

Generations of Applied Geochemists

INTRODUCTION

Our fearless but now retiring Editor of **EXPLORE**, Mary Doherty, suggested that one of us (Gerry Govett) should write a few anecdotal comments about the history of geochemistry from the early Professor John Webb days to now. Many of us are either second, third or perhaps fourth generation geochemists as a result of that initial group at the Royal School of Mines (RSM) at Imperial College (IC), London. She suggested that this would be an opportune time as the Association takes “a bend in the road” with its name change and broadened activity.

GG quickly realised that the project was too big for one person – and in any case, doubted the veracity of his memory. Consequently, he solicited help from a few geochemists of various generations whose names appear at the end of this article; in addition to these, special thanks are due to Dr Robert Garrett of the Geological Survey of Canada (GSC) for help in documenting some of the history. Many more (perhaps hundreds!) could have been contacted; the time frame, however was short – about three weeks. Moreover, this is intended to be just a snapshot of a particular strand of the applied geochemical story (i.e., the exploration academic strand) and not a definitive history. Nevertheless, Gerry Govett, as compiler, takes responsibility for errors of omission and commission.

SOME HISTORY

The precursor of the Applied Geochemistry Research Group (AGRG), was known as the Geochemical Prospecting Research Centre (GPRC), and commenced in the latter half of 1952. John S. Webb, then a mining geology lecturer at RSM, made a tour of North America with Herb Hawkes of the USGS (who had started work on exploration geochemistry after World War II) and others. While this was in progress, the Professor of Mining Geology, David Williams, recruited John S. Tooms, a chemistry and Honours geology graduate, as the first geochemical research student.

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Applied geochemistry at RSM then commenced in one third of a small room shared with two mining geology postgraduate students, Jeff Kenyon and Tony Barringer. The latter became better known as a geophysicist and founder of Barringer Research in Canada and USA; interestingly, a great deal of Barringer’s consulting and research was in exploration geochemistry. A total of one hundred pounds sterling was allocated from departmental funds to set up a geochemical laboratory (in the same one third of a room!). Fortunately, this was in the days when dithizone was used for the determination of Cu, and Zn, and *B* nitroso *a* naphthol was used for Co.

The first research was funded by Rhodesian Selection Trust (RST) on the Copperbelt of what is now Zambia. Herb Hawkes expressed some concern about the project as the USGS had failed to obtain soil anomalies over mineralization beneath much thinner laterite profiles in Nigeria. The research, in fact, proved hugely successful in establishing soil and reconnaissance drainage exploration techniques that were rapidly adopted by the major mining companies (RST and Anglo American) in Central Africa and beyond. The difference between the failure in Nigeria and success in Zambia was analytical methodology.

From this relatively modest beginning, but with backing from various organizations including, in particular, the Natural Environment Research Council, the Department of Scientific and Industrial Research and numerous mining companies, the GPRC rapidly expanded into the AGRG (in 1961-62) occupying half of a new floor of the RSM.

THE PRESENT CONTEXT

It has been argued in support of the change of name of our Association that geochemistry is important in land use, groundwater, human and animal health related to bedrock and the regolith, and the broad field of environmental geochemistry, and that we should attract geochemists working in these fields to our Association. It is sobering to look at the titles of papers given at the meeting held in London more than 20 years ago (in 1983) to honour John Webb (*Iain Thornton and Richard J Howarth, Eds, 1986; Applied Geochemistry in the 1980s. Graham and Trotman, 347p*).

In addition to the expected exploration-oriented papers, there are titles like *Geochemistry and Animal Health*, *Geochemistry and Human Health in the 1980s*, and *The Interaction Between Geochemical and Pollutant Metal Sources in the Environment: Implications for the Community*. It is also worth remembering that low density regional geochemical surveys and geochemical atlases (the original research surveys were by well known geochemists Keith Viewing, Lloyd James, and Robert Garrett, under the supervision of John Tooms and Ian Nichol), and environmental geochemistry in its broadest sense were pioneered by John Webb’s group.

