposium in Santiago in May. Since then the whole exploration industry, and those of us in geochemistry in particular, have been saddened by the sudden death of Alan Coope. Elsewhere in this edition are several articles about Alan, and I will try not to repeat what is said more eloquently than I can manage, except to say that Alan was, in my opinion, one of the truly great figures in our science. Whilst Alan always said, very tactfully, that he was only a co-founder of this Association, it is true to say that without his vision and hard work, the AEG would be unlikely to exist at all, let alone in anything like its present, world-wide form. Men such as Alan have seemingly boundless energy. They work so hard on behalf of others, as well as for their employers, that one can only feel inadequate by comparison. Alan truly deserved the status of Honorary Member of this Association, which was bestowed upon him at Santiago. I am extremely pleased that the bureaucracy of the AEG managed to work fast enough for him to be so honoured before his untimely death. Alan, go in peace. We will miss you, but your friends in AEG will always remember you fondly!

Some other issues facing AEG will take a back seat for a while as we consider the AEG in the post Alan Coope era. Council has discussed an appropriate memorial to Alan. Our feeling is that Alan would have liked a scholarship to be established in his name to support someone studying exploration geochemistry. Alan was always keen to pass on his own experiences to others. Please contact me, or other Council members, with ideas for this memorial, or indeed with financial contributions necessary for it to become a reality.

Another excellent suggestion is that AEG dedicates a volume of "Geochemistry: Exploration: Environment: Analysis" to Alan's memory. In this volume we hope to

present a series of papers about the geochemistry of the Great Basin, especially the gold fields of Nevada where Alan made so great a contribution. Peter Rogers has agreed to coordinate this volume, and Gwendy Hall will edit it. Please contact Peter, Gwendy or any Council member with ideas or papers. For Alan, let's make this a truly remarkable volume!

As I write this to you, news is coming over the airwaves about terrorist attacks in the USA. It sounds horrendous, and all I can say at this time is that I hope none of the friends or relatives of our members are involved. Unfortunately ours is an itinerant industry and it is more than likely that at any one time, we, our friends and relations are on the move. I pray that AEG has not lost any of its cherished members in these tragedies.

Despite the air of optimism at the conference in Santiago, the climate in our industry continues to depress. Slashed exploration budgets and staff lay-offs are almost a weekly occurrence. Mergers and takeovers are happening a pace, and whilst these are probably essential for the industry's longer-term survival, the almost inevitable consequence of these mergers is smaller exploration budgets and therefore fewer jobs. Make no mistake, things are not as they were. The mining industry is in decline: it is "on the nose" in public opinion terms. Whilst one hopes this will be a temporary feature, increasingly I'm not so sure. I don't believe that speculative capital will ever come back to the exploration Juniors, at least not like before. With the Majors cutting back on exploration, especially green-fields, it's increasingly hard to see who is going to find the new ore bodies the industry needs for long term stability. These cut backs in mineral exploration don't just lead to fewer company geoscientists, they inevitably lead to reductions in funding for teaching, less money for research and a lower profile for our science at government level, thus putting geological survey organisations under further

Continued on Page 3

## President's Message ... *continued from Page 2*

pressure. There *will* be a new order, one day, but what it will be, I cannot predict! However, in terms of the PR battle, we can all do something about it. For too long the mining industry has been apologetic about itself, and we have been soundly outmanoeuvred by those who oppose mining and development for whatever reasons. I believe it is high time we stood up and were counted! Next time you're at a dinner party or having a political discussion with friends, go on the attack! Tell them just how miserable life would be without the products that come from the mines our industry discovers and develops. Let's try and sell our industry a bit more forcefully!

Keeping our Association relevant to scientists involved in all aspects of the geochemistry of mineral resources in this new order, whatever it may end up being, is a huge challenge, and one that I hope AEG Council can continue to deal with in the coming years. It is fundamental to our long-term direction, and to the well being of the Association, that all members make their views clear to Council. It is your association after all! Please use the columns of this newsletter and the web page to tell us what you think!

**Nigel Radford, President AEG**

*nigel.radford@normandy.com*




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## GEEA Journal Packaging

From a recent letter from a member, I became aware that the plastic packaging in which our new journal is dispatched, can become torn. In this case the journal got wet and the pages stuck together. It's hard to know if this was a one-off excess of the local postman, or if the packaging is seriously too fragile. If anyone else has experienced similar problems, please let us know. Firstly we can and will replace your spoilt copy of the journal, and secondly we will ask the publishers to make the packaging more robust.

**Nigel Radford**

*President AEG, 2001.*




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## AEG Council Meetings on Web Site Minutes

At the AEG's Annual General Meeting in Santiago on May 9, 2001, it was suggested that the minutes from AEG Council meetings should be made available to members via the AEG web site. Council approved this suggestion and you can now access the minutes for the 2001 Council meetings in the "Members Only" section of the AEG web site. Minutes will be placed on the web site as soon as Council officially approves them. This will usually take place a few weeks after the date of the meeting.

**David B. Smith, Secretary AEG**

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# Analyst's Couch

## Acid Soluble Zirconium

I recently submitted a batch of samples for whole rock analysis. These days there is a veritable smorgasbord of methods to choose from. ICP this-that-and-the-other, following digestion by various acids or various fusions. Sometimes it's hard to know what to choose, and this case shows that the cheapest is not necessarily the best.

I talked it all over, as one should do, with my friendly analyst, in this case John Flynn at Genalysis in Perth, Western Australia. I was especially concerned over zirconium and the extent to which an HF-based acid mixture, followed by ICP, a very cost effective method, would give me a total Zr value, especially if the Zr is tied up in zircons. After all, zircons are a common constituent in heavy mineral sand deposits, so they know how to resist erosion! We agreed that, despite the higher cost, the Zr should be done by ICP MS following a sodium peroxide fusion. However, that meant we had to do an HF acid digestion to get Na, without interference from the fusion mixture. So out of curiosity, John agreed to supply me with the Zr data from the HF acid digestion as well as the fusion Zr data.

The two data sets are shown opposite in Figure 1. As can be seen, the fusion almost universally gives higher values than the acid digestion. I rest my case? Well, yes,

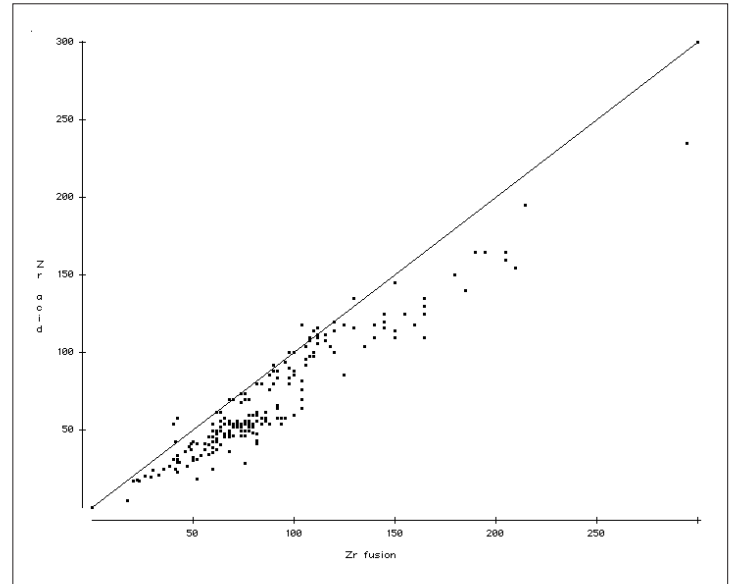


Figure 1. Plot of Zr by peroxide fusion and ICP (x axis) vs Zr by HK digestion and ICP (y axis).

Note that most samples fall below the line of equal concentration indicating that the acid digestion is extracting roughly 70% of total Zr in samples.

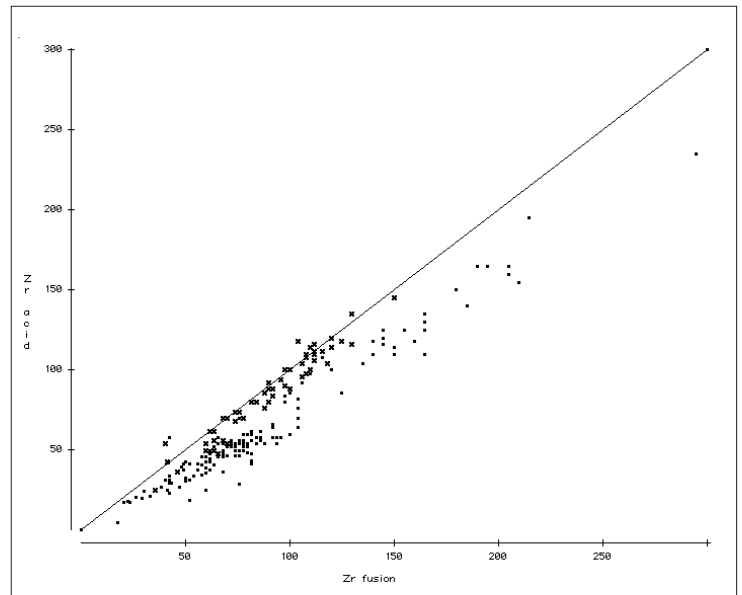


Figure 2. Plot of acid soluble vs fusion soluble Zr as for Figure 1, but with samples from Hole BD 5389 shown with crosses.

except that there are some samples, all up about 50 in number, for which the two methods gave almost identical results. See Figure 2 where these samples are highlighted as crosses. Is there a story in this observation?

