

30th International Applied Geochemistry Symposium Adelaide, Australia

The 30th International Applied Geochemistry Symposium (IAGS) was recently held from October 14–18 in Adelaide, South Australia. The theme for the 2024 conference was “Applied Geochemistry for a Sustainable Future” and we achieved our goal of attracting over 300 representatives from industry, universities, research organizations, government departments, and consultancies, along with a strong contingent of recent and current students. The opportunity to host the IAGS once again in Australia (last held here in 2005) presented many opportunities to advance geochemistry and its application to exploration and the environment, promote the exchange of scientific knowledge and encourage research and development, and foster geochemistry as a profession of choice. With a strong focus also on diversity and inclusion, plus the financial and governance support of the AAG, we believe that the IAGS presented an exciting opportunity to showcase the organization to an international audience.

Thank you to all who took part in the symposium, whether it was as a presenter, as a workshop or field trip host, or as a sponsor or exhibitor. The support of all of you really was the catalyst for a successful event, and we appreciate the time and effort you all contributed. And of course, thank you to everyone who came and listened, shared, and networked!

The aim of the symposium was primarily to integrate the practical applications of geochemistry in exploration, mining, and the environment with the technical conference program. As a result, workshops and field trips were held before, during, and after the conference to ensure attendees had a balance of professional development opportunities.

The excellent selection of workshops that were convened showcased the application of geochemistry across industries:

- *Geology and Geochemistry of Iron Oxide Copper Gold Deposits* was led by Adrian Fabris, Kathy Ehrig, Louis Corriveau, Tobias Schlegel, and others at the Drill Core Reference Library.
- *Introduction to ioGAS & Exploration Geochemistry* was presented by Putra Sadikin, Imdex Ltd. This was a hands-on introduction to the use of ioGAS software for exploratory data analysis (EDA) on geochemical datasets and was successfully combined with Scott Halley’s course (*see below*) for a fantastic 2 days of applied geochemistry!
- *Applied Geochemistry of Porphyry Copper Deposits* was led by Scott Halley of Mineral Mapping. Presentations explained how to get the most out of multi-element geochemistry by integrating it with logging and spectral data. This hands-on workshop used porphyry copper as an example in ioGAS.
- *Applied Data Science for Geologists with DataRock* presented how to gain insight into core Machine Learning concepts in the context of geoscience.
- *Molar Element Ratio Analysis—Its Use in Lithogeochemical Exploration* was presented by Cliff Stanley (Acadia University). This workshop presented ways of investigating rock compositions utilizing molar element ratios (MER’s), allowing geoscientists to directly relate the lithogeochemistry to the petrology of the rocks under investigation.
- The workshop and field trip *Geochemical Lab Tours – Noble Gas, MEA, ATTA, XRD, and XRF*, featuring Stacey Priestley, Alec Deslandes, Rong Fan (CSIRO), Rohan Glover (University of Adelaide), visited a number of specialized geochemical labs.
- *Isotope Geochemistry for Exploration and Environmental Applications* was presented by Alexandre Voinot and James Kidder (Geological Survey of Canada). This course presented a current picture of isotope analytical methods, key innovations in method development, and novel field applications.
- *Regolith Geology and Geochemistry* presented by Walid Salama, Ryan Noble (CSIRO) and David Cohen (University of New South Wales) was an introduction to the fundamentals of regolith/critical zone, landscape evolution, mapping, and techniques used in modern exploration geochemistry.

The symposium field trips showcased South Australian geology as well as demonstrated innovations in geochemistry from research to industry.

- *Kapunda In Situ Recovery (ISR) Cu Project*—the first of our field trips to the Kapunda ISR Cu project—took place at the historic copper mining town of Kapunda. The company involved, Enviro Copper, explained the ISR process for recovering copper from historic operations. The field trip was capped off with a great lunch at The Greenock.
- *Geology of Hallett Cove Conservation Park* was presented by Mario Werner and Jarred Lloyd leading the keen attendees. This half-day trip to the coastal Hallett Cove Geological Trail showcased evidence of Permian glaciation, including striated glacial pavements, glacial lacustrine sediments, and erratics. A tour of the laboratories at CSIRO and The University of Adelaide was enthusiastically attended by a niche number of attendees as well.

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Note from the Editor

Welcome to the fourth and final EXPLORE issue of 2024. This issue features a summary of the 30th International Applied Geochemistry Symposium (IAGS), which was held in Adelaide, Australia in October 2024.

EXPLORE thanks all those who contributed to the writing and/or editing of the content of the four issues in 2024, listed in alphabetical order: Elizabeth Ambrose, Steve Amor, Al Arsenault, Evgeniy Bastrakov, Chris Beckett-Brown, Lynda Bloom, Denise Brushett, Patrice de Caritat, John Carranza, Steve Cook, Theo Davies, Nick Dawes, Adrian Fabris, Jane Graham, Grant Hagedorn, Gwendy Hall, Julie Hollis, Shane Hogan, Ray Lett, David Leng, Brent McInnes, Roger Paulen, Sarah Paulen, Anna Petts, Jessey Rice, Behnam Sadeghi, McLean Trott, Yulia Uvarova, and Alexander Walker.

Beth McClenaghan

Editor

Steve Cook,

Business Manager



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President's Message

Welcome to the last issue of EXPLORE for 2024, how quickly the year has gone by. I feel as though I just wrote my first President's message at the beginning of 2024! And what a great year for the Association it has been. In collaboration with the Geological Society of London, we recruited Dr Matthew Leybourne as a new Editor-in-Chief for our journal, *Geochemistry: Exploration, Environment, Analysis* (GEEA). Matthew will formally commence in the role in January 2025. We would like to extend our gratitude to Scott Wood, GEEA's outgoing Editor-in-Chief, for all his hard work, not only managing the journal but also raising the profile of applied geochemistry, which is evident from a significant rise in GEEA's impact factor.

The Association has been active in supporting our affiliate and associated organizations and societies. We co-sponsored *Workshop 21: International Union of Geological Sciences Manual of Standard Methods for Establishing the Global Geochemical Reference Network* at International Geological Congress (IGC) 2024 in South Korea, and supported the Society of Economic Geologists (SEG) to promote their international conference SEG 2024: Sustainable Mineral Exploration and Development, which was held September 27–30, 2024 at the Safari Conference Centre, Windhoek, Namibia. These efforts serve as a plan for our affiliation with other organizations in a mutually beneficial effort.

The Association also supported the Australian team that prepared the IGC 2028 bid for the event to be hosted in Melbourne. The bid was not successful, and we are naturally disappointed that Melbourne didn't win, but huge congratulations to the Calgary, Canada bid team! Congratulations are extended to AAG Fellow David Cohen, who was part of the IGC 2028 Australian bid team, as David was elected Treasurer of the IUGS.

The highlight of the year for the Association was the 30th International Applied Geochemistry Symposium (IAGS), held from the 14th to 18th of October in Adelaide, South Australia. The event was highly successful, and there is an article about it in this issue of EXPLORE. I would like to thank the Local Organizing Committee, chaired by amazing Anna Petts, for all their hard work and dedication in shaping and delivering this great event. It was fantastic to catch up with so many colleagues, hear about advancements in the field of geochemistry, and also award four Medals of the AAG to our worthy recipients at the Gala Dinner! The awards were i) **Gold Medal 2023** to Renguang Zuo for Outstanding Scientific Achievement in geochemistry; ii) **Silver Medal 2023** to Ryan Noble for Dedicated Service to the Association; iii) **Cameron-Hall Copper Medal 2023** for Outstanding Scientific Publication in *Geochemistry: Exploration, Environment, Analysis* (GEEA) titled, "Alteration assemblage characterization using machine learning applied to high-resolution drill-core images, hyperspectral data and geochemistry" by M. Trott, C. Mooney, S. Azad, S. Sattarzadeh, B. Blumel, M. Leybourne, and D. Layton-Matthews. The medal was received by Matthew Leybourne; and iv) **Cameron-Hall Copper Medal 2022** for Outstanding Scientific Publication in *Geochemistry: Exploration, Environment, Analysis* (GEEA) titled "Tellus regional stream water geochemistry: environmental and mineral exploration applications" by V. Gallagher, E.C. Grunsky, M.M. Fitzsimons, M.A. Browne, S. Lilburn, and J. Symons. The medal was received by James Symons.

The AAG Council has made a decision to refresh our Strategic Plan for the Organization, and this work will commence in early 2025.

I would like to take this opportunity to thank you all for your ongoing support of the Association and geochemistry in general. Wishing you a very festive holiday season and a fantastic New Year of 2025!