So, upon reflection, it is likely that John Webb would regard the change of name to *Association of Applied Geochemists* coming full circle rather than “a bend in the road”. The change of name from *Geochemical Prospecting Research Centre* in the 1960s to the *Applied Geochemistry*

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Research Group was to better reflect its broadened activities (parallel thinking to our change of name for AEG to AAG!).

The influence of John Webb, and his students and staff, upon the development of applied geochemistry and its spread around the world has been remarkable. The success of the AGRG should be judged not only on the quality of the research which resulted in its recognition as the premier applied geochemical research centre in the world, but also on the success of the human output. Of particular interest to the Association, of course, is that the late Alan Coope was one of the very early graduates of GPRC (1958). The numbers of ex-students of AGRG who head, or have reached senior positions in, mining and other organizations is impressive (and we apologise for not having space to list them all here). For this, their research supervisors may claim, possibly, some credit!

THE SUCCESSION

Apart from the huge number of students that were trained in applied geochemistry with John Webb (the first 100 post-graduates were celebrated at the IGES at Vancouver in 1974), a few of these went on to become academics in various corners of the world and themselves trained geochemists who are now training more geochemists.

In the following paragraphs there is a very truncated history of second generation academic geochemists (in approximate chronological order of their time at IC) and *their* academic geochemical offspring. If we have omitted anyone, we apologise.

John Tooms

The first of the second generation is John Tooms, who stayed at RSM as Senior Research Fellow after his graduation and was later Reader. He was supervisor and mentor to many of the early geochemists (and hence an invaluable source of data for this article). John, however, was also *de facto* second-in-command to John Webb until he left to join the UN in 1973. He supervised more than 20 students (including Gerry Govett) with projects on four continents and in three oceans. In the mid-1960s he started the applied geochemical oceanographic and marine research (phosphates, tin, manganese nodules, metalliferous brines). Although the latter activity is not part of the exploration geochemistry story, two of John's students must be mentioned here – **Colin Summerhayes** who took over the marine side of John's job when he left IC, and **Dave Cronan** who joined the University of Ottawa and is now a professor in the Department of Earth Science and Engineering at IC. In the minds of those who followed him, John Tooms is regarded as first generation (perhaps 1.5?)

Dr Clifford James (*dec*)

(Information kindly supplied by Dr Nigel Radford, Consulting Geochemist Newmont Australia, and one of Cliff James' graduates; additional information was given by Dr Charlie Moon, see below).

Cliff was the third of the second generation and he

joined RST immediately following his graduation in 1957. In 1961 he returned to the IC Geochemistry Group as a DSIR Fellow where he taught and supervised students on exploration projects in Australia, the Far East and Ireland. While there he developed and patented a widely used mercury vapour meter. In 1965 he was appointed Lecturer in Economic Geology at Leicester University to help develop a new MSc course in Mining Geology and Mineral Exploration. He was Head of the Department of Geology from 1973 to 1976.

In 1982 he was appointed Head of the Department of Mining Geology in the Western Australia School of Mines in Kalgoorlie where he remained until his retirement in 1994. He was an enthusiast for applied geochemistry and trained many students from many countries. One of his most notable graduates was **Jane Plant**, CBE. Jane has had an influential career in the British Geological Survey where her most recent position is Chief Scientist. She has now also been appointed Professor of Applied Geochemistry at IC and is no doubt planning on continuing the geochemical legend of IC with her own particular flavour!

Gerry Govett, Emeritus Professor

The fourth of the second generation was Gerry Govett who joined the GPRC in 1955 and went to the Copperbelt (naturally!) to investigate factors controlling the dispersion of copper in soils and stream sediments that lead to a trial reconnaissance level drainage survey. He regards himself as an accidental academic as he never planned nor intended to be an academic. Nine years after his PhD he was working in the Philippines for the UN. His project manager, the late Ernie Hale on leave from the University of New Brunswick (UNB), suggested he go to UNB as a Visiting Professor for a year. As the UN were trying to persuade him to go to the Solomon Islands (which did not greatly enthuse him), he decided to give it a go in 1966.