First of all, I looked for a batch-related connection. Was there one batch of samples for which the two were equal? As it turned out, there is not. The samples with equal Zr occur in two of the 5 batches which comprised the job.

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## Analyst's Couch

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Finally I did make a connection. To my surprise, despite them being in two separate batches, the samples with equal Zr come from one single drill hole. In Figure 2, samples from DDH BD 5389 are shown by crosses.

OK, so perhaps that drill hole cuts a rock type, unique within the data set, in which the Zr host minerals are different from the rest of the samples? Once again, not so. All samples come from the Super Pit at Kalgoorlie, and the samples with fully acid soluble Zr are from one hole cutting the Paringa Basalt. In the data set there is one other drill hole, and 38 samples also exclusively cutting the Paringa Basalt. So it is not a rock-type unique feature.

I'm running out of ideas here! Let's recap. Almost all of the 587 samples in a suite of basalts have HF soluble Zr substantially lower than fusion soluble Zr. No big deal there, indeed exactly as one would predict. However, unusually, 57 samples show equal Zr by the two methods. They fall within two analytical batches, and are therefore unlikely to be a between-batch artefact. They all come from samples from one drill hole in the Paringa Basalt. But samples from another hole nearby are also exclusively from Paringa Basalt, and these do not have equal Zr extractability.

Finally I took a look at the remainder of the elements. In particular I looked at holes BD 5389, in which the Zr values by the two methods are effectively equal, and hole BD 5584, on the same cross section in the mine, cutting the same unit, Paringa Basalt, and only a few tens of metres away from BD 5389. The major elements gave no clues. All samples were essentially alike, having the chemistry of more or less altered basalts. Two trace elements for which the samples with equal Zr were different from the rest were Ce and P. In each case they are higher in BD 5389 than in BD 5584. Phosphorous does substitute for Si in zircons, and Zr is often replaced by rare earths and/or Th and U, giving rise to the commonly radioactive metamict zircons. This radiation-induced crystal damage could explain the additional acid solubility of the Zr. But it seems hard to account for the relatively large difference in P content between the two holes, (600ppm compared with 330ppm) and lesser difference in Ce (18ppm compared with 12ppm) purely in terms of substitution of these elements in zircons, since there is less than 100ppm Zr to begin with. Could there be discrete monazite in the rocks also contributing to the radioactivity?

I don't know the answers to this one yet. The next step is to make some thin sections and see what state the zircons are in, as well as seeing whether monazite is in fact present at all. My purpose in writing this up now is ask if anyone else has seen similar effects with Zr? Additionally it is to point out the dangers of using acid soluble data for elements usually tied up in resistate minerals despite the relative cost effectiveness of this analytical method.

This study was part of a joint undertaking between

Normandy Mining, Homestake Australia, (co-owners of the Super Pit), and the mine operators, Kalgoorlie Consolidated Gold Mines. Genalysis Ltd kindly made the acid digestion data for Zr available at no cost, and their help in this regard is appreciated.

**Nigel Radford**

*Normandy Exploration*

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## Technical Note

### Matrix Matched Nickel Sulphide Standards

Recently, WMC Resources Ltd (WMC) produced a suite of matrix matched reference materials or "Standards" for use in monitoring quality of assays generated during nickel exploration programmes and by nickel operations, primarily in Western Australia.

The importance of quality control procedures in mineral exploration cannot be overstated. WMC recognised the need for a series of matrix matched nickel standards several years ago. Material was collected from WMC's three nickel operations, Kambalda, Leinster and Mt Keith to cover weathered and fresh ultramafic rocks; and disseminated, matrix and massive nickel sulphides with resulting nickel concentrations ranging from 0.3-12%. The standards are named as follows:

- MK1 – weathered komatiite
- KN1 – barren ultramafic
- MK2 – disseminated sulphides
- LN1 – matrix sulphides
- KN2 – massive sulphides

This article documents the preparation of these materials and the results of an initial round robin to determine accepted values for elements of interest to explorers for nickel sulphides.

#### Preparation of materials

Approximately 75kg of ¼" material for each of the five standards was shipped to Ore Research and Exploration Pty Ltd (ORE) in Victoria for preparation. The samples were dried (sulphide-rich samples at 65 degrees Celsius, rest at 105 degrees), crushed, milled and homogenised. The matrix and massive sulphide ores were then packaged under nitrogen. The material was then packaged in 100g foil pouches. Two important characteristics of a standard are:

- *Homogeneity* - it is vital that the standard is homogeneous so that individual sub-samples will have the same concentration of the target elements. This is achieved by taking a large sample and pulverising it to a very fine grain size and then mixing it thoroughly. This is less of an issue with base metals such as nickel than with Au, but is still important. Pulverising the standard however, can make it

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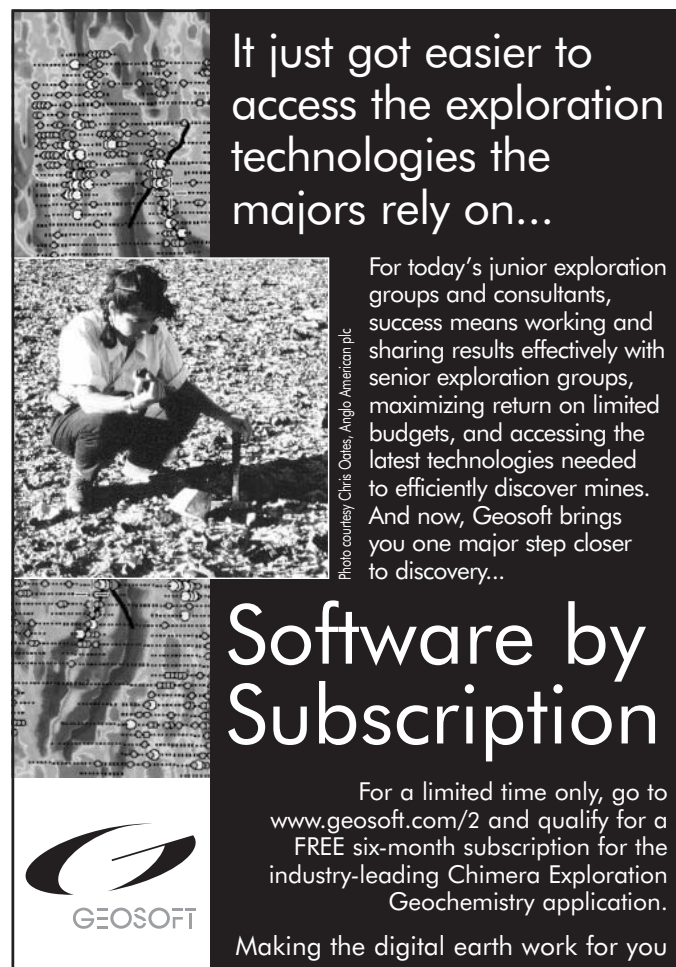
more visible to the laboratory, especially if it is submitted with split drill core.

- *stability* - one side effect of pulverising the material to less than 40 microns is that a large surface area is created which enables the material to oxidise much quicker than it would normally. Oxidation can affect the phase in which elements of interest occur in the standard (for example, nickel initially present in pentlandite which changes to violarite and then with further oxidation to iron oxides) and therefore can change the measured concentration of those elements in the standard. This is especially a problem with nickel sulphides which react with air. To overcome this, the standards are packaged in small air-tight foil pouches which contain 100g of material. In addition, a reference sample of each of the five standards has been sealed under liquid nitrogen at ORE to enable measurement of long term changes to the concentration of the elements of interest.

### Mineralogy

Each of the standards was analysed by X-Ray Diffraction (XRD) at WMC's Geological Research Laboratory in Perth to determine the dominant mineralogy.

The Table below shows the results of analysis of the five standards by XRD.



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Table 1.