Yulia Uvarova
President



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30th International Applied Geochemistry Symposium, Adelaide, Australia *continued from page 1*

- *Willunga & McLaren Vale soils* trip, led by Rob Fitzpatrick, was a highlight, with over 40 attendees enjoying the local flavours. The full-day visit to the Adelaide Plains and Willunga Basin discussed the effect of soil geochemistry on vineyard quality. The mix of soil scientists and geochemists provided different perspectives.
- The post-conference field trip was a four day tour of the northern Flinders Ranges, led by Stephen Hore from GSSA and Alan Collins from the University of Adelaide, visited spectacular geological sites with a range of mineralization styles. Despite widespread power outages caused by a significant mid-week storm, all participants were able to enjoy the sites, geology, and foods of the region as planned. The highlight was a visit to the Nilpena Ediacara National Park to look at some of the earliest fossils of complex life found anywhere on Earth.

The IAGS program officially started with the Sunday Icebreaker at the Maltshovel Taphouse on the stunning River Torrens, where old friends reconnected and delegates interacted over the element-inspired IAGS lanyards and name tags.

IAGS 2024 featured amazing keynote presentations with each speaker reflecting on the conference themes of Research, Define/Extract, Mine Waste, Data, and Exploration. The first keynote was Dr Steve Hill, Chief Scientist at Geoscience Australia (GA) presenting 'Old Country, New Country, Future Connections to Country' about how understanding landscape systems from ancient times to today are fundamental to our future. Prof Anita Parbhakar-Fox (Sustainable Mining Institute, University of Queensland) presented a brilliant run-through of mine waste potential in her keynote, 'Towards the Recovery of Critical Metals from Copper Tailings- a QLD Case Study'. Dr Scott Halley's (Mineral Mapping) keynote in the Exploration theme described 'Fluid and Metal Sources in Archean Orogenic Gold Systems', definitely challenged the audience to analyse and integrate data for exploration. The Research theme keynote was presented by Michelle Carey (Imdex) on 'Orientation Studies, Technology and Data Science - A Winning Recipe for Change?'. Dr Kathy Ehrig, BHP Olympic Dam, had the audience enthralled in her keynote, 'Vertical Exposure Of >1800 m of IOCG Mineralization At Olympic Dam'. Prof Renguang Zuo (China University of Geosciences) presented an insightful keynote on 'Big Data Analytics and AI-driven Geochemical Mapping'.

Monday featured the opening of the 30th IAGS at the Adelaide Convention Centre, with a welcome from Dr Anna Petts and the official 'Welcome to Country' by Robert Taylor, followed by a day of abstract presentations and the chance to meet over 15 exhibitors. Later, Jess Keast from GeoHUG hosted a fun social evening at Bank St Social with pizza, drinks, and some great tunes.

Tuesday brought another full day of presentations, followed by the unforgettable conference Gala Dinner held at the Adelaide Oval. Our MC, Jarrod Walsh, kept us entertained, with David Cohen filling in with a lively 'heads and tails' quiz (times 2) and an unforgettable conga line. Yulia Uvarova also awarded four Medals of the AAG to our worthy recipients at the Gala Dinner.

- Gold Medal 2023 to Renguang Zuo for Outstanding Scientific Achievement in Geochemistry.
- Silver Medal 2023 to Ryan Noble for Dedicated Service to the Association.
- Cameron-Hall Copper Medal 2023 for Outstanding Scientific Publication in *Geochemistry: Exploration, Environment, Analysis* (GEEA) titled "Alteration assemblage characterization using machine learning applied to high-resolution drill-core images, hyperspectral data and geochemistry" by M. Trott, C. Mooney, S. Azad, S. Sattarzadeh, B. Blumel, M. Leybourne, and D. Layton-Matthews. The Medal was received by Matthew Leybourne.
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Thursday and Friday were packed with more insightful presentations, and then Thursday night's Student Networking event at the Riverside Rowing Club was a fantastic opportunity for our future geochemists.

Friday included the last of our presentations, plus a very insightful and very well received panel session that included the likes of Sam Scher, David Cohen, Heidi Pass, Mike Whitbread, and Mark Arundell. Following our final daytime sessions, we said farewell to the majority of you, upstairs at the Strathmore Hotel. Once the Premier of South Australia finally decided to vacate our room, we were given the chance for one final hurrah, some last-minute networking, and a chance to say our goodbyes before heading off to our respective destinations.

Central to any IAGS is making sure opportunities are presented to students to attend and present their research and projects. IAGS 2024 was no exception, with 20 students sponsored to attend the conference, Gala Dinner, and a choice of a field trip or workshop. Thirty-eight students attended from across the globe, with great feedback from students about how much attending IAGS and meeting experts has made a positive impact on their current and future interests in geochemistry. The best student oral presentation was awarded to Travis Batch of UniSA. The volunteer program at IAGS also was organized to provide local undergraduate and early career scientists access to the workshops and program, with much gratitude from the Local Organizing Committee (LOC) for their enthusiasm and assistance throughout the week.

The LOC also wanted to show that IAGS is not just about the technical program (though it's the most important part, obviously!). Wanting to also highlight that IAGS is about community, and collaboration, and friendships, Jessica Keast and

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GeoHUG (<https://geohug.rocks/>) were brought on as official Media Partners for IAGS 2024. In addition to presenting at the Monday night social program event at Bank Street Social, there was also a GeoHUG podcast area throughout the week where Jess held some great interviews, and of course continued her love affair with the elemental table. Make sure you take a look at these on the IAGS YouTube page <https://www.youtube.com/@InternationalAppliedGeoc-uz9xk>.

Diversity, equity, and inclusion were also recognized as a central priority for the LOC, and in order to ensure the symposium managed this properly the LOC worked with Women in Earth and Environmental Science Australasia (WOMEESA - <https://www.womeesa.net/>) to assist with developing our policy and ensure that the program reflected the diversity of backgrounds and experience of attendees. Integral to this was the provision of a 'Little Rockers' creche, which was fully funded by IAGS and free for all mini-geochemists throughout the week. This was well utilized by attendees, especially speakers, with 30% of the speakers at IAGS 2024 being female, which is much higher than many similar technical conferences (a number that still needs improving through the support from conference organizers to change).

Over the course of the week, the LOC arranged for a fantastic photographer to take photos and videos to capture the energy and buzz of IAGS. These have been loaded onto Facebook so please feel free to check them out and share! <https://www.facebook.com/iags2024>. Look out for the hashtag #IAGS2024 and do a search to see what else attendees shared across the week of the conference!

Of course, IAGS is supported by amazing sponsors and exhibitors who bring so much expertise, innovations, and applications of geochemistry. Thank you to our sponsors and exhibitors:

- Diamond: CSIRO
- Platinum: IMDEX, Newmont, Geological Society of Australia
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- Exhibitors: Labwest, Portable Analytical Solutions, SciAps, MinEx CRC, Portable PPB, Evident Scientific, Oreas, Bruker Nano Analytics, Newspec, Actlabs, Geological Survey of Queensland, Veracio, Lithodat, Nu Instruments

Many, many thanks to the Local Organizing Committee, and PCO for their enthusiasm and hard work to present the very successful symposium 'down under'!

See future issues of EXPLORE and the AAG website (<https://www.appliedgeochemists.org/>) for information about the 31st IAGS meeting to be held in China and scheduled for 2026.

Anna Petts, Yulia Uvarova, Adrian Fabris, Shane Hogan, Nick Dawes.



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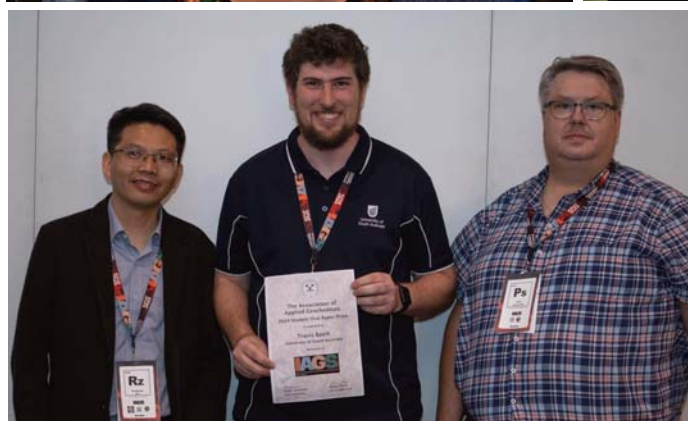
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Some photographs from the symposium!