He went back to the UN in 1967 and, while in Cyprus, he was offered a permanent position as Associate Professor at UNB. In 1968, when the UN was again offering him the Solomon Islands, which continued to be unattractive to him, he accepted the position at UNB. The rest, as they say, is history. While at UNB he supervised 23 MSc and PhD students from 13 countries with projects in seven of them. Two of these graduates became full-time academics (**Bob Whitehead** and **Sam Chork**, see below) while a third, **Wayne Goodfellow** of the GSC, is an Adjunct Professor at the University of Ottawa.

Gerry Govett left UNB at the end of 1977 to take the Chair of Geology in Mineral Exploration at the University of New South Wales (UNSW) where, after a few years **Sam Chork (retired)**, joined him on staff. While at UNSW he supervised eight MSc and PhD (and numerous Honours) students before being diverted into administration. One of his notable PhD graduates was **David Cohen** who is also an MSc graduate of Ian Nichol! Another IC applied geochemistry PhD graduate (**Alistair Dunlop**) was on staff at UNSW during Gerry Govett's time there (see separate entry, below).

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R (Bob) E Whitehead, Emeritus Professor.

Bob says that he became a geochemist because while an undergraduate he asked a visiting lecturer a question. The visitor in question was Gerry Govett who replied “I do not know the answer, but if you will sell me your soul for three years, you can find the answer yourself.” In due course Bob sold his soul and graduated from UNB with a PhD in 1973. As neither Gerry nor Bob can remember the question, no one knows if Bob found the answer. He served as research assistant to Gerry until January 1974 when he took up a position as exploration geochemist at Laurentian University. Bob supervised 19 graduate students at the M.Sc. level, most of whom found work in the mineral exploration industry, and spent 5 years, along with J.F. Davies and H. Gibson, setting up and editing the CIM Journal of Exploration and Mining Geology.

David Cohen completed graduate research degrees under both Ian Nichol at Queen’s and Gerry Govett at UNSW (it is debated whether this provided him with the least or the most genetic diversity of any exploration geochemist). He continued on at UNSW in coal and then groundwater research before joining the academic staff (replacing Sam Chork) at UNSW in 1992, to teach alongside Gerry Govett and Al Dunlop, and completed a sabbatical at CSM with Graham Closs. He is now Presiding Member of the Faculty of Science as well as (hopefully) masterminding the resurgence of applied geochemistry. His first PhD student *Samad Alipour* has been the head of the Geology Department at Urmia University in Iran, and he has a number of other graduate students from various corners of the planet.

Ian Nichol, Emeritus Professor

After finishing his PhD research at Durham University with Sir Kingsley Dunham in 1961, Ian served his apprenticeship with John Webb assisting in the supervision of some ten students working in Sierra Leone, Zambia, Ireland, and Northern Ireland. Of particular current interest is Ian’s involvement with the Northern Ireland Geochemical Atlas, and the geochemical maps of Derbyshire, Denbighshire and Devon that drew attention to features of environmental concern as well as their exploration interest. In 1969 Ian returned to Queen’s University (where he had completed his M.A. in 1958) to commence research activity in exploration geochemistry in the context of the need for expansion in university research training opportunities.

Although most of the research was sited in Canada, research was also carried out in Australia, Thailand and China. In a two-year leave of absence from Queen’s (1986-88) Ian was Technical Manager of the U.N. Revolving Fund for Natural Resources Exploration. Over the years Ian supervised some thirty five Masters and PhD students at Queens, a significant number of whom have attained senior positions in the exploration industry, government agencies and universities. One of his most notable graduates is

Graham Closs, Associate Professor.