### Results of XRD Analyses of WMC Nickel Standards

(negative results imply uncertainty in mineral identity and/or Wt%)

IDENT	MK1	KN1	MK2	LN1	KN2
Alkali feldspars	-	-	-	2	-
Amphibole	-	< 1	-	5	-
Antigorite	-	-	-	< 1	11
Biotite	-	-	-	1	-
Brucite	-	2	-	< 1	-
Calcite and/or chalcopyrite	-	< 1	1	< 1	5
Chlorite	-	10	-	-2	-
Dol-ankerite	-	5	1	< 1	1
Goethite	16	-	-	-	-
Hematite	48	-	-	-	-
Hydroxy - carbonate	-	-	26	-	-
Iowaite	-	-	-	3	-
Lizardite	-	-	57	39	-
Magnesite	-	44	-	-	-
Magnetite	9	< 1	2	1	-
Microcline/ rutile/sphene	4	-	< 1	-	-
Pentlandite	-	-	-2	9	25
Pyrite	-	4	-	-	18
Pyrite and/or hematite	-	-	3	-	-
Pyrrhotite	-	-	< 1	18	38
Quartz	12	13	2	5	< 1
Sodic &/or calcic plagioclase	9	-	2	-	< 1
Sodic plagioclase	-	-	-	15	-
Talc	2	21	1	< 1	1
Tochilinite	-	-	2	-	-
Volatile free MgO	-1	38	41	21	5
MgO	-1	28	34	19	5
Loss on Ignition	2	26	18	7	2
Ni	-1	-1	-1	3	8
Fe	50	3	7	16	40
S	-1	2	-1	10	33

It can be clearly seen that MK1, the weathered komatiite standard is composed dominantly of goethite and hematite, as expected. The "barren" ultramafic, KN1 and the disseminated sulphide standard, MK2 have carbonate +/- talc and serpentine compositions with minor amounts of sulphides. The matrix sulphide standard, LN1 is a high MgO ultramafic with approximately 30% sulphides. The massive sulphide standard, KN2 has >80% sulphide and correspondingly lower MgO. The lack of chromite and other resistate minerals indicate that digestions such as nitric-perchloric or 4-acid should be successful in dissolving most elements of interest. Aqua-

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regia digest, when used with standard MK1, should approximate a “total” digest with respect to elements such as Ni and Cu which will exist in Fe-oxides.

**Round Robin Testing**

Before the standards could be used routinely, it was necessary to obtain accepted values for concentrations of the elements of interest. To have greater confidence in these values, it is important to have a large dataset to work with. To achieve this, each of the five standards were sent to a total of 13 commercial and internal laboratories, both within Australia and overseas. The five standards were sent to the commercial laboratories as five sub-samples and each sub-sample was analysed in triplicate. In total therefore, for each of the five standards, over 150 analyses were obtained. The standards were analysed at least for Ni, Cu, Co, Cr, Fe, Mg, Mn and in some cases As and S. Some laboratories provided data for many more elements as part of a multi-element suite. These results were obtained by total acid digest (including HF acid) followed by analysis by either ICPOES or AAS. This is a typical analysis used for drill samples in nickel exploration and is designed to dissolve oxide, sulphide and silicate nickel. The analysis gives a near total digestion except for resistant minerals such as chromite, spinel, barite, monazite, zircon, gahnite and cassiterite. This will only have an affect on the Cr results which will be lower than the actual concentration due to undissolved chromite (Actlabs, 1999).

**Calculation of acceptable values**

On receipt of the results from each laboratory, calculations of mean and standard deviation were made for each element.

The average “coefficient of variation” defined as the (standard deviation/mean x 100) for Ni values at each lab is shown in the table below.

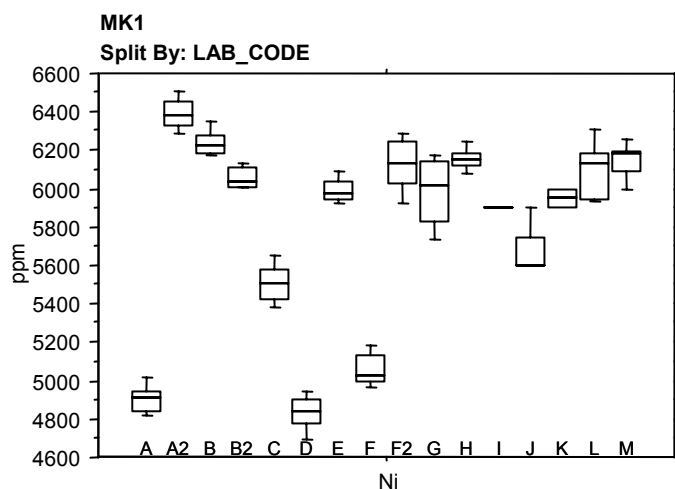
**Table 2.**  
**Average “Coefficient of Variation” values for Nickel within each of the 13 Laboratories.**

Standard	Average “Coefficient of Variation” (std deviation/mean*100) for Nickel
MK1	1.65
KN1	1.75
MK2	2.12
LN1	1.68
KN2	1.70

This simple calculation shows that the standards are indeed homogenous and that good precision can be obtained by multiple analyses of the material.

The data for each standard was then combined for comparison between the 13 laboratories. The box plot below shows the Ni values for MK1, the weathered komatiite standard.

**Figure 1. Values of Nickel for MK1, weathered komatiite standard.**



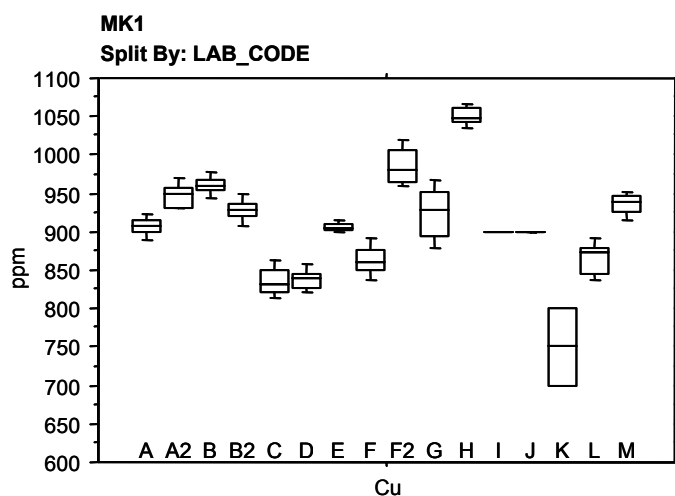
It can be seen immediately that three (and maybe four) laboratories appear to be reporting significantly lower than the rest. Labs “A” and “F” were asked to re-assay the samples and returned values closer to the rest of the round robin laboratories.

Laboratory “B” re-assayed the samples several months later and showed a decrease in values. Certified reference materials also returned lower values consistent with the change in nickel standard values, so the decrease was attributed to instrument drift.

This pattern was repeated for all five standards, but the apparent underreporting by Laboratories A, C and F was worse for the lower Ni values. The box plot also shows the good precision that all laboratories obtained.

By comparison, Cu values between laboratories (with the exception of one) were much closer as shown for MK1.

**Figure 2. Values of Copper for MK1, weathered ultramafic standard.**



To calculate “accepted” values for future use, results from laboratories that were obviously biased either higher or lower were removed. The following table shows the final

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Ni results calculated from the round robin.

**Table 3. Mean and Standard Deviation of Nickel for all round robin data after biased laboratories removed.**

Standard Name	Number of analyses	Mean Ni (ppm)	Std Dev.	CV*
MK1 – weathered komatiite	148	6052.10	254.21	4.20
KN1 – “barren” ultramafic	148	6273.73	216.52	3.45
MK2 – disseminated sulphides	148	5823.29	235.35	4.04
LN1 – matrix sulphides	148	15779.32	597.57	3.79
KN2 – massive sulphides	133	117407.68	3123.97	2.66
<b>Average</b>				<b>3.49</b>

\* CV = “coefficient of variation” (standard dev./mean x 100)

### Conclusions

Although the aim of the round robin was not to test individual laboratories, it was obvious that at least three had problems obtaining a reasonably accurate Ni result with a simple analytical technique (4-acid digest followed by ICPOES). This highlights the need for checking quality control both within and between commercial laboratories. The results of the round robin showed that the newly produced standards are indeed homogenous. The stability question will be answered over time as more and more results are obtained. These standards are now in use throughout WMC and are being used to monitor the results obtained from commercial laboratories. Other analyses have recently been performed for Platinum Group Elements and these are being interpreted at the time of writing of this paper.

### References

Actlabs Pacific Pty Ltd (1999), 1999 Fee Schedule.

**Alan Kelley**  
WMC, Australia



## News from China...

### International Seminar on Regional Exploration Geochemistry

The Seminar on Regional Exploration Geochemistry sponsored by the Coordinating Committee for Coastal and Offshore Geoscience's Programmes in East and Southeast Asia (CCOP), Ministry of Land and Resources of China (MLR) and China Geological Survey (CGS) was held in Beijing, China on May 21-26, 2001.

The aims of the seminar were to have the CCOP member countries share their ideas, technology and experiences on geochemical exploration/mapping in China, to apply them in national geochemical mapping using different sampling media in different geographic environments in the CCOP member countries, to discuss the implementation of global geochemical mapping using flood-plain sediments as the sampling medium to quickly obtain an overview of the distribution of 71 elements in the CCOP member countries, and how to use a huge mass of information of geochemical data in mineral exploration, basic geology, environmental monitoring and agricultural production increase.

The 42 participants from 10 CCOP country members (Cambodia, China, Indonesia, Japan, Korea, Malaysia, Papua New Guinea, Philippines, Thailand, Vietnam) and from Argentina had an excellent opportunity to share and exchange ideas, standards, technology and experiences in geochemical exploration and geochemical mapping through 4-day lectures and many hours of fruitful discus-

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## News from China...

— — — — — continued from Page 8

sion, and a one-day visit to the Institute of Geophysical and Geochemical Exploration (IGGE) in Langfang.