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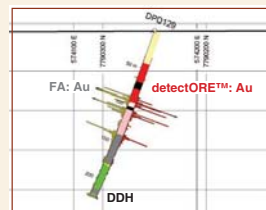
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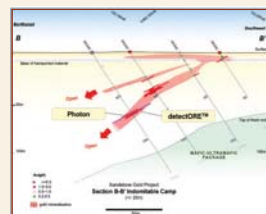
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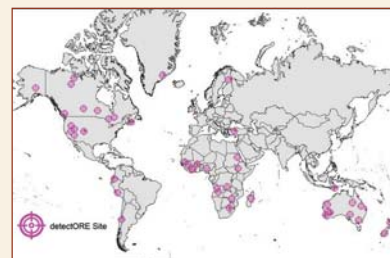


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Visit us at the 30th International Applied Geochemistry Symposium (IAGS) in Adelaide, South Australia (14 – 18 October 2024)

AAG Awards Presentation at the 30th International Applied Geochemistry Symposium, October 2024

2023 Gold Medal

The Association of Applied Geochemists awarded its Gold Medal for 2023 to **Professor Renguang Zuo** in recognition of his exceptional contributions to the scientific fields of exploration, mineral, and environmental geochemistry and his exemplary service in promoting the exchange of ideas and the dissemination of information in these fields through a distinguished career in university teaching and research. He obtained his PhD in mineral resources prediction and assessment from the China University of Geosciences in Wuhan (CUG Wuhan) in 2009. Since then he has had a long association with the State Key Laboratory of Geological Processes and Mineral Resources, CUG Wuhan, first as an Instructor (2009–2010), then as Associate Professor (2010–2012), and finally as Full Professor (2012 – present). In 2021, he founded the Research Center for Solid Earth Big Data in CUG Wuhan, and since then he continues to be its Founding Director. He has established a substantial research group and has supervised over 40 higher degree students, thereby significantly influencing the research directions of the next generations of mathematically inclined geochemists.

Professor Zuo has made significant contributions to a number of areas: (i) developing big data analytics and deep learning algorithms for processing geochemical survey data and identifying geochemical anomalies associated with mineralization, (ii) promoting the application of geoinformatics in the field of applied geochemistry, (iii) evaluating the uncertainty in the processing of geochemical survey data, and (iv) developing software for processing geochemical survey data. These methods and related software are increasingly recognized as popular approaches for processing geochemical survey data and identifying mineralization-related geochemical anomalies. Due to his exceptional contributions, Professor Zuo was the first recipient of the Kharaka Award by the International Association of GeoChemistry.

Professor Zuo has published more than 160 journal papers and 6 books and book chapters, generally as the lead or corresponding author. According to Google Scholar he has an H-index of 47 from over 7000 citations. He has served on the editorial boards of many SCI-indexed journals, including Geochemistry: Exploration, Environment, Analysis, Journal of Geochemical Exploration, Computers & Geosciences, Natural Resources Research, Ore Geology Reviews, and Journal of Earth Sciences. He has also been guest-editor of eight special issues in international high-quality journals.



AAG President Yulia Uvarova (left) and Professor Renguang Zuo (right) receiving the AAG Gold Medal at the 30th IAGS in Adelaide, October, 2024.

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Presentation of AAG Awards at the 30th IAGS

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2023 Silver Medal

The Association of Applied Geochemists awarded its Silver Medal for 2023 to **Dr Ryan Noble** in recognition of his dedicated service to the AAG and for his extraordinary time and energy devoted to advancing the affairs of the Association. Ryan dedicated long-standing and continuing service (>10 years) to the Association, as President, Vice President, Councillor, and member of several Association committees, and through many other activities of the Association over the course of his long and distinguished career. He has also been the Association's representative to the Australian Geoscience Council and the Executive Committee for the journal *Elements*. He has been on the Editorial Board of the Association's journal – *Geochemistry: Exploration, Environment, Analysis (GEEA)* – for the past 12 years. Ryan supports the Association in his contributions to its scientific publications and training of Association members, including his contributions to the Association's Writing Geochemical Reports, the EXPLORE newsletter, GEEA, and short courses at various International Applied Geochemistry Symposia. His committed service has been marked by a record of thoughtful evaluation and improvements.



AAG President Yulia Uvarova (left) and Ryan Nobel (right) receiving the AAG Silver Medal at the 30th IAGS in Adelaide, October, 2024.

2022 Cameron-Hall Copper Medal


The Association of Applied Geochemists awarded its Cameron-Hall Copper medal to **Vincent Gallagher** as the lead author of the most outstanding scientific publication in our journal *Geochemistry: Exploration, Environment, Analysis* in 2022 for the paper that appeared in Volume 22 entitled: "Tellus regional stream water geochemistry: environmental and mineral exploration applications" written by Vincent Gallagher, Eric C. Grunsky, Mairead M. Fitzsimons, Margaret A. Browne, Sophie Lilburn and James Symons. This paper describes the analysis of a Tellus regional stream water geochemistry survey in Ireland to assess its potential for mineral exploration and environmental impacts. Interpolated geochemical maps and multivariate statistical analysis, including principal component analysis and random forest classification, demonstrated broad geogenic control of stream water chemistry, with both bedrock and subsoil contributing to the patterns observed. Anthropogenic inputs to stream water in the survey area came mainly from agricultural sources. Comparison of these data with stream sediment and topsoil geochemistry showed that stream water geochemistry has strong potential for use in mineral exploration, with the same base metal and gold pathfinder anomalies apparent in all three data sets.



AAG President Yulia Uvarova (left) and co-author James Symons (right) receiving the 2022 AAG Cameron-Hall Copper Medal at the 30th IAGS in Adelaide, October, 2024.

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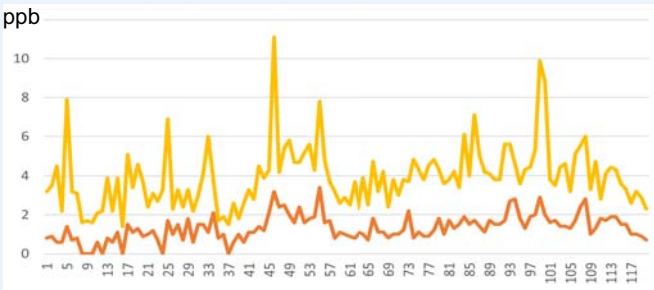
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Presentation of AAG Awards at the 30th IAGS

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2023 Cameron-Hall Copper Medal

The Association of Applied Geochemists awarded its Cameron-Hall Copper Medal to **McLean Trott** as the lead author of the most outstanding scientific publication in volume 23 of our journal *Geochemistry: Exploration, Environment, Analysis* in 2023 for the paper entitled "Alteration assemblage characterization using machine learning applied to high-resolution drill-core images, hyperspectral data and geochemistry" by McLean Trott, Cole Mooney, Shervin Azad, Sam Sattarzadeh, Britt Bluemel, Matthew Leybourne, and Daniel Layton-Matthews. This important paper demonstrates a machine learning workflow to comprehensively structure and integrate composition, alteration mineralogy and texture of a rock mass derived from structured (i.e. geochemical) and unstructured (i.e. photographic) datatypes to holistically represent rock character and predict alteration.



AAG President Yulia Uvarova (left) and Matt Leybourne (right) receiving the 2023 AAG Cameron-Hall Copper Medal at the 30th IAGS in Adelaide, October, 2024.



A 2024 Review of Successes and Challenges in the Application of Applied Geochemistry in Southern Africa

Theo Davies

AAG Regional Councillor for Southern Africa

INTRODUCTION

There is an increase in the application of applied geochemistry in southern African laboratories in the last few years, coinciding with the acquisition of smaller, more compact, accurate, and easy-to-use analytical instrumentation, such as the portable X-ray fluorescence spectrometer, and the proliferation of high integrity commercial geochemical laboratories. A brief synopsis of examples involving successes in applied geochemistry teaching and research in southern Africa is presented.

Research capacity has been strengthened through a number of training programs offered to graduate students and laboratory technicians in higher education institutions (HEIs) in Africa, in collaboration with national, regional, and international research institutions. Although substantial gains have been realized (as at 2024) that have contributed to the increase in the self-reliance and sustainability of applied geochemistry programs within the region, many challenges remain and massive investment is required.

Applied Geochemistry Teaching and Research

Teaching at southern Africa geochemistry departments continues to blossom since the early 2000s, mainly as a result of the acquisition by a number of laboratories of portable analytical instrumentation that require little technical expertise for their operation. A number of high-integrity commercial geochemistry enterprises have made their appearance in the subregion.

The BSc Honours in Geochemistry at the University of the Witwatersrand provides an opportunity for students to combine fieldwork with laboratory studies and receive hands-on training by working with a range of state-of-the-art



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Application of Applied Geochemistry in Southern Africa

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analytical equipment (<https://www.wits.ac.za/course-finder/postgraduate/science/geochemistry/#anchor>; accessed 12.09.2024). The practical component focuses on actual laboratory analyses of rock and mineral samples using X-ray Fluorescence Spectroscopy (XRF), Inductively-Coupled Plasma Mass Spectrometry (ICP-MS), Thermal Ionisation Mass Spectrometry (TIMS), Secondary Ionisation Mass Spectrometry (SIMS), and Electron Microprobe Analysis (EPMA).

The Marine and Environmental Geochemistry Department at Stellenbosch University focuses on macro-nutrients (e.g. N, P, Si) and trace metal cycling in the modern ocean (e.g. Fe, Mg, Zn, Cd, Co, Cu), interactions with biological organisms (especially with microbes and algae), and the impact of atmospheric deposition (dust) ([https://www.sun.ac.za/english/faculty/science/earthsciences/research/Environmental-Geochemistry#:~:text=Currently%20our%20research%20at%20Stellenbosch,of%20atmospheric%20deposition%20\(dust\)](https://www.sun.ac.za/english/faculty/science/earthsciences/research/Environmental-Geochemistry#:~:text=Currently%20our%20research%20at%20Stellenbosch,of%20atmospheric%20deposition%20(dust);); Accessed 12.09.2024).