After graduating from Queen’s University in 1973, Graham joined the Ontario Division of Mines (now Ontario Geological Survey) in Toronto as a geologist/geochemist. In 1978 he was appointed to the Department of Geology and Geological Engineering, Colorado School of Mines (CSM) following the retirement of the late Harold Bloom. He has supervised more than 25 graduate students in exploration geochemistry and economic geology, and still counting. One of those students is *Germano Melo*, now a Professor at the Federal University, Natal, Brazil. (and the only recorded fourth generation academic, so far!)

As an aside, it is of interest that Hal Bloom was a member of 1954 New Brunswick team of Herb Hawkes, John Webb, and John Riddell that conducted the English-speaking world’s first regional scale stream sediment survey. Both Hal and Herb left positions with the USGS to take up the opportunities associated with the New Brunswick activity. Hal then joined CSM in 1955 and Herb was associated with MIT and Cal Tech before becoming a private consultant. Another historical footnote is that in 1976 Gerry Govett had Herb Hawkes and John Riddell re-enact their stream sediment sampling in New Brunswick as part of the Exploration Geochemistry in the Appalachians Regional AEG meeting.

Keith Viewing, sometime Professor

Keith had his first contact with geochemistry as an employee of RST watching a demonstration by John Webb in the Copperbelt in 1952. After a number of contacts in southern Africa with John Tooms and Cliff James, he joined the RSM group in London in 1960 where he did a PhD on regional drainage mapping in Sierra Leone. He returned to RST in 1963. In 1969 he joined the new Institute of Mining Research at the forerunner to the University of Zimbabwe where he was awarded a personal chair in 1975. In leading and developing the Institute for 20 years, he also supervised postgraduate applied geochemistry students. He also taught an intensive applied geochemistry course to mature age students in an MSc mineral exploration course at Rhodes University in South Africa in 1981-1989. In 1989 Keith left the University to join Anglo American to re-build their local exploration team where he remained until his retirement in 1993. Keith is an Honorary Fellow of the IMM (now the IMMM).

K Fletcher, Emeritus Professor

Following his graduation from IC, K (we always wonder what K stands for!) went to the University of British Columbia in 1968 as a Postdoctoral Fellow with Professor Harry Warren. Two years later he became an Assistant Professor and started his own graduate student programme that eventually graduated twenty-two Masters and Doctoral students. Apart from teaching at UBC, K has given short courses in exploration geochemistry in more than a dozen countries – most recently, Tunisia and Mexico under the auspices of the Keevil Chair in Mineral Exploration that he held until his recent retirement. During time away from UBC, K spent three years in Zambia (where he was able to

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repeat history by using dithizone on the Copperbelt) and two years with the UN at the Southeast Asia Tin Research and Development Centre in Malaysia (where he now plans to reside for part of each year).

Among his graduate students in the 1970s were **Moses Olade**, who returned to academia in Nigeria (but is now believed to be in Arizona), and **Stan Hoffman** who contributed to the education of many geologists/geochemists through short courses and case histories based on articles in *Explore*. Several of K's other graduates have distinguished themselves by winning the **AEG Student Paper Prize** and most have gone on to careers in either mineral exploration or environmental geochemistry related to mining activities.

Charles Butt

Charles sneaks in as a representative of those who are not strictly academics but are occasional supervisors and course presenters. Charles escaped the purist tendencies of most British geology departments (who believed that it was unworthy to study anything that might be either useful or tainted by trade) after reading John Webb's papers on exploration geochemistry and the links between geochemistry and agriculture and health. He studied at the AGRG from 1967-1971, commencing the regional geochemical survey of Northern Ireland, with Ian Nichol and later Iain Thornton as PhD supervisors, following up both exploration and agricultural issues.

Charles subsequently joined CSIRO in Perth, Western Australia, and has concentrated on developing exploration procedures for deeply weathered terrains ever since. Charles has delivered courses at undergraduate (at Curtin University) and graduate levels in Australia and several other countries. One of his PhD graduates, **Louisa Lawrance**, is a part-time lecturer at the University of Western Australia where she, in turn, has supervised several Honours and PhD students.