The seminar focused on the following topics:

Introduction: Evolution of basic ideas and methodology in exploration geochemistry, Prof. Xie Xuejing

Geochemical mapping in China, Prof. Xie Xuejing

Geochemical blocks, Prof. Xie Xuejing

Deep-penetration geochemical survey, Dr. Wang Xueqiu

Geochemical methods in oil and gas, Prof. Xie Xuejing

Geochemical field methods, Prof. Du Haiyan

Geochemical analysis, Prof. Dong Gaoxiang

Geochemical data management and processing, Dr. Xiang Yunchuan

Geochemical case histories, Dr. Wang Xueqiu

Global geochemical mapping, Prof. Xie Xuejing

Environmental geochemistry, Dr. Zhou Guohua

Environmental geochemistry at global scale, Dr. Shaun Reeder

Geological Surveying Programs in China, Dr. Tan Yongjie

Exploration geochemistry into the 21<sup>st</sup> century, Prof. Xie Xuejing

Implementation of Global Geochemical Mapping in Circum-Pacific Regions, Prof. Xie Xuejing

***Exploration geochemistry was first used in the 1940s as a prospecting technique in mineral exploration. Over the past 60 years exploration geochemistry has expanded its scope from mineral exploration to geochemical mapping and environmental geochemistry.***

Since 1979 China's National Geochemical Mapping Project, the Regional Geochemistry - National Reconnaissance (RGNR) project has been implemented. During the past two decades, it has covered more than 6 million km<sup>2</sup> of China's territory with stream sediment sampling and multi-element analysis for 39 major, minor, trace and ultra-trace elements. It has proven to be one of the most successful geochemical mapping projects in the world. It has made a magnificent contribution to mineral exploration in China.

The discoveries of 579 ore deposits including precious metals (421), base metals (139), dispersed metals (12) and others (7) are due to this project. This project also provides a huge mass of information for basic geology, land use and environmental monitoring. The project is ongoing until China's entire territory is covered. The Geochemical Atlas of China with 39 elements will be published in the near future.

In 1970's and 1980's regional or national geochemical mapping projects were carried out in many countries. However, due to lack of standards the results were not always entirely satisfactory except in China. Thus standardization for geochemical mapping is essential. The International Geochemical Mapping Project, whose main aim was to establish standards, was accepted as part of the International Geological Correlation Program (IGCP259) in 1988.

The ideas, standards and methodology of China's National Geochemical Mapping Project contributed much to the IGCP259. In 1994 Global Geochemical Mapping Project using wide-spaced sampling in approximately 5000 GRN (Geochemical Reference Networks) cells to cover the whole earth surface to generate a global geochemical atlas was accepted as the IGCP360 entitled "Global Geochemical Baselines" in 1995. The Environmental Geochemical Monitoring Networks Project in China as the pilot study for the IGCP360 has demonstrated that flood-plain sediments from large basins are a suitable sampling medium for global geochemical mapping. The results of the two projects were summarized in a special UNESCO publication entitled "A Global Geochemical Data Base for Environmental and Resource Management."

To meet the requirements for the China's National Geochemical Mapping Project in the initiation stage of the late 1970s and early 1980s, more than 20 laboratories from all over China made a great effort to develop the analytical methods, prepare the standard materials, and design the quality control scheme. Today this analytical system and experiences have made a great contribution to the International Geochemical Mapping and the Global Geochemical Mapping.

To manage the huge set of data from the China's National Geochemical Mapping Project, software based on GIS for data management, processing and integrated interpretation of geochemical datasets has been developed and named the Regional Geochemical Database and Information System (GeoMDIS 2000). Since 1994 three versions have been released; it has become a basic tool for geochemical data management, data processing and map generation in China.

There are large diverse unexplored or under-explored overburden terrains in China and abroad that still remain to be covered by geochemical mapping. However, conventional geochemical methods are not suitable for or have limited application in searching for deposits hidden under cover of transported overburden or sequence of post-ore volcanic or sedimentary rocks. Development of low-cost and efficient methods is a real challenge for regional exploration of targets in such terrains. Deep-penetration geochemical methods have been developed and are being further exploited by use in regional survey in various overburden conditions such as alluvium, sand desert, grassland, loess and laterite terrains.

From the 1980s the search for giant ore deposits has been becoming the focus of the world mining industrial activities. Great efforts have been made in developing criteria for recognizing geological processes or settings favorable for the occurrence of giant ore deposits. However, such efforts have not led to encouraging results. This induced us to consider how to use the mass of high quality data obtained from China's Geochemical Mapping Projects to estimate the metal endowment (metal supply) necessary for the formation of large/giant ore deposits. A hierarchy of nested geochemical patterns was found in 1990s from the

*Continued on Page 10*

## News from China...

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study on tungsten patterns in the whole of China. In 1995 further investigation recognized that the hierarchy of geochemical patterns are really the surface expressions of large rock mass with high contents of certain metal or metals. Total tonnage of metals in the rock mass could be calculated at given thickness of the rock mass (500 m or 1000 m), and its internal structure can be used to track the build-up of metal concentration toward the formation of an ore deposit. Such rock mass is termed as "geochemical block", whose area is equal or larger than the dimension of a geochemical province.

As a group of developed countries, Europe has its environmental problems. Dr. Shaun Reeder presented the progress of the Global Geochemical Baseline Project in Europe and used Europe as an example how to employ geochemical data to monitor and assess environmental problems. As a developing country, China (and other Asian countries) is also facing environmental problems. Multi-level environmental geochemical systems for monitoring regional, national and global environmental problems and the development of cost-effective bio/phytoremediation technology to clean "Delayed Geochemical Hazards" were proposed.

Resources, environments and population growth are the three main problems influencing the survival of human being. Mineral resources are composed of elements, while environmental problems in turn reflect the distribution and behavior of chemical elements in nature. Geochemistry studies chemical elements' distribution and behavior, and thus it can make a greater contribution to solving resource and environment problems in the new millennium.

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Dave Evans has a complete set of the Journal of Geochemical Exploration (volumes 1 to 68) that he would like to donate to an individual or organization that will make good use of them. He also has a few years of Applied Geochemistry as well as some early Geochemical Symposium Volumes. Everything is a good shape with no highlighting and only his name or initial marking the front or first page.

The only condition is that the recipient pays for the shipping charges.

**D. S. Evans, Ph.D., P. Geol.,**  
Senior Consultant  
CSC Project Management Services  
Calgary, Alberta, Canada  
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[CSCDaveE@cs.com](mailto:CSCDaveE@cs.com)

The seminar aroused wide interest in the participants from the CCOP member countries. Mr. Jiang Chengsong, Deputy Minister of MLR, Dr. Zhang Hongtao, Deputy Director-General of CGS, and Mr. Chen Shick Pei, director of the CCOP Technical Secretariat, have reached an agreement on further cooperation in the implementation of global and national geochemical mapping in East and Southeast Asian countries in the future.

### Xueqiu Wang

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Shea Clark Smith

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## Alan Coope... Memories

I first met Alan as a pipe-smoking PhD student (when I was a cigarette-smoking PhD student) at the Geochemical Prospecting Research Centre, Royal School of Mines, London. He arrived a year or two after me in the 1950s, and went to the Philippines to do his research while I went to Canada to work. When I returned from *my* stint in the Philippines in 1966 I found Alan was also in Canada. He turned up in my office at the University of New Brunswick one cold day to propound his vision of a professional association of exploration geochemists. This had my enthusiastic support, and we had many discussions in New Brunswick and at Toronto where he was based, until that day in Toronto in 1970 when the Association of Exploration Geochemists came into being.

Until I left Canada at the end of 1977, Alan was a welcome friend at our house in Fredericton, and I stayed with him and Carol in Toronto when there. The main topic of conversation was always geochemistry and, as all exploration geochemists know, Alan never ceased to concern himself with his profession and the Association.

Since coming to Australia I have regretfully seen less and less of Alan as the years have passed (the tyranny of distance!). I am so glad that I saw him (and Carol) at the Association's meeting in Townsville in 1995. He was still the same thoughtful, concerned Alan I knew so long ago – I think he even looked the same! The Association of Exploration Geochemists has lost a guide, mentor and friend with the passing of Alan Coope.