The Analytical Geochemistry and Laboratory Division of the Geological Survey of Namibia houses geochemical laboratories equipped with a wide range of modern facilities and instruments to provide analytical services to a wide range of clientele, with the Regional Geochemistry subdivision conducting countrywide baseline geochemical mapping (<https://www.mme.gov.na/directorates/gsn/geochem/>; accessed 12.09.2024).

The acquisition of a portable XRF by Mangosuthu University of Technology of South Africa in October 2022, continues to provide valuable services to graduate students through sampling and analyses of the concentration of potentially harmful elements (PHEs) and assessment of their levels of contamination in the soils, natural waters, and food crops at several abandoned mine sites in South Africa.

In February 2023, Fortune Business Insights announced Attom's desire to revolutionize geochemistry research in the coming years. Analytical instruments were deployed in the Department of Geological Sciences at UCT as a portion of the BIOGRIP network of new research facilities to provision and progress biogeochemical research in South Africa (<https://www.fortunebusinessinsights.com/industry-reports/geochemical-services-market-100398>; accessed 12.09.2024).

In February 2024, the Council of Geosciences (CGS) of South Africa presented a summary of the results of geochemical studies conducted as part of the CGS 10 year mapping program that began in 2013. The seven comprehensive Geochemical Synthesis Reports (FY23/24) provide in-depth analyses of the soil samples collected, along with interpretations and conclusions concerning the geochemical characteristics of the studied environments (<https://www.geoscience.org.za/media/press-release/release-of-geochemical-synthesis-reports/>; accessed 12.09.2024).

The Africa Geochemical Database Project

The Africa “Geochemical Database Project”, which has suffered considerable setbacks since its initiation in the early 1990s, produced a couple of successes in the last few years. Examples include

1. The report in 2023 by Sun et al. (2024) who, through “The Sino–Zambian Cooperation Project”, have filled the gap in Zambia national-scale geochemical mapping, providing basic geochemical guarantees for Zambia's basic geology, mineral development, environmental protection, agricultural production, and other aspects.

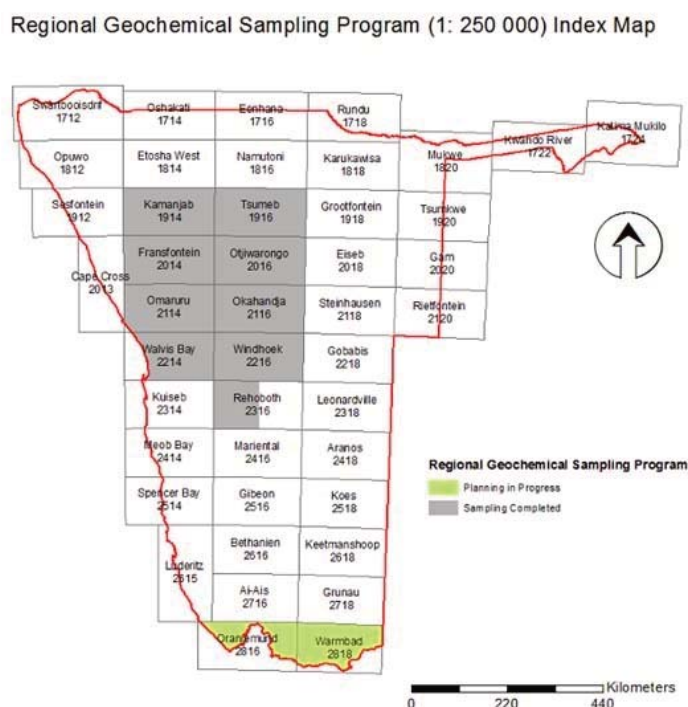


Fig. 1. Regional geochemical mapping in Namibia. Credit: Geological Survey of Namibia (<https://www.mme.gov.na/directorates/gsn/geochem/>; accessed 12.09.2024).

2. In 2024, the ongoing Regional Geochemistry Sampling Programme (RGSP) of the Geological Survey of Namibia continued its focus on country-wide baseline geochemical sampling (1:250 000 scale) that is envisaged to generate valuable information with respect to potential economic deposits, land use planning, environmental monitoring, pollution control, and many other applications (<https://www.mme.gov.na/directorates/gsn/geochem/>; accessed 12.09.2024).



Geochemical exploration in glaciated terrain
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Application of Applied Geochemistry in Southern Africa

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Commercial Laboratories

SGS, one of the world's leading testing, inspection and certification companies, provides analyses to the southern African market on a wide range of geological materials containing precious, base, rare-earth, and battery metals, as well as bulk commodities, like bauxite and iron ore.

Spectrometer Technologies, with regional headquarters in Johannesburg, Cape Town and Kigali (Rwanda), supplies high-integrity and reliable handheld XRF and other scientific analytical equipment (AAS, UV-Vis, EA, NIR, etc.) for the Sub-Saharan region of Africa for the mining and the mineral industry (<https://us-tech.co.za/>; accessed 12.09.2024).

Southern Africa also boasts a number of other large commercial geochemical laboratories, including ALS and UIS Analytical Services (Pty), specializing in mining, exploration, and environmental samples.

CHALLENGES IN APPLICATION OF APPLIED GEOCHEMISTRY RESEARCH IN AFRICA

Summary of Challenges


1. Geochemical complexities of the surface environment of Africa – new. Standardized sampling and analytical protocols are needed, re: Darnley et al. (1995) recommendations. This has not been fully achieved.
2. Lack of sufficient analytical capacity (e.g. modern highly sensitive analytical instrumentation) at regional centres to perform such a large-scale ultraprecise undertaking. This has been partly achieved.
3. Lack of a sufficient number of highly trained technicians able to install, maintain, troubleshoot, and operate today's modern analytical instrumentation. This has been partly achieved.
4. Lack of unanimity among geochemists for a determination of “background value”. This has not been fully achieved.
5. Lack of recognition by African governments (Geological Surveys), parastatals, other stakeholders, and potential donors of the value of geochemical knowledge of Africa's surface environment, and hence,
6. The investment of large sums of money are required to carry out such a large-scale and dedicated exercise in the production of regional geochemical maps of the region.

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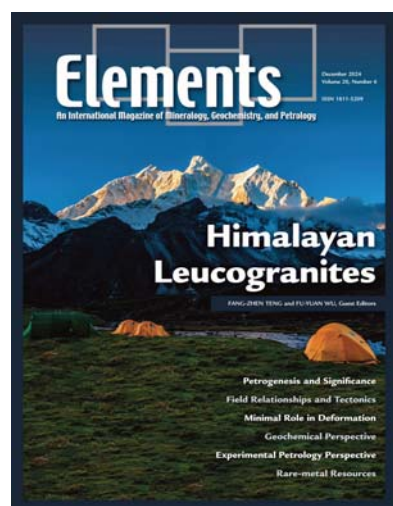
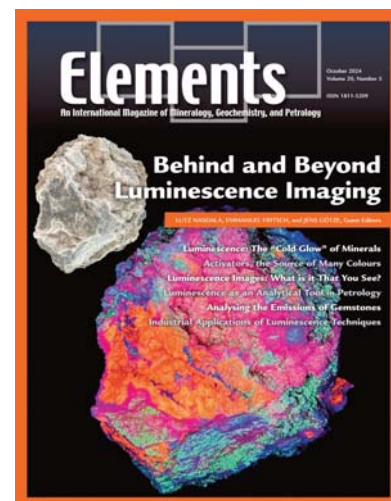
Recently Published in Elements

October 2024, v. 20, no. 5

Behind and Beyond Luminescence Imaging

This issue of Elements aims to convince readers that luminescence is not at all restricted to interesting pictures that show “something,” and that the analysis of the emissions may bear a wealth of information on what exactly is observed. Luminescence spectroscopy has become a versatile, quantitative group of techniques whose successful applications virtually cover all geoscientific sub-disciplines.

There are two AAG news items in this issue. The first is a citation to Renguang Zuo, the recipient of the AAG Gold Medal Award for 2023. The second is a citation to Ryan Noble, the recipient of the AAG Silver Medal Award for 2023.



December 2024, v. 20, no. 6

Behind and Beyond Luminescence Imaging

This issue of Elements describes the current understanding of the petrogenesis and significance of the Himalayan leucogranites by focusing on their tectonic and geodynamic background, source rocks, petrology, geochemistry, and links to orogenesis and economic resources. This issue not only summarizes the state-of-the-art research on leucogranites but also presents an example of how a multidisciplinary approach can be used to constrain the petrogenesis of granites and the associated mineralization and orogenic evolution.

There are no AAG news items in this issue of Elements.