Alistair Dunlop (retired 2003)

Alistair completed his PhD under the supervision of Tim Meyer from the AGRG at IC in 1973. He taught ore deposit geology, mineral exploration and exploration geochemistry at the University of New South Wales initially as a tutor and then as Senior Lecturer. He was a colleague of Gerry Govett and Sam Cork, and more recently David Cohen. Alistair supervised more than a dozen Masters and PhD students and many Honours students. One of his PhD students, **Surapon Arryikul** (graduated in 1985) returned to Thailand to continue the IC legacy at the Prince Sonkla University.

Martin Hale, Professor

After learning geochemical surveying as an exploration geologist for Anglo American in Zambia, Martin embarked on his PhD research in exploration geochemistry at AGRG from 1972 to 1975. Another accidental academic, he stayed at IC as a lecturer, then senior lecturer and assistant director of the Department of Geology while supervising more than

15 PhD students in exploration geochemistry. In 1990 he moved to the Netherlands to become Professor of Mineral Exploration at the International Institute for Geoinformation Science and Earth Observation (ITC) and, until recently, was concurrently Professor of Geochemistry at Delft University of Technology. Now Head of Research at ITC, he has maintained strong links with exploration geochemistry by supervising mineral exploration PhD students and by editing two volumes (one with Jane Plant) of the Handbook of Exploration Geochemistry. After Gerry Govett passed the Series editorship to Martin in 2001, he widened its scope as the Handbook of Exploration and Environmental Geochemistry.

Charlie Moon was a research assistant to Martin Hale at IC and obtained a PhD in exploration geochemistry in 1983. He has been at the University of Leicester since then and is now Senior Lecturer in Mineral Exploration. **Flavio Tavora** and **Claudio Porto** were both research students of Martin's at IC in the late 1980 and went on to become academics at different universities in Brazil.

THE FUTURE

We do not know whether applied geochemistry has become an entirely respectable academic pursuit, but it is probably now much more acceptable in the halls of learning than in the early days. Gerry Govett still vividly recalls John Webb's outrage at an encounter with another academic. He had tried to explain his discipline, to which the other academic responded with "Oh! You are just a technician, then". Gerry confesses to encountering similar attitudes in his early days – the problem being the word "applied". His response to doubters and critics then (and now) is that "applied geochemistry" is the same as "pure geochemistry" but more so – we do the same basic research but carry it a stage further by designing a practical use for our results.

Today the obvious question is: where are the fourth generation academic geochemists? More important than this is the question: is applied geochemistry being taught in enough universities to ensure a supply of trained geochemists to support the needs of the minerals industry, agriculture, environment and human health? The perception in Australian Universities is that available courses are more and more dictated by student demand (and hence funding). Whereas specialist geochemists can be trained through postgraduate degrees by supervisors who can get research funds and sponsors in relatively few institutions (and are there enough of these?), the increasingly broad scope of applied geochemistry does require that applied geochemistry be taught at the undergraduate level in a substantial number of universities.

We think that it is the task of all members of the newly-named **Association of Applied Geochemists** to make all the users of applied geochemistry – such as the mining industry, agricultural organisations, environmental agencies at local and national levels – aware of the need for universities to produce appropriately trained graduates for their needs. The users should also be lobbied to provide support, both in kind and cash, to assist universities meet the demand.

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POSTSCRIPT

This brief article is dominated by the interest of the contributors — exploration geochemistry. There is a parallel story to be told about the rest of applied geochemistry that is generally referred to as environmental geochemistry. The history of this (as has been alluded to above) may also fairly be said to have started with John Webb’s group, and was developed under John Webb’s successor at Imperial College,

Professor Iain Thornton. A final note of interest is to remind everyone that *Mary Doherty* – who suggested this brief historical adventure – is herself a third generation applied geochemist with an MSc from Queen’s University supervised by Ian Nichol.

Charles Butt, Graham Closs, David Cohen, Alistair Dunlop, Gerry Govett, Martin Hale, K Fletcher, Charlie Moon, Ian Nichol, John Tooms, Robert Whitehead and Keith Viewing