### GJS Govett

*Emeritus Professor*

*Moss Vale, NSW, Australia*

## A Tribute to J. Alan Coope

Given at the Memorial Service in Tucson on  
September 7, 2001

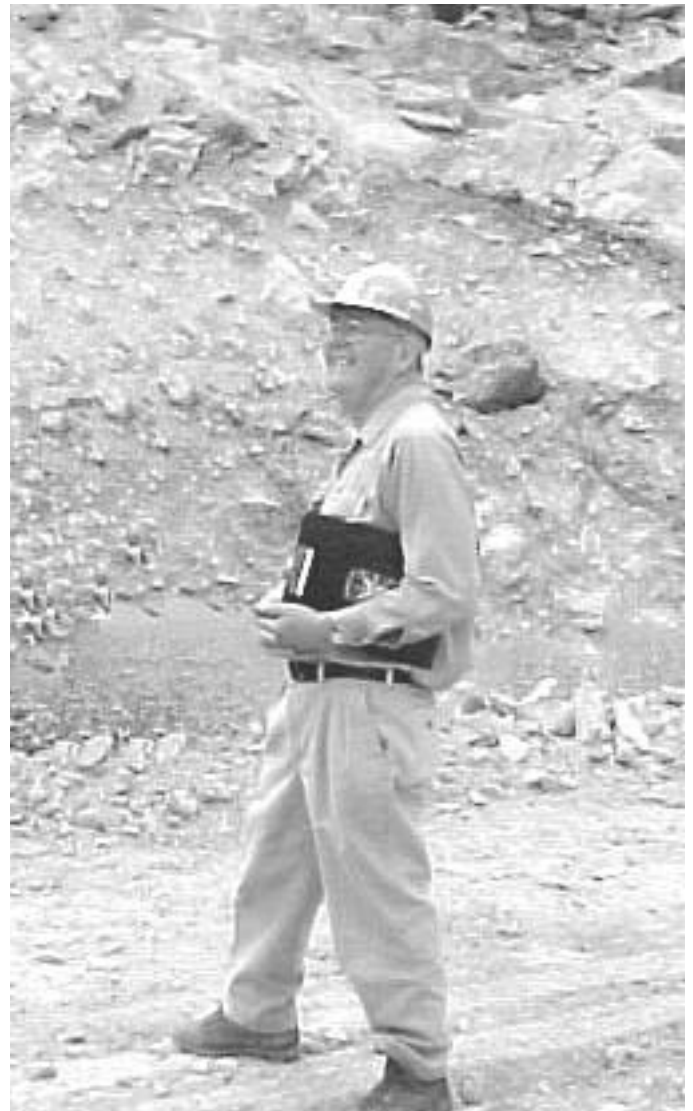
Carol, Brenda, and James have asked me to say a few words about Alan's professional attributes. First, I must say that it would be extremely difficult to communicate, in words, all that Alan has done for his chosen profession and for those of us who have had the honor to walk along side of him or touched paths with him during his career.

I met Alan just over 20 years ago at the Toronto Symposium for the Assoc. of Exploration Geochemists. Upon meeting Alan, one encountered a quiet English mannered gentleman. It is only after you have had the extraordinary honor of having worked with him or having discussed one of his projects that you were able to discover the talented impassioned professional, scientist, mentor, and scholar that was beneath the surface.

Alan was in all ways

### An exacting scientist

He continually asked questions – always looking for



the one piece of information that would lead him on toward the next higher level of understanding and, of course, more questions.

### A great professional

He applied his knowledge and skills efficiently and only after due consideration to every project.

### An admired mentor

He communicated his ideas and knowledge to others freely and without prejudice. He cheerfully taught those willing to learn the skills he had developed through his extensive experience.

### A noble scholar

He willingly shared his hard won knowledge with others through reports, journals, newsletters, and personal communications.

And,

### Always a true friend

to everyone who was lucky enough to have worked with him.

Alan deserves the well-earned recognition he has received due to his exemplary actions and attitudes and as

*Continued on Page 12*

## Alan Coope... Memories

----- continued from Page 11

the guardian of the profession of exploration geochemistry. He was honored this year with the Assoc. of Exploration Geochemists highest honor – Life Membership and has been awarded numerous medals and honors from many Professional Associations to which he belonged. He was a strong and consistent voice promoting quality in the science, professionalism in the individual, and success within the industry. Alan never ceased to expand his knowledge of, and to develop new understandings within, the geological sciences even after retiring – which he kept saying he was going to get around to soon.

Alan's thorough understanding of the Geosciences and the practical application of the science kept him very busy evaluating and participating in advisory committees on many of the programs and grant applications for the Geological Survey of Canada, the US Geological Survey, the Arizona Geological Survey, the Ontario Geoscience Research Review committee, the Centre for Earth Resource Research, Natural Sciences and Engineering Research Council, and many other government and private research organizations.

Alan consistently aided and assisted in the career development of geologists entering into the field of exploration geochemistry. Newmont, under Alan's guidance, supported research programs within various MS and PhD programs. Alan played a key role in each of these supported research programs and always knew the details of each. During his career with Newmont, Alan positively influenced more than 50 graduate students, many of whom are now the principals of the exploration community. He was a mentor and inspiration to many of us, as he was always

willing to share his knowledge and experience with those of us who aspire to be first rate explorationists

He has been a continuous contributor to professional societies throughout his career. Alan was the first President and primary author of the constitution and by-laws for the Association of Exploration Geochemists. Always present in person or as a thoughtful voice in the background, much of the success of AEG can be directly attributable to Alan's insight and influence. He has served on many committees for the Society of Economic Geologists, Society of Mining Engineers, Geological Society of Arizona, American Institute of Professional Geologists, Geological Association of Canada, Canadian Institute of Mining and Metallurgy, Prospectors and Developers Association of Canada, and others.

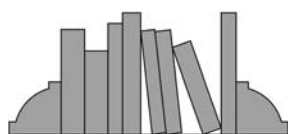
I realize that his family missed out on some quality time with their father & husband while he was off trying to find the elusive key question that would unravel some aspect of the science he was currently investigating. However, as his family we hope you understand that in devoting the time that he did to his profession he touched on more lives within this lifetime than most of us could wish to in several lifetimes. Our appreciation goes out to you for sharing him with us so that he could participate fully in his profession and enhance our lives as well.

Alan was a man of **true greatness** and will be missed.

**To Alan!**

**May he rejoice in a life well lived !!!**

**Erick Weiland**  
*Tucson, Arizona*



## RECENT PAPERS

This list comprises titles that have appeared in major publications since the compilation in **EXPLORE** Number 112. 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**.

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*Continued on Page 14*

Pre-Conference Workshop:  
**“Exploration Technology: Discovery Thru Innovation”**

**Dates:** April 12-13, 2002.

**Location:** Holiday Inn - Airport

Precedes SEG Conference:

Global Exploration 2002 – Integrated Methods for Discovery

**Denver, Colorado: April 14-16, 2002.**

**Workshop Organizers:**

L. Graham Closs (Colorado School of Mines, email: [lcloss@mines.edu](mailto:lcloss@mines.edu))

Mary E. Doherty (International Geochemical Consultants, LLC, email: [MaryEDoherty@earthlink.net](mailto:MaryEDoherty@earthlink.net))

Ken Witherly (Condor Consulting, Inc., email: [ken@condorconsult.com](mailto:ken@condorconsult.com))

The workshop will include the participation of corporate executives, senior management of major, junior and consulting firms as well as experts in the fields of exploration geophysics, geochemistry, GIS and remote sensing applications.

**Outline:**

*This two-day workshop will evaluate current exploration technologies and their role in integrated exploration programs. Technology integration will be explored from the large, small and junior company, as well as from the consulting perspective. Exploration geophysics, geochemistry, remote sensing and information technology will be reviewed; successful discoveries based upon integrated exploration will be presented; and a panel will investigate strategies for effective implementation of integration of these technologies into the exploration environment.*

*This workshop will be of particular interest to exploration managers and senior exploration geologists charged with design and execution of exploration programs.*

For more information visit the websites: Society of Economic Geologists (SEG): [www.seg2002.org](http://www.seg2002.org)  
 Association of Exploration Geochemists (AEG): [www.aeg.org](http://www.aeg.org)

**Workshop Program**

**Friday April 12, Morning**

8-8:30AM	Registration and Coffee
8-8:40	Introduction
8-8:40	Role of Integration in Mineral Exploration
9-9:30	Geophysics - Introduction
9:30-10:00	Airborne Geophysics
10-10:15	Break - Coffee
10:15-11	Ground Geophysics
11-11:30	Borehole Geophysics
11:45-12:45	Lunch
	Major Co. Perspective on Integration

**Saturday April 13, Morning**

8:00-8:10AM	Introduction/Logistics/Updates
8:10-8:30	Junior Company Perspective on Integration
8:30-9	Remote Sensing – Big Picture!
9-9:30	GIS
9:30-10:15	Visualization Technology
10:15-10:30	Break - Coffee
10:30-11	Smart Rooms
11- 11:30	Remote Sensing – Mineral Mapping
11:45-12:45	Lunch
	Consultant's Perspective on Integration

**Friday April 12, Afternoon**

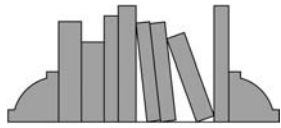
1-1:30	Geochemistry – Introduction
1:30-2	Sampling and Landscape Geochemistry
2-2:30	Analytical Services and QA/QC
2:30-3	Selective Extractions
3-3:15	Break – Coffee
3:15-3:45	Hydrogeochemistry
3:45-4:05	Biogeochemistry
4:05-4:25	Gas Geochemistry
4:25-4:45	Lithogeochemistry

**Saturday April 13, Afternoon**

1-1:30PM	Process of Integration
1:30-1:50	Case Study 1: Diamonds
1:50-2:10	Case Study 2: Base Metals
2:10-2:30	Case Study 3: Uranium
2:30-2:50	Case Study 4: Porphyry Copper/Skarn
2:50-3:10	Case Study 5: Gold
3:10-3:30	Break – Coffee
3:30-4:30	Wrap-up
	Review and Synthesis
	Panel Discussion

**Friday April 12, Evening**

6-7PM	Dinner
	Petroleum Exploration Perspectives on Integration



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*continued from Page 12*

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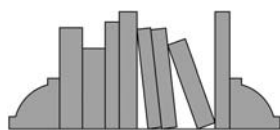
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*Continued on Page 15*