Reminder

AAG members can access past issues of Elements at
<http://elementsmagazine.org/member-login/>
 using their e-mail address and AAG member ID

John Carranza

Writing Geochemical Reports, 3rd Edition

Guidelines for surficial geochemical surveys

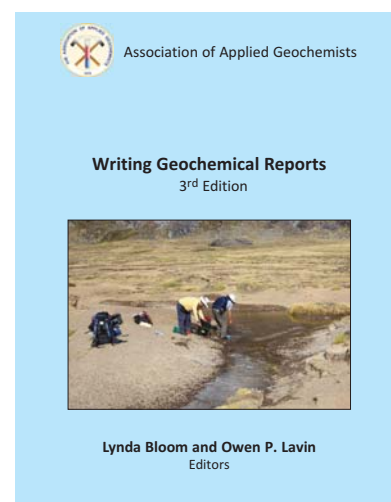
Edited by Lynda Bloom and Owen Lavin

The Association of Applied Geochemists has developed international standards for writing geochemical reports that provide clear instructions for reporting geochemical results, together with the requisite supporting information to evaluate these results for accuracy, integrity and credibility.

The target audience for these guidelines is anyone charged with reporting geochemical results, which includes, but is not limited to, company geoscientists, external consultants and contractors, government scientists, and university scientists and students. The guidelines focus on preparation of an electronic publication that provides a systematic and permanent record of the work performed and take into account the ability to bundle text, tables, figures, images, and oversized maps into one electronic file. The third edition of this guide was released in 2022 and expands the original mandate of Writing Geochemical Reports (1st and 2nd editions) to include multiple types of geochemical surveys with survey-specific recommendations.

The guide may be **downloaded free of charge** from the AAG website:

<https://www.appliedgeochemists.org/publications>



Geochemistry: Exploration, Environment, Analysis

VOLUME 24, ISSUE 4, NOVEMBER 2024

Enhanced enrichment of rare earth elements during pedogenesis under subtropical climate

Jian Wu, Zheng Gong, Qian Jin, Maochao Zhang, and Chengmin Huang

<https://doi.org/10.1144/geochem2024-024>

Thallium enrichment mechanism and geological significance of the Xiangquan thallium deposit in Anhui Province, China

Zhijuan Guo, Renting Xu, Yuntao Song, Wei Han, Mu Kong, and Yang Fan

<https://doi.org/10.1144/geochem2024-028>

Pollution risk assessment and spatial distribution of potentially hazardous elements in selenium-rich soils in the Menyuan Basin of the northeastern Tibetan Plateau

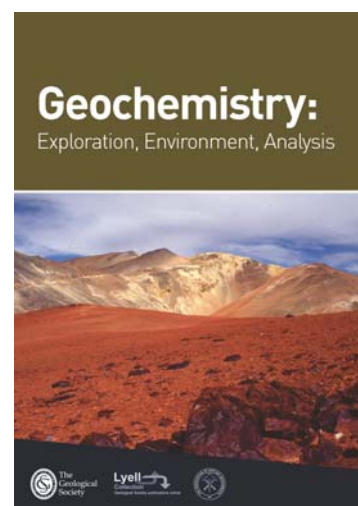
Zhao An, Leiming Li, Changwei Qi, Ji'en Dong, Ying Ma, Fuchun Wang, Haikui Tong, and Zhenhua Zheng

<https://doi.org/10.1144/geochem2024-011>

Removal performance and adsorption behaviour on Mg-based adsorbents in As(III) and F simultaneous removal as in comparison with As(V)

Hajime Sugita, Kazuya Morimoto, Takeshi Saito, and Junko Hara

<https://doi.org/10.1144/geochem2024-022>



REVIEW ARTICLES IN GEOCHEMISTRY: EXPLORATION, ENVIRONMENT, ANALYSIS

Exploration geochemistry is a topic no longer taught in most geology or geoscience courses. However, the field is still very relevant for the mineral resource industry, as high levels of interest in continuing education short courses in exploration geochemistry has indicated in recent years. In addition, there have been no recent textbooks that specifically cover the broad field of exploration geochemistry, leaving a vacuum of recent and relevant information on the many sub-topics that comprise this field. It is within this context that the AAG has canvassed its members to provide state-of-the-art reviews on various topics of exploration geochemistry. The authors are current or recently retired practitioners and experts in their respective fields. The review articles in this series capture their respective expertise and practical experience gathered over many decades of experience, and provide a valuable resource for those undertaking exploration geochemistry for years to come. Four papers have been published to date with more to be published in 2025.

Articles

Practical applications of quality assurance and quality control in mineral exploration, resource estimation and mining programs: a review of recommended international practices

B.W. Smee, L. Bloom, D. Arne, and D. Herberlein

Geochemistry: Exploration, Environment, Analysis, v.24(2)

<https://doi.org/10.1144/geochem2023-046>

Stream sediment geochemistry in mineral exploration: a review of fine-fraction, clay-fraction, bulk leach gold, heavy mineral concentrate and indicator mineral chemistry

M.E. Doherty, K. Arndt, Z. Chang, K. Kelley and O. Lavin

Geochemistry: Exploration, Environment, Analysis, v.23(4)

<https://doi.org/10.1144/geochem2022-039>

Review of till geochemistry and indicator mineral methods for mineral exploration in glaciated terrain

M.B. McClenaghan, R.C. Paulen, I.R. Smith, J.M. Rice, A. Plouffe,

I. McMartin, J.E. Campbell, M. Lehtonen, M. Parsa, and

C.E. Beckett-Brown

Geochemistry: Exploration, Environment, Analysis, v.23(4)

<https://doi.org/10.1144/geochem2023-013>

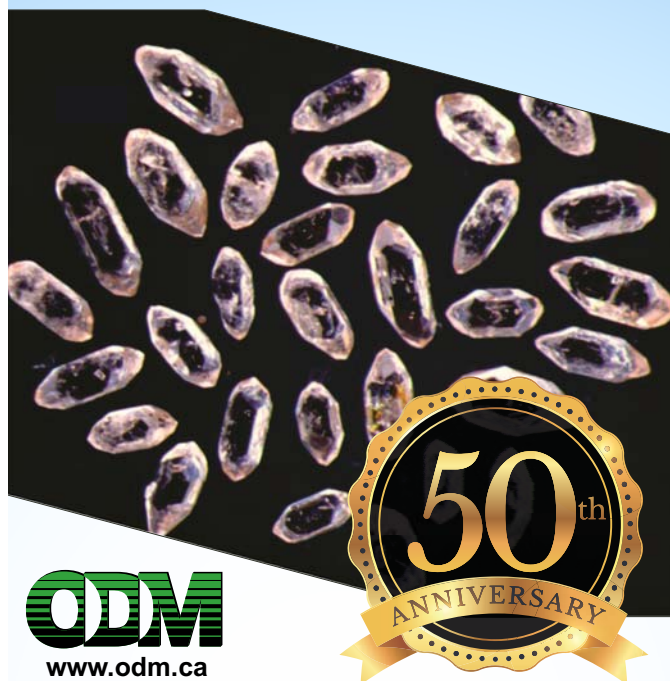
Soil gases in mineral exploration: a review and the potential for future developments

C. Plet and R.R.P. Noble

Geochemistry: Exploration, Environment, Analysis, v.23(2)

<https://doi.org/10.1144/geochem2023-008>

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News

EARTHCHEM GEOCHEMICAL DATA PORTAL

Innovative research in the Earth, Ocean, and Environmental Sciences is strongly supported by the availability of data to answer key questions. In a community increasingly looking for answers to global-scale questions, access to global data is an even stronger support. To this end, EarthChem provides a global source of open access geochemical, petrological, and related data, at <https://www.earthchem.org/> (Fig. 1).

EarthChem is effectively a “one-stop-shop” that gives users the ability to search for existing data, contribute new data, and interact with like-minded professionals. Open access data is queried from federated databases including PetDB, SedDB, NAVDAT, MetPetDB, the USGS National

Geochemical Database, GEOROC, and GANSEKI.

Geochemical, petrological,

mineralogical, and other related data are acquired for many different scientific purposes, by a large variety of methods, and on different sample types. To facilitate accessibility, data may be queried in a variety of ways, including spatially, by author, keyword, community and data type (Fig. 2).

New data may be submitted with help from standardized templates (<https://www.earthchem.org/ecl/templates/>) and registered with Digital Object Identifiers (DOIs) to be preserved for the long term and contribute to future research.

EarthChem strives to continuously align and optimize its data services in support of the evolving research needs and scientific priorities of its diverse user community. EarthChem recognizes that its user community is diverse; the data that it hosts span many subdisciplines in the Earth, Ocean, and Environmental Sciences. Users are encouraged to access and build communities around specific data types or scientific themes to collaborate with colleagues from around the world in development and promotion of data best practices and accessibility.

Earthchem is part of an ecosystem of related projects governed by IEDA2 (<https://www.iedadata.org/>).

IEDA2 is a collaborative data infrastructure of three complementary data systems – EarthChem, LEPR/traceDs, SESAR – that jointly support researchers in the Geosciences to share and access sample data following the FAIR data principles (Wilkinson et al. 2016), and to ensure

open, reproducible, and transparent science practices. IEDA2 is funded by the US National Science Foundation through a Cooperative Agreement.

Readers are encouraged to interact with this valuable resource and use it to advance the state-of-the-art in geochemical research and innovation!

Contact info@earthchem.org for more information!

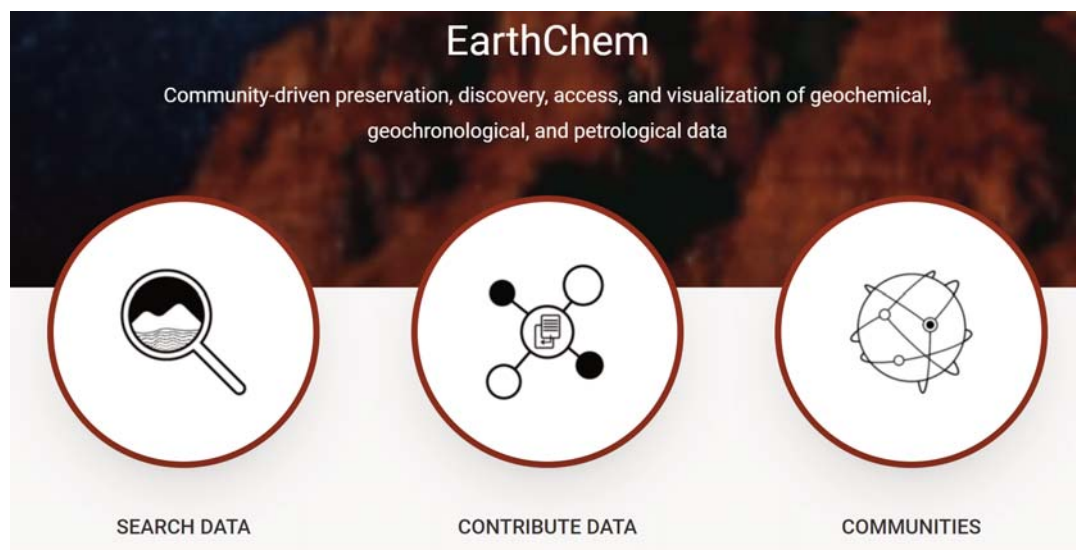


Fig. 1. The landing page at www.earthchem.org offers quick links to query the available data, submit new data, or connect with relevant research communities.

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IGSN ?

Community

Select Community

- Clumped Isotopes
- Critical Zone Observatory
- CZNet

Data Type

Select Data Type

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- Chemistry:ClumpedIsotope
- Chemistry:Fluid

Release Date, After

Click on map below to create polygon. Double-click last vertice to close polygon.

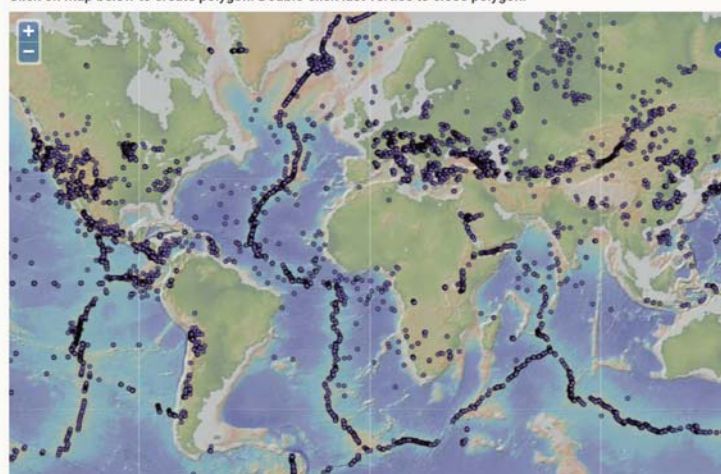


Fig. 2. This interface to the EarthChem Library can be found at <https://ecl.earthchem.org/search.php>.

News

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OSNACA (ORE SAMPLES NORMALIZED TO AVERAGE CRUSTAL ABUNDANCE) DATABASE

The OSNACA Project (Ore Samples Normalized to Average Crustal Abundance) is an open source project in which assay data are freely available online. Representative ore samples from all over the globe are being donated to the project and assayed at Bureau Veritas' Ultratrace Laboratory in Perth. All funds contributed by industry go towards analytical costs. The assay suite includes 65 ore, pathfinder, major and lithochemical elements.

<https://www.cet.edu.au/project/the-osnaca-project/#>

McLean Trott

IRELAND COMPLETES 13 YEAR NATIONAL SOIL MAPPING PROGRAM

Ireland has become one of the only countries in the world to complete detailed geochemical national soil sampling. Starting in 2011 in the border region, the Tellus survey, which is managed by Geological Survey Ireland, has collected its final sample in county Cork. Samples were completed for Northern Ireland in 2006 and now all-island sampling is complete. Samples were collected every 4 km² on a regular grid, ensuring all types of soil were collected as part of the national survey. Samples were also collected within urban locations every 500 m². The analytical data is being used by Geological Survey Ireland as well as other researchers to map soil for agricultural, environmental, health, and geological benefits. In total over 42,000 samples from 20,660 different locations were collected. The geochemical data from the Tellus survey is currently available for over 50% of the country, with more data being released over the coming months and years. Once all the data has been released, it will be used to deliver positive economic, environmental, and agricultural benefits by helping in the understanding of the local environment, soil management and natural resource potential. This soil survey is part of the Tellus Geochemical Survey in which soil and stream sediment samples are being collected. Data collected throughout the Tellus project is published and made freely available on the Tellus website: www.tellus.ie/en-ie/programs-and-projects/tellus/Pages/default.aspx.

NEW EDITOR-IN-CHIEF OF GEOCHEMISTRY: EXPLORATION, ENVIRONMENT, ANALYSIS

Matthew Leybourne, Professor of Geochemistry and Analytical Geochemistry in the Department of Geological Sciences and Geological Engineering, Queen's University, Kingston, Canada. Matthew, a long-time contributor to *Geochemistry: Exploration, Environment, Analysis* (GEEA) having published in some of the earliest issues of the journal, will take up the position of Editor-in-Chief starting in January 2025. He brings a wealth of enthusiasm and understanding to the role, including his broad knowledge of fields covered by the journal as well as practical editorial experience.

The Geological Society and the Association of Applied Geochemists would like to thank Scott Wood, outgoing Editor-in-Chief, for his excellent stewardship of GEEA over the last 6 years. GEEA continues to welcome submission of papers across geochemistry as applied to exploration and associated environmental issues. Submit your paper to

<https://www.editorialmanager.com/geochem/default2.aspx>.

Bethan Littley, Journal Manager

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In Memoriam

Agnete Steenfelt

On Sunday, September 29th, 2024, my good friend Agnete Steenfelt died. Agnete was the Chief Geochemist for the Geological Survey of Denmark and Greenland (GEUS), where she worked for her entire career – more than forty years. When she started working for GEUS in 1972, Agnete was one of very few female field geologists employed by the survey. Early in her career, she led a program of airborne gamma spectral surveying in east Greenland, to address the EU's then new interest in finding sources of uranium for future nuclear power generation in Europe. Flying those surveys involved sitting next to the pilot of a small fixed wing aircraft, navigating and route-finding using printed



aerial photographs, while speaking into a tape recorder to note when the aircraft passed pre-determined waypoints, identified visually by looking out of the window at landmarks (like cliffs and glacier fronts) and directing an assistant to manually mark the gamma spectra as it printed from the spectrometer onto computer paper in the back of the aircraft.

Agnete had a passion for geochemistry and was responsible for introducing modern geochemical prospecting to Greenland. In the 1980s, she instigated a campaign of continental-scale stream sediment sampling of Greenland. Over the ensuing more than three decades, she oversaw the collection of over twenty thousand stream sediment samples, many of which she collected, and in the first decades without the aid of GPS. Latterly, she personally harmonized the west Greenland datasets to produce a stunning seamless geochemical product encompassing more than seven thousand samples stretching around two thousand kilometres of coastline from north of Upernavik in the northwest to Kap Farvel in the south and into southeast Greenland. Agnete was an old-school geochemist in the best sense – focussed first and foremost on quality control of the data, selection of the most reliable analytical data, and elimination of analytical bias. For Agnete, science started and ended with the data. No shortcuts. Her work could always be relied on to have the strongest foundation in data quality. From her extensive work, Agnete was instrumental in determining that geochemical provinces occur on continental scale, and that South Greenland – in particular – is one such province, strikingly geochemically enriched in gold, uranium, niobium, tantalum, rare earth elements, and zinc.

While her scientific work undoubtedly contributed to major advances in understanding the continental-scale geology of Greenland, and in drawing international interest in mineral exploration, Agnete was never one to talk-up her own achievements. I was lucky to convince her to speak about some of her work (reluctantly and, I am quite sure, largely because she wanted to support me) on Polar Podcasts in 2020. As a result, I am grateful to be able to still listen to her voice and to the passionate way she spoke about her years of work in Greenland.