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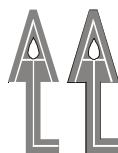


### Deadlines for the Next Four Issues of EXPLORE

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

<u>Issue</u>	<u>Publication date</u>	<u>Contributor's Deadline</u>
114	January 2002	November 30, 2001
115	April 2002	February 28, 2002
116	July 2002	May 31, 2002
117	October 2002	August 31, 2002

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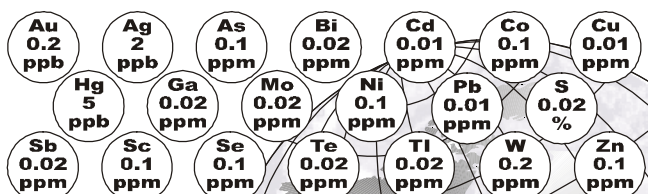


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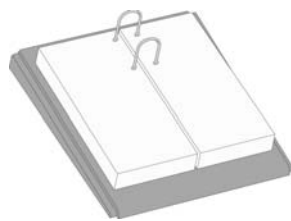
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## CALENDAR OF EVENTS

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

■ Oct. 5-12, 2001, **27th Ann. Conf. of Federation of Analytical Chemistry & Spectroscopy Societies**, Detroit, MI. INFORMATION: Div. of Analytical Chemistry. FACSS, (505) 820-1648, fax (505) 989-1073, Internet: <http://FACSS.org/info.html>

■ Oct 21-24, 2001, **Third South American Symposium on Isotope Geology**, Gran Hotel Pucón, Pucón, Chile, by the Servicio Nacional de Geología y Minería de Chile (SERNAGEOMIN); Dept. de Geología, Universidad de Chile; and Sociedad Geológica de Chile. (Eugenia Fonseca, Laboratorio Sernageomin, Til-Til 1993 Ñuñoa, Santiago, Chile, Phone: 56-2-2385292 EMail: [ssagi@sernageomin.cl](mailto:ssagi@sernageomin.cl) Web: <http://www.sernageomin.cl/ssagi/>)

■ November 5-8, 2001, **Annual Meeting of the Geological Society of America**, Boston, Massachusetts. Information: TEL 1-800-472-1988, [meetings@geosociety.org](mailto:meetings@geosociety.org).

■ December 2-3, 2001, **2001 Arizona Conference**, Doubletree Hotel at Reid Park, Tucson, Arizona. Information: Sam Rasmussen, 2001 Arizona Conference Program Chair, [sasmussen@phelpsdodge.com](mailto:sasmussen@phelpsdodge.com)

■ December 10-14, 2001, **American Geophysical Union Fall Meeting**, San Francisco, California. Information: AGU Meetings Dept., 2000 Florida Ave., NW, Washington, D.C. 2009, phone 1-800-966-2481. E-mail: [meetinginfo@agu.org](mailto:meetinginfo@agu.org). WEB: <http://www.agu.org/meetings/fm01top.html>.

■ December 16-18, 2001, **ICCE - 2001 International Congress of Chemistry and Environment**, Indore, M.P., India (Dr. Shankar Lal Gargh, A/80, Scheme No. 54, Vijay Nagar, Indore 452 010 (M.P.) India, Phone: +91/731-552837 EMail: [chemjyot@sancharnet.in](mailto:chemjyot@sancharnet.in) Web: <http://www.chemenviron.com>)

■ February 25 - 27, 2002, **Society for Mining, Metallurgy, and Exploration (SME) annual meeting**, Phoenix, Arizona. William Wilkinson Jr., Phelps Dodge Mining Co., 2600 N. Central Ave., Phoenix, AZ 85004, (602) 234-6080, Fax: (602) 234-4847. E-mail: [wwilkinson@phelpsd.com](mailto:wwilkinson@phelpsd.com).

■ March 4-7, **GeoProc2002—Geochemical Processes**, Bremen, Germany. Information: Horst D. Schulz, +49(0)421-218-3393, fax +49(0)421-218-4321; Astrid Haderler, +49(0)421-218-3950, fax +49(0)421-218-4321.

■ March 10-13, 2002, **AAPG Annual Convention and Exhibition**, George R. Brown Convention Center, Houston, Texas, by the American Association of Petroleum Geologists. (AAPG Convention Department, 1444 S. Boulder Ave., Tulsa, OK 74119 USA, Phone: 800-364-2274 or

918-560-2679 EMail: [convene@aapg.org](mailto:convene@aapg.org) Web: <http://www.aapg.org>)

■ April 7-11, 2002, **223rd ACS Natl. Mtg. Orange County Convention/Civil Center, Orlando, Fla.** INFORMATION: ACS Meetings, 1155 16th St., N.W., Washington, D.C. 20036-4899, (800) 227-5558, (202) 872-4396, fax (202) 872-6128, e-mail: [natlmtgs@acs.org](mailto:natlmtgs@acs.org)

■ May 27-29, 2002, **47th Joint Annual Meeting of the Geological Association of Canada and the Mineralogical Association of Canada (GAC/MAC)**, From Plains to Shield: "The Making of a Continents Interior...", University of Saskatchewan, Saskatoon, SK., Canada. Information: fax - 306-966, e-mail - [mel.stauffer@usask.ca](mailto:mel.stauffer@usask.ca), [www.usask.ca/geology](http://www.usask.ca/geology).

■ June 8-14, 2002, **AMERICAN SOCIETY for SURFACE MINING and RECLAMATION (ASSMR) 18th National Meeting**, Lexington, KY. [http://www.ca.uky.edu/assmr/Upcoming\\_Events.htm](http://www.ca.uky.edu/assmr/Upcoming_Events.htm)

■ July 14-August 2, 9th International Platinum Symposium and Field Conference, Bozeman, Montana. Organizers: IGCP (International Geological Correlation Programme) 427, Society for Geology Applied to Mineral Deposits. Information: Roger Cooper, (409) 880-8239, fax 409-880-8246.

■ July 22-27, 2002, **The Earth System and Metallogensis: A Focus on Africa**, Windhoek, Namibia, by The Geological Society of Namibia, The Geological Society of South Africa, and The Geological Society of Zambia. (The Secretary, IAGOD/GEOCONGRESS 2002, P.O. Box 44283, Linden 2104, South Africa, EMail: [gssa@pop.onwe.co.za](mailto:gssa@pop.onwe.co.za) Web: <http://www.gssa.org.za>)

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

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

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

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

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

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**32nd International Geological Congress, Florence, Italy, August 20-28, 2004**  
**In collaboration with and under the sponsorship of the IUGS**

***From the Mediterranean toward a Global Renaissance***

*Geology, Natural Hazards and Cultural Heritage*

The 32nd International Geologic Congress will be held in Florence, internationally known as city of artistic heritage and cultural traditions. The recently remodeled pentagonal fortress of the Fortezza Da Basso, a wide area in the heart of the town, will host the event. The congress centre has a variety of modern integrated spaces which enable to display a large number of posters nearby the session rooms, to organise short courses, meeting of Scientific Associations, a Geoexpo exhibition, etc.

The 32nd IGC is being organized in cooperation with a number of perimediterranean countries grouped in the GEOMED Consortium. Italy and the Mediterranean area offer a great variety of choice for outstanding field trips on the most diverse geological subjects, from well studied mountain chains (Alps and Apennines) to the active volcanic areas surrounding Naples, the Etna Volcano in Sicily or the Aeolian Islands in the Tyrrhenian Sea, but also offer the possibility to focus on recent devastating natural hazards and on geological aspects of famous archeological sites such as Pompei and Paestum.

**CALL FOR SYMPOSIA, WORKSHOPS AND SHORT COURSES**

The rationale under which the 32nd International Geological Congress in Florence was approved in Rio, in August 2000, was centered on the need of the international geological community of fostering new ideas and models for implementing a close interplay between pure science and its applications.

The congress will include topics related to the whole spectrum of the Earth Sciences fields but also thematic sessions. A significant number of scientific sessions will be devoted to themes related to the Mediterranean area, natural hazards and cultural heritage but also to satisfy the aims of the IGC that meets only every four years. However, we invite to propose themes for symposia, workshops and short courses on all subjects. The themes accepted as appropriate for the meeting by the Scientific Program Committee, will be included in the **first circular** to be distributed by **early spring 2002**.

**GENERAL SYMPOSIA** - They will include issues related to the whole spectrum of the Earth science disciplines.

**SPECIAL SYMPOSIA** - They will focus on interdisciplinary issues and the latest scientific advancements. Poster sessions will be designed and organised to interact positively with the oral sessions.

**WORKSHOPS** - The selected workshops will be generally held before and after the Congress at the University of Florence (located nearby the Congress venue) or in other Italian Universities and Institutions.

**SHORT COURSES** - Pre- and post-congress short courses will be held at the University of Florence; during-congress short courses will be held at the Fortezza Da Basso Conference Venue.