After she retired, despite declining health, she continued to work as an Emeritus senior scientist for GEUS for many years, continuing to share her enormous wealth of knowledge of the geology and geochemistry of Greenland with younger generations, with exploration companies, and with her many academic colleagues. Even in this last year of her life, she continued to work when she could and to co-author new academic papers on the geology of Greenland.

Agnete leaves behind an enormous body of data and knowledge of the geochemistry of Greenland. She also leaves behind a gaping hole. Agnete was my friend, the kind of friend you hope to have. To the young geologist I was at the time I joined GEUS, alone in a new country, Agnete was immediately kind and welcoming. Throughout our long friendship, she shared her insight, new perspectives and ideas, and she never (sorry Agnete, you probably wouldn't like the language) took any shit from anyone, including me. When I was thoughtless, or superficial, or wrong, she told me straight, and I am glad she did.

When we said our final goodbyes, we both remembered one perfect day of fieldwork we spent together almost twenty years ago, high up near the Inland Ice in west Greenland, an evening that was almost warm, the blue sky stretching westward toward the Davis Strait. After dinner, we sat side-by-side in our camp chairs in the still air, not a mosquito, not a sound, our stomachs full, dessert wine in our camp mugs, and looked toward the horizon.

from LinkedIn by **Julie Hollis**

Secretary General, EuroGeoSurveys

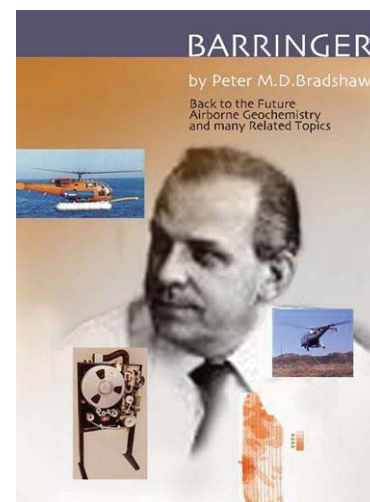
Barringer

Back to the Future: Airborne Geochemistry and many Related Topics

by Peter M.D. Bradshaw

The 1960s and 70s were marked by an explosion in mineral exploration and remote sensing technology. A leader throughout this period was Dr. Anthony (Tony) Barringer and his team at Barringer Research Ltd. (BRL). The highly successful airborne geophysical methods created at BRL are well known while the contributions to exploration geochemistry and many other fields are not. This book documents the many advances in geochemical theory, as well as the ground, airborne and remote sensing techniques plus analytical methods that were conceived and developed under the leadership of Tony Barringer. Innovative concepts backed by pioneering research funded by BRL on the movement of metals in rock, soil and vegetation remain important areas of investigation.

Tony Barringer's ability to bring together a diverse team including geologists, geochemists and physicists with electrical, optical and aeronautical engineers under one roof, provide leadership, a highly stimulating environment and financial support, was truly remarkable. This led to ground breaking advances in a number of different fields, including: exploration geochemistry for minerals and oil and gas; environmental monitoring from the ground, aircraft and space; and civilian and armed forces security. The underlying scientific principles for many of the inventions, now upgraded with modern electronics, are still considered state of the art. One of the many inventions from the BRL "incubator" described in this book is lonscan, the drug and explosive screening device used in most airports today, which was conceived and developed by BRL in conjunction with technology for the detection of mineral deposits.



The book may be downloaded free of charge from the AAG website:

<https://www.appliedgeochemists.org/publications>

CALL FOR AAG MEDAL NOMINATIONS

Significant contributions to applied geochemistry or service to AAG are recognised by award of either the AAG Gold or Past Presidents' (Silver) medals respectively. The history of how the medals came about and the formulation of guidelines for their award are discussed in the April 1992 issue of EXPLORE, issue 75, which can be found on the AAG website under Publications/EXPLORE newsletter/1990–1994.

Guidelines for nominating individuals for either medal are posted in 'The Association' section of the AAG website (www.appliedgeochemists.org) under the 'Awards' area. Past discussions of the guidelines indicated that the process for nominating individuals for either medal was a little cumbersome, to the extent that some nominations were not being made, and others took an unnecessarily long time to resolve. With this in mind, the 2012–2013 Awards & Medals Committee (Chair: Paul Morris. Committee members Eion Cameron, Pertti Sarala, and Chris Benn) revisited the guidelines to make the nomination process a little friendlier, with a more concise time frame for resolution. The revised guidelines for nominations are presented

3.0 NOMINATIONS

- 3.1 To be eligible for consideration for either award, nominations must be received by the Chairman of the Awards and Medals Committee on or before December 1st of any year.
- 3.2 For acceptance by the Awards and Medals Committee, nominations must be signed by a minimum of four (4) Fellows (voting members) of the Association in good standing. Nominations should include the following:
 - (a) A one-page recommendation from each of the four nominators;
 - (b) A resume or curriculum vitae of the nominee;
 - (c) An itemized list of the outstanding scientific achievements (Gold Medal) or the dedicated service to the Association (Silver Medal) of the nominee (maximum two pages).

Since members of the Awards Committee may not have personal knowledge of the nominee, the completeness and quality of the nomination will be critical in terms of evaluation and selection.

Nominations for either medal can be made any time to ejmcarranza@gmail.com and will be considered in the year of the nomination provided they are received prior to December 1.

John Carranza
AAG Past President
Chair, Awards and Medals Committee



Book release

Fractals and Multifractals in the Geosciences

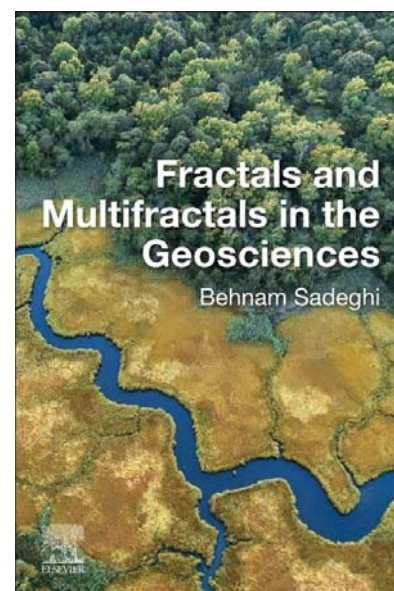
Behnam Sadeghi

Association of Applied Geochemists Councilor, Dr. Behnam Sadeghi, has recently published a new book with Elsevier, titled *Fractals and Multifractals in the Geosciences*. This book details the application of a wide range of multifractal methods, including the novel methods developed by the author, along with the assessment of uncertainty in sample classification and stability of spatial patterns. It also provides criteria for the selection of the most effective combination of data pre-processing and multifractal modelling to extract desired features or signals in the data. The book specifically aims to introduce, apply, and test novel multifractal models that account directly for changes in relationships between variables, as well as the effects of distance between samples and the source of anomalous metal contents in geoscience samples. Linked to this will be an assessment of the effects of different pre-processing of data prior to the application of the models and quantification/model uncertainty in geochemical anomaly maps, associated with sample classification and spatial interpolation. Also included are a variety of exploration and environmental projects in 2-D and 3-D in Sweden (throughout the country), Cyprus (Southern half of the country), Turkey (Western Turkey) and Iran (Central Iran), on various mineralisation types, including VMS, IOCG, and orogenic gold, using a variety of geochemical samples.

Fractals and Multifractals in the Geosciences will be invaluable for exploration and applied geochemists, urban and environmental geochemists, mathematical geoscientists, geostatisticians, computational geoscientists, data scientists, and GIS professionals, mining engineers, petroleum engineers, exploration geophysicists, mining and petroleum industry decision-makers and stakeholders, who need to better understand fractal geometry, along with its theory and applications in geochemical anomaly targeting that are helpful for decision-making for follow-up sampling and explorations.

The book is available at:

<https://shop.elsevier.com/books/fractals-and-multifractals-in-the-geosciences/sadeghi/978-0-323-90897-9>



Book release

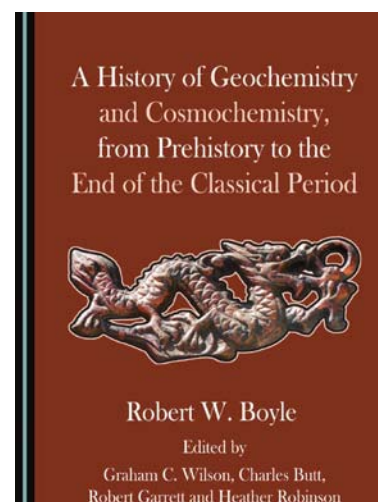
A History of Geochemistry and Cosmochemistry, from Prehistory to the End of the Classical Period

Since Mendeleev outlined the modern periodic table in 1869, many new uses have been found for the 92 naturally occurring elements. This book travels back in time to describe the utilization of materials familiar (gold, copper, iron) and arcane (arsenic, boron, red ochre) and their practical history (mining, metallurgy, and crafts), with evidence from archaeology and geology. Together with the technological developments, author Robert Boyle portrays the advances in our understanding of materials science which led to modern geological and environmental sciences. It is a source book valuable to students of history and archaeology, mining and metallurgy, as well as to geologists, mineralogists and geochemists everywhere.

About the author, Bob Boyle (1920–2003)

Bob was a pioneer of the application of geochemistry to mining geology and mineral exploration. He was an eminent geochemist with a long career at the Geological Survey of Canada where he initiated the Geological Survey of Canada's regional geochemistry program in 1957. His publications spanned various mineral-deposit types and a wide spectrum of precious and base metals. Bob was a founding member of the Association of the Applied Geochemists in the 1970s, and was awarded the Association's highest honor, the Gold Medal, in 1999 in recognition of his lifetime of outstanding achievement in exploration geochemistry. Among Bob's many achievements and awards was his induction into the Canadian Mining Hall of Fame in 1997.

The book is available at: <https://www.cambridgescholars.com/product/978-1-5275-7614-8>



Welcome New AAG Members

REGULAR MEMBERS

Regular Members are non-voting members of the Association and are currently engaged in the field of applied geochemistry at the time of their application and have been active for at least two years prior to the date of joining.

Nicholas Estrada

Consultant Geologist
Project Geologist, Greenheart Gold
RRM8+JJ Paramaribo
Km 17 via palmas
Paramaribo, PM
Suriname
Membership #4570

Ian McBride

Geologist, Copper Search Ltd.
11 Elmwood Ct
Mawson Lakes, SA
5095 Australia
Membership #4565

Michael Carter

Principal Geologist, Orange Geoscience
50 Meredith St, VIC
3084 Australia
Membership #4559

Marcus Wilson

Principal/Director,
Outcrop Exploration Services Pty Ltd
3 Riverby Close
Shelly, WA
6148 Australia
Membership #4551

Daniel Layton-Matthews

Professor, Queen's University
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Kingston, ON K7L 3N6
Canada
Membership #4552

Hans Oskierski

Senior Lecturer, Murdoch University
90 South St West
Murdoch, WA
6150 Australia
Membership #4558

Jinxiang Huang

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Perth, WA
6005 Australia
Membership #4556

Angeline Orkild-Norton

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Denver Federal Center
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Denver CO 80215
USA
Membership #4568

Dr Sam Spinks

Generative Lead (Exploration)
Teck Resources Ltd
8 Welch Rd
Roleystone WA
6111 Australia
Membership #4569

FELLOWS

Fellows are voting members of the Association and are actively engaged in the field of applied geochemistry. They are Regular AAG Members nominated to be a Fellow by a Fellow of the Association by completing the Nominating Sponsor's Form. Consider becoming a Fellow of the AAG. Download the application form here: <https://www.appliedgeochemists.org/>

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Professor, China University of Geosciences
No. 388 Lumo Road, Wuhan, P.R. China
Wuhan Shi, Hubei Sheng
430074 China
Membership #4534

Dr Anna Petts

34 Pine Ave
Warradale, SA
5046 Australia
Member # 889

Samantha Scher

Principal Geochemist
1338 Fairmont Sr NW #2
Washington, DC 20009
USA
Membership #4189

STUDENT MEMBERS

Student members are students that are enrolled in an approved course of instruction or training in a field of pure or applied science at a recognized institution. Student members pay minimal membership fees.

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PhD Candidate, University of Tasmania
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Hobart, TAS
7005 Australia
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7005 Australia
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Therese Nganje

Professor, University of Calabar
Eta Agbor Rd, Calabar
Cross River, 540242
Nigeria
Membership #4557



Articles in Past Issues of EXPLORE

1 year ago EXPLORE 201 (December 2023)

Inverting the missing SiO₂ and LOI contents in the North American Soil Geochemical Landscapes datasets

5 years ago EXPLORE 185 (December 2019)

Petrological and geochemical study of the Precambrian basement complex rocks in Katchuan Irruan areas, southeast of Ogoja, Southeastern Nigeria

10 years ago EXPLORE 165 (December 2014)

GeoVIEW.WA – an interactive geological resource

20 years ago EXPLORE 126 (January 2005)

Sample preparation of 'nuggety' samples: Dispelling some myths about sample size and sampling errors

30 years ago EXPLORE 86 (January 1995)

Accumulation of gold and heavy minerals by moss mats: An example from northern Vancouver Island, British Columbia

<https://www.appliedgeochemists.org/explore-newsletter/explore-issues>



CALENDAR OF EVENTS

International, national, and regional meetings of interest to colleagues working in exploration, environmental and other areas of applied geochemistry. These events also appear on the AAG web page at: www.appliedgeochemists.org.

2025

- | | |
|------------------|---|
| 15–18 January | 41 st Spanish Mineralogical Society Annual Meeting, Seville, Spain. Website: https://gestioneventos.us.es/congreso-sem-sea-2025 |
| 20–23 January | Association of Mining and Mineral Exploration BC (AMEBC) Cordilleran Round Up Convention, Vancouver, British Columbia, Canada. Website: roundup.amebc.ca |
| 2–5 March | Prospectors and Developers Convention, Toronto, Canada. Website: pdac.ca/convention |
| 2–7 March | European Winter Conference on Plasma Spectrochemistry. Berlin, Germany. Website: ewcps2025.de |
| 20–21 March | GEMS 2025 - International Conference on Geology Engineering and Marine Sciences. Wuhan, China. Website: gems.isgcpi.com/ |
| 1–4 April | GSA, 2025 ,Cordilleran Section Meeting, Sacramento, California, USA. Website: https://www.geosociety.org/GSA/Events/Section_Meetings/GSA/Sections/cd/2025mtg/home.aspx |
| 27 April – 2 May | European Geosciences Union, EGU, EGU 2025 - European Geosciences Union General Assembly. Vienna, Austria, Website: egu25.eu/ |
| 5–7 May | 14 th International Congress of Prospectors and Explorers proEXPLO2025. Lima, Peru. Website: https://proexplo.com.pe |
| 11–14 May | Geological Association of Canada, GAC-MAC-IAH-CNC, Annual Meeting, Ottawa, Canada. Website: https://event.fourwaves.com/ottawa2025/pages |
| 3–5 June | 25 th North American Workshop on Laser Ablation. Knoxville. Tennessee. Website: https://www.nawlaworkshop.com/ |
| 6–11 July | Goldschmidt 2025 Conference, Prague, Czech Republic. Website: https://conf.goldschmidt.info/goldschmidt/2025/meetingapp.cgi |
| 16–21 July | Third IAGC International Conference (IAGC-3), Cagliari, Italy. Website: https://www.unica.it/wri-18/ |
| 3–7 August | 18 th SGA Biennial Meeting. Golden. Colorado USA. Website: sga2025.org |
| 8–11 September | Australasian Exploration Geoscience Conference 2025. Perth, Australia. Website: https://2025.aegc.com.au/ |
| 8–12 September | Eurosoil 2025. Seville, Spain. Website: soilscience.eu/eurosoil-2025 |
| 26–29 September | Society of Economic Geologists, SEG 2025. Brisbane, Australia. Website: www.seg25.org |
| 19–25 October | Geological Society of America Annual Meeting, San Antonio, Texas. Website: https://community.geosociety.org/gsa2025/home |

The status of the meetings was confirmed at the time of publication, but users of the listing are strongly advised to carry out their own research as to the validity of an announcement.

Please let us know of your events by sending details to: Ray Lett (Raylett@shaw.ca)



EXPLORE Publication Schedule

Quarterly newsletters are published in March, June, September, December

• **Deadlines** for submission of articles or advertisements:

March newsletter: January 15

September newsletter: July 15

June newsletter: April 15

December newsletter: October 15

- **Manuscripts** should be double-spaced and submitted in digital format using Microsoft WORD®. Articles should be between 2000 and 3000 words. Do **not** embed figures or tables in the text file.
- **Photos** (colour or black and white) should be submitted as separate high-resolution (minimum 300 dpi at the scale of reproduction) PNG, TIFF, JPEG or PDF files.
- **Figures** should be submitted as separate EPS, PDF or original software (e.g. CDR, AI) files.
- **Tables** should be submitted as separate digital files in Microsoft EXCEL® format (i.e. XLS).
- All scientific/technical articles will be reviewed. Contributions may be edited for clarity or brevity.
- Formats for headings, abbreviations, scientific notations, references and figures must follow the Guide to Authors for *Geochemistry: Exploration, Environment, Analysis* (GEEA) that are posted on the GEEA website at:
<https://www.geolsoc.org.uk/geea-authorinfo>
- An **abstract** of about 250 words must also be submitted that summarizes the content of the article. This abstract will be published in the journal ELEMENTS on the home page at <https://www.elementsmagazine.org>.

Submissions should be sent to the Editor of **EXPLORE**:

Beth McClenaghan

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