Send your proposal forms before **November 30th 2001** to the following addresses:

E-MAIL OF THE WEB SITE: [cmanetti@geo.unifi.it](mailto:cmanetti@geo.unifi.it)  
Ms. Chiara Manetti  
Universita' degli Studi di Firenze  
Dipartimento di Scienze della Terra  
Via La Pira, 4 -50121 FIRENZE - ITALY  
Tel/Fax: 055/2382146

Please note that acceptance of proposals will be acknowledged by early spring 2002

We are looking forward to hearing about new ideas that can contribute to the success of the Congress.

Gian Gaspare Zuffa  
(Chairman of the 32nd IGC Scientific Program Committee)  
<http://www.32igc.org/>



## 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 David B. Smith, Secretary AEG, USGS, Box 25046, MS 973, Denver, CO 80225, USA.

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.

### Fellowship

#### **Townley, Brian K.**

*Assistant Professor,*  
University of Chile  
Santiago, CHILE

### Membership

#### **Skandenbeg, Brian**

*Field Geologist*  
Phelps Dodge  
Winnipeg, CANADA

#### **Ellis, Robert**

*Senior Scientist*  
GEDEX  
Mississauga, CANADA

#### **Cass, David**

*Exploration Manager*  
Hudsons Bay Exploration  
Vancouver, CANADA

#### **Sharp, Jason**

*Government Geologist*  
Iqaluit, CANADA

#### **Burke, Robert**

*Consulting Geologist*  
Norwood, SA, AUSTRALIA

#### **Gresham, Jeffery**

*General Manager Exploration*  
Perth, WA, AUSTRALIA

#### **Johnson-Williams, Gary**

*Exploration Manager (Petroleum)*  
MNG Exploration  
Tulsa, OK, USA.

#### **Amrdrada de Palomera, Paul P.**

*Mining and Exploration Geologist*  
Gormicruz SA  
Rio Gallegos, ARGENTINA

#### **Cracotta, III, Charles A.**

*Research Hydrologist, USGA*  
New Cumberland, PA, USA.

### Student Membership

#### **Benamghan, Ahcene**

*PhD Student*  
Univ Catholique de Louvain  
BELGIUM




## Bylaws Comments

“BY-LAWS” MAY APPEAR BORING, BUT THEY ARE IMPORTANT COMMENTS ON THE AEG IDENTITY

The recent article by Nigel Radford (Vice President AEG) in Explore No. 108 brings forth an issue, which has been raised in the past by many colleagues, that of the “AEG Identity”. He proposes a new name for the Association and changes to criteria for membership. Before proposing my own recommendations on this very significant issue, it is worth reviewing and commenting on other similar articles, published in Explore since 1990.

Donald D. Runnels in 1990 (**Explore** No. 69: 10-12) discusses the relationships between Exploration Geochemistry and Environmental Geochemistry and suggests that “both groups could benefit from a greater awareness of the resources available in the other camp”, and finally proposes a joint symposium, sponsored by AEG and SEGh “with the goal of allowing these two scientific communities to learn from each other?”

Chi-I Huang in 1991 (**Explore** No. 70: 17) compares the two fields of the exploration and environmental geochemist, and concludes in his “environmental monitor” that they both “have a lot in common”, and “if the two groups can compare notes more frequently, they very likely can avoid the ‘reinvention of the wheel’ many times over.”

J. Alan Coope in 1991 (**Explore** No. 71: 10-11) informs the AEG members about the purpose of the *ad hoc* Committee on the Identity of the AEG, which was “to address the central question whether the Association should continue to focus its energies on its defined objectives and aggressively promote the broader aspects of exploration geochemistry or expand its horizons to include additional geochemical disciplines while attempting to maintain some central focus on exploration geochemistry.”

J. Alan Coope later on in 1991 (**Explore** No. 73: 1, 3-7) reports on the findings of the *ad hoc* Committee about the AEG identity, which are indeed interesting and very important in promoting exploration geochemistry as a profession, but also in influencing the development of correct university curricula. In the executive summary the Committee states that “the message underlying the following recommendations is that exploration geochemistry must advance beyond the empirical into the more creative and intellectual in order to guarantee the future of both the profession and the Association. The achievements of our pioneers and mentors and the foundations they established were profound, appropriate and timely, but in order to be effective, **the Association must continually adapt to the challenges of the changing world.**” The last statement has been highlighted for in my opinion it is important, and the AEG must undoubtedly adapt in the correct direction in order to be effective. One of the worrying findings of the *ad hoc* Committee was that “many practitioners in the environmental geochemistry field are chemists and engineers without an expert appreciation of geological aspects of the natural environment ...” Unfortunately, I

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have seen the involvement of chemists and engineers in 'environmental' geochemistry problems, and their conclusions and recommendations were detrimental on the natural environment, because they have no understanding and appreciation of natural processes, and the variables involved. The *ad hoc* Committee, although it recognises that "exploration geochemists have developed skills of application needed in environmental investigations and often work with environmentally significant data in pursuit of the mineral discovery objective", it recommends that **"The Association should not unreservedly embrace the broad discipline of environmental geochemistry, but maintain its present identity, restrict its objectives to the dispersion (both natural and anthropogenic) of naturally occurring geochemical species and exchange ideas and encourage joint meetings and projects in areas where exploration geochemical and environmental geochemical interests overlap."** It is quite apparent that this recommendation was made, because Committee members were more afraid of the "danger that dilution of the current membership with peripheral interest groups could cause serious identity problems for the Association and unreservedly opening the Association to environmental membership will not serve the needs of the majority of the current AEG membership who are exploration geologists practising exploration geochemistry." The identity of the AEG could, however, be protected by strict rules of membership, and especially voting members.

Adrian Smith in 1994 (**Explore** No. 84: 5-6) states that "environmental geochemistry is almost tangential to exploration geochemistry in intent and purpose" and "only the term geochemistry is the same." He continues to say that "environmental geochemists spend their lives responding to ever increasing bizarre regulatory impositions and numeric criteria which have almost nothing to do with science and everything to do with political ideology." I totally disagree with his perception of the "environmental geochemist", for since the decline of mineral exploration in Greece in the early 1990's, I have been working in the so-called 'environmental' geochemistry field. I use my experience in "exploration" or more correctly in "applied" geochemistry to tackle environmental contamination problems. The difference, as has already been pointed out by Chi-I Huang in 1991 (**Explore** No. 70: 17), is the end user. Adrian Smith has the same fears as the AEG *ad hoc* Committee (**Explore** No. 73: 1, 3-7), that "dilution of the focus of the Association would be retrogressive and harmful to the AEG."

Robert G. Garrett in 1994 (**Explore** No. 85: 5-6) replies, to Adrian Smith's fears, in an interesting and effective manner. I agree with Robert that "I have always considered myself as an 'Applied Geochemist' wanting to apply my knowledge to any pertinent problem." As Robert was a student of the renowned "Applied Geochemistry Research Group" of Imperial College of Science & Technology (University of London), which was organised by John S. Webb, he is indeed proud to have received his graduate degree in Applied Geochemistry. I agree with Robert that the AEG should have been called the

**"Association of Applied Geochemists"**, for it would have encompassed from the beginning all interest groups. Robert's other comments are also significant, for we all have seen the chaos environmental geochemists and legislators have made: "We all laugh with derision at regulations that mandate levels in the environment that are lower than those that occur naturally." As he quite rightly points out "the very fact that these regulations came into place marks a failure of the geological and geochemical community to communicate what we have learned of natural processes to the regulators." So, to be effective we must become involved in these new arenas.

An interesting addition in the logo of the AEG is featured in **Explore** No. 86 (January 1995), where the words "Exploration" and "Environment" have been added, before the decision to include them in the title of our new Journal. Why was this addition not commented by any members? Did we silently accept that the AEG membership is involved in both mineral exploration and the environment?

Gwendy E.M. Hall, as President of the AEG in 1995 (**Explore** No. 89: 4), puts the question "whether the AEG should embrace environmental geochemistry as a sister discipline in its activities and publications, and if so, to what degree." Her personal opinion is that the AEG "should, not attract more members to fill the void created by declining North American explorationists ..., but rather to bring our expertise and experience to the attention of those working in the 'environmental field'." It appears that Gwendy is also afraid of dilution, a fear already expressed by the AEG *ad hoc* Committee (**Explore** No. 73: 1, 3-7) and Adrian Smith (**Explore** No. 84: 5-6). She goes on to describe a two-day workshop held at York University, which was attended by geoscientists and environmentalists. Her comments are that "the language is completely different, with its own slant.... The surficial environment is seen more in a static than kinetic mode, as passive rather than active." Gwendy suggests that these two disciplines should come together "in scientific collaboration to address some of the issues which are being brought to the fore now." The problem, however, is how can the AEG bridge the gap that has been created with just scientific meetings or collaboration? We must remember that these people are "opportunists", they have jumped on the bandwagon of "geo-environmental" problems, because of the money involved, and generally oversimplify matters, since they do not have the basic knowledge of geological sciences and the principles of classical and applied geochemistry.

Ashlyn Armour-Brown in 1996 (**Explore** No. 90: 4) supports the views expressed by Gwendy Hall about "embracing environmental geochemistry". But, he goes on to say that he cannot "understand why there is any question about this at all." For him "there is no schism between exploration and environmental geochemistry." Ashlyn's views are along the same lines as those of Robert Garrett (**Explore** No. 85: 5-6.), since he also believes that the AEG should have been called the "Association of **Applied** Geochemists". The last two paragraphs of his letter to the *Explore* Editors are indeed very illuminating: "If we, as 'applied geochemists' do not 'embrace environmental geochemistry' much of our field of ac-

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## Bylaws Comments...continued from Page 19

tivity will be high-jacked by the environmental agencies: for example, the geochemical mapping techniques which as so useful for determining the fluxes of the elements and setting of realistic background element levels for the natural environment. This could lead to much duplication of effort, the redevelopment of techniques and competition for precious and dwindling research resources." Ashlyn Armour-Brown expresses the opinion that the "Association neglects the environmental aspects of our profession at its peril" and he recommends that "the Association not embraces environmental geochemistry but claims it as its own."

John Fortescue in 1996 makes "Suggestions for a Conceptual Bridge between Exploration and Environmental Geochemistry" (Explore No. 93: 6-8). His technical article is interesting, and especially the suggestion that "communication would be improved if exploration geochemists would use the language of environmental ecology as a basis." He further states that "expertise in geochemical mapping and monitoring is clearly of vital importance in the development of a self-sustaining environment. Exploration geochemists are in a unique position to guide and educate environmental scientists in geochemical mapping."

Peter Simpson, as President of the AEG in 1998, announces the new title of our journal: **Geochemistry – Exploration: Environment: Analysis** (Explore No. 101: 1-2). He states that "the order of topics in the subtitle is also impor-

tant since exploration geochemistry is the principal unifying theme of our association, with environment and analysis providing important links to related disciplines".

The above review was presented in order to remind all the AEG members, that the matter is being discussed since 1990. I sincerely believe that time is ripe for this issue to be finally resolved. In my experience, exploration geochemists find it very difficult to change their thinking and methodologies, and the foundations of our applied science, which have been bestowed upon us by the pioneers and mentors of our profession. However, "in order to be effective, **the Association must continually adapt to the challenges of the changing world**" (*ad hoc* Committee's report by J. Alan Coope in Explore No. 73). I strongly support the opinion of Ashlyn Armour-Brown that the Association should not only embrace environmental geochemistry, but to claim it as its own.

The first move has already been made with the name of our new Journal: **Geochemistry – Exploration: Environment: Analysis**. This movement gives the impetus for the next courageous move, which is to embrace environmental geochemistry by changing the name of the Association to the "Association of Applied Geochemists" as has already recommended by Robert Garrett and Ashlyn Armour-Brown, since as Ashlyn points out there is "no schism between exploration and environmental geochemistry." I believe the two names, were developed for the benefit of the market, and not the science. Consequently, I disagree with Nigel Radford's compromised proposal for the Association to be named "The Association of Exploration and Environmental Geochemists", because in this case we accept that there is a schism. Let us, therefore, correct the wrong decisions of the past, and this time we should not be influenced by the market.

The Association, as a professional geological and an applied geochemistry association, should not accept Voting members (Fellows) without a degree in geology or earth sciences, especially if they work solely in the environmental field, for this will be detrimental to our profession. I, therefore, propose that Clause 2.06 (i) for Fellows to be changed to "possess a Bachelor's or equivalent degree in geology or earth sciences from an educational institution recognised by the Council." In paragraphs (ii) geochemical exploration methods to be changed to applied geochemistry methods, and (iii) exploration geochemistry to applied geochemistry.

In Clause 2.08 for Honorary Members the first sentence to be changed to "To be eligible for election as an Honorary Member, a person shall have made a distinguished contribution to applied geochemistry that warrants exceptional recognition, and should hold a degree in geology or earth sciences."

In Clause 2.09 (i) for Members "geochemical exploration" should be replaced by "applied geochemistry". The so-called "environmental geochemists", who do not have a first degree in geology or earth sciences, may be allowed to join the Association only as non-voting members. Then communication among members should be encouraged by the Association through the organisation of regional "training" workshops or meetings, where Fellows and Members meet and discuss their experiences in applied geochemistry.



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## **Bylaws Comments...** continued from Page 20

I finally agree with Nigel Radford that voting members will have to rule on the matter, and the results of the referendum must be enforced by Council.

### **Alecos Demetriades**

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*E-mail: alecos\_demetriades@hotmail.com*

## **THE BY-LAWS AND THE ENVIRONMENT**

(Note: Written in 2000)

It was pleasing to read our Vice-President's article on the By-Laws and how they relate to the vexed question of environmental geochemistry. Nigel Radford has provided some challenging alternatives which I have long considered require answering.

As noted by Nigel, our industry has changed dramatically since the sub-committee, chaired by Alan Coope, last addressed the issue in 1990. The number of exploration geochemists employed by companies, consultants, government agencies and research institutes has declined, there are fewer tertiary institutes teaching exploration geochemistry and at the same time there has been a proliferation in environmental sciences including geosciences. I, like many other members of the AEG, have changed direction. It is my very strong belief that without the knowledge of sampling, analysis, geochemical characteristics and processes gained through the practice of exploration geochemistry, the environmental sciences would still be in the dark ages.

What is the Association doing about it? The answer is, very little, and although there are constant mutterings, the issue has appeared too emotive for any action. But, by changing the publishers of the journal, we have made the first tentative steps by incorporating 'environment' in the title of our new journal. Why don't we build on this initiative.

It is my recommendation that we should embrace Nigel's "radical" suggestions to change the name to "The Association of Exploration and Environmental Geochemists" (AEEG), and change the criteria for Fellowship and Membership to reflect both exploration and environmental issues related to the minerals (and coal) industry. This would have a flow-through impact on such initiatives as the Student Paper Prize, which is presently restricted to exploration topics. I do not believe that we should go part-way (there is nothing worse than partial pregnancy). By far the greatest task will be getting agreement by our members to such changes, necessitating some carefully worded arguments for and against. Should the changes be agreed to, David Garnett will have the unenviable task of rewriting the By-Laws. Much needs to be done, and quickly, because if we continue to have a narrow view of the scope of the Association, it will become non-viable.

In 1972, the catch cry "It's Time" was heard throughout Australia. Some 28 years later, the same catch cry is equally germane to the well-being of the association.

**Graham F. Taylor**  
*Councillor and Past President AEG*



# EXPLORE

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Please complete the section relevant to the class of membership sought and supply your address on this form.  
Mail the completed application, together with annual dues, to the address below.

**\*Details of requirements and application forms for voting membership (fellowship) can be obtained from the AEG website (<http://www.aeg.org>) or business office.**

**MEMBER**

I \_\_\_\_\_ wish to apply for election as a Member of the Association of Exploration Geochemists. I am presently employed by:

\_\_\_\_\_ as a \_\_\_\_\_  
(employer) (employment title)

I am actively engaged in scientific or technological work related to geochemical exploration and have been so for the past two years. Upon receipt of the Code of Ethics of the Association I will read them and, in the event of being elected a Member, agree to honour and abide by them. Witness my hand this \_\_\_\_\_ day of \_\_\_\_\_ 19\_\_\_\_.

(Signature of applicant)

**STUDENT MEMBER**

I \_\_\_\_\_ wish to apply for election as a Student Member of the Association of Exploration Geochemists. I am presently engaged as a full-time student at \_\_\_\_\_, where I am taking a course in pure or applied science. Upon receipt of the Code of Ethics of the Association and in the event of being elected a Student Member agree to honour and abide by them. Witness my hand this \_\_\_\_\_ day of \_\_\_\_\_ 19\_\_\_\_.

(Signature of applicant)

Student status must be verified by a Professor of your institution or a Fellow of the Association of Exploration Geochemists. I certify that the applicant is a full-time student at this institution.

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Please note: Your completed form should be mailed to the Business Office of the Association and will be acknowledged upon receipt. The Admissions Committee reviews all applications and submits recommendations to Council, who will review these recommendations at the next Council Meeting or by correspondence. If no objection is raised the names, addresses and positions of candidates will be listed in the next issue of the Association Newsletter. If after a minimum of 60 days have elapsed following submission of candidate information to the membership no signed letters objecting to candidates admission are received by the Secretary of the Association from any Member, the Candidate shall be deemed elected, subject to the receipt by the Association of payment of required dues. Send completed application, together with annual dues to:

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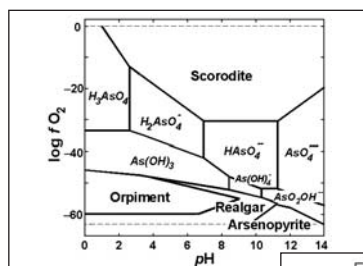
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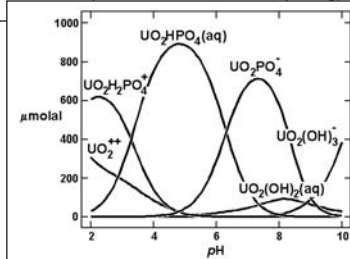
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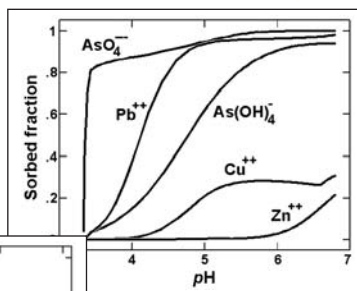


